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FINAL

# RESULTS OF THE HYDROGEOLOGIC INVESTIGATION VIEQUES ISLAND, PUERTO RICO

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## 1.0 INTRODUCTION

This document presents the results of hydrogeologic investigations completed in August 1999 at the Eastern Maneuver Area (EMA) on Vieques Island, Puerto Rico, an ecological screening evaluation, and a Baseline Human Health Risk Assessment for soil and groundwater exposure pathways. The work was performed under contract number N62470-95-D-6007, Navy CLEAN II Program, for the Atlantic Division of the Naval Facilities Engineering Command.

Vieques Island has a land area of approximately 33,000 acres and is located in the Caribbean Sea approximately seven miles southeast of Puerto Rico. The Navy's facility (Navy Facility) is located on the eastern one-third of Vieques Island. The facility includes both the Atlantic Fleet Weapons Training Facility (AFWTF) comprising 3,600 acres, and the adjacent and wholly contiguous Eastern Maneuver Area (EMA) comprising 11,000 acres. Both are under the command of U.S. Naval Station Roosevelt Roads (NSRR). Camp Garcia is located in the southeastern part of the EMA.

The AFWTF, located on the far eastern tip of the island, provides facilities and schedules naval gunfire support and air-to-ground ordnance delivery training for Atlantic Fleet ships, NATO ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic, conducts training for Marine amphibious units, battalion landing teams and combat engineering units in the EMA. On occasion, naval units of allied nations having a presence in the Caribbean and the Puerto Rican National Guard also utilize the EMA.

The training areas have been in continuous use since World War II when the Navy acquired title to the land. Recently, some Puerto Rican citizens and officials have publicly expressed that ordnance-derived constituents may have migrated (via groundwater, surface water and air emissions) from the Navy property to the western two-thirds of Vieques Island. This investigation was conducted to respond to the stated concerns of the Puerto Rican citizens and officials. In addition, as part of a RCRA Facility Investigation, the United States Environmental Protection Agency (USEPA) has requested the Navy to complete a "baseline" groundwater investigation along the western property boundary of the Navy Facility. The groundwater

baseline investigation is to be designed to establish baseline groundwater quality and regional groundwater flow patterns along the western perimeter of the Navy's Facility.

## 1.1 Purpose and Objectives of the Field Investigations

The purpose of the investigation is to provide specific information regarding soil and groundwater conditions at the western property boundary of the EMA.

The scope of the field program was designed to meet four specific objectives:

- Determine if the surface soil at the western property boundary contains explosive compounds
- Determine if the groundwater at the EMA western property boundary contains explosive compounds and assess if there is a potential for the compounds to migrate off-site
- Evaluate groundwater flow direction in the vicinity of the EMA property boundary
- Assess the risk posed to potential receptors if explosives were found in either the surface soil or groundwater through an Ecological Screening Evaluation and a Baseline Human Health Risk Assessment.

## 1.2 Baseline Human Health Risk Assessment and Ecological Screening Evaluation

A Baseline Human Health Risk Assessment (HHRA) and ecological screening evaluation was conducted for the western property boundary of the EMA. The objectives of the HHRA were to:

- Identify Chemicals of Potential Concern (COPCs) in surface soil and groundwater by comparing detected concentrations of chemicals to USEPA Region III Risk-based Concentrations (RBCs) (USEPA, 1999a) and;
- Conservatively evaluate current and future potential risks associated with direct contact exposures (e.g., ingestion, dermal contact, and inhalation of particles) to those chemicals exceeding Region III RBCs.

The objective of the ecological screening evaluation was to identify COPCs in the surface soil and groundwater samples collected from the western property boundary of the EMA. This was accomplished by comparing detected concentrations of chemicals for which a possible complete exposure pathway exists to appropriate criteria and toxicological benchmarks. Those chemicals with detected concentrations exceeding appropriate screening thresholds were identified as ecological COPCs.

## 1.3 Organization of the Report

The report is organized into seven sections. Section 1.0 provides an introduction to the report and explains the purpose and objectives of the investigations. The site setting is provided in Section 2.0. Section 3.0 contains details of the investigation method and scope of work for the field program. Results of the laboratory analysis of soil and groundwater are provided and discussed in Section 4.0. Also, Section 4.0 includes the analysis of local groundwater flow. Section 5.0 contains the analysis of risk using the results of the sampling program. Section 6.0 provides a brief summary of the report findings while the references used in developing this report are provided in Section 7.0.

## 2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

This section presents a summary of information regarding the environmental setting of Vieques Island including physiography, climatology, regional geology and regional hydrogeology.

### 2.1 General Physiography

Vieques, the largest offshore island belonging to the Commonwealth of Puerto Rico, is located approximately 7 miles east-southeast of the island of Puerto Rico; the long axis of Vieques Island is orientated east to west. Figure 2-1 presents the location of Vieques off the coast of Puerto Rico. The topography of Vieques is characterized by a series of low hills and small valleys. The most elevated areas (hills) occur along a west to east axis near the center of the island. The highest peak is Monte Pirata with an elevation of 987-feet above sea level. The slopes of the central mountains are steeper on the north coast than the south. Figure 2-2 presents a map of the area of interest on Vieques Island (Torres-Gonzalez, 1989)

### 2.2 Climate

The climate of Vieques is tropical-maritime. Temperatures are nearly constant with an annual average of about 79 degrees Fahrenheit (°F). August is the warmest month (82°F) and February is the coldest (76°F). Vieques lies within the path of the prevailing easterly trade winds that result in a rainfall pattern characterized by a dry season (December through July) and a rainy season (August through November). Heavy precipitation (Torres-Gonzalez, 1989) may be induced by tropical storms in the Caribbean from June to November.

The long-term annual average precipitation is approximately 45-inches. The eastern part of the island receives about 25-inches of precipitation annually while the Resolución Valley area (western) receives approximately 50-inches of annual rainfall. Approximately 50 percent of the total annual precipitation occurs during the rainy season (Torres-Gonzalez, 1989).

## 2.3 Regional Geology

The geology of Vieques is characterized by volcanic and plutonic bedrock generally overlain by alluvial deposits and patches of limestone. The generalized geology of Vieques Island is presented on Figure 2-3. Volcanic andesites of Late Cretaceous age were deposited in a marine environment. Later in the Cretaceous a quartz-diorite plutonic complex intruded the andesite, and are exposed over a large portion of the island. Limestone of Tertiary age occurs in sections of the north, south, and eastern parts of the island. The most extensive deposits of limestone are found on the south coast peninsulas. The limestone is generally soft and yellowish, and well indurated due to weathering. The alluvial deposits are generally of Quarterny age, consisting of a mixture of sand, silt, and clay. Most of the Esperanza and Resolución aquifers are formed by these deposits. Seaward, the floodplains consist of beach and dune deposits formed by calcite, quartz, volcanic rock fragments and minor magnetite. Unconsolidated deposits of sand that are the direct result of stream erosion along major streams and along where the deposits enter the sea are carried along the coast. Unconsolidated deposits of sand are typically found in the northwestern part of the island, and to the south along Quebrada la Mina in the Esperanza Valley.

Well logs and surface geophysical surveys indicate that the thickness of the sedimentary deposits range from 0 to about 90 feet in the Esperanza Valley (Figure 2-4). A basal clay bed, with a maximum thickness of 15 feet, overlies a granitic quartz-diorite. The clay is overlain by interbedded sand and silt deposits with a maximum thickness of 60 feet. Aquifers in Vieques are generally semiconfined because of a series of interbedded clays. The uppermost unit is largely colluvium consisting of sand and silt, with sand predominating coastward (Torres-Gonzalez, 1989).

## 2.4 Regional Hydrogeology

The following section summarizes the regional hydrogeology of Vieques Island including the hydrogeology of the Esperanza Valley, Camp Garcia, and salt water intrusion within the aquifers.

### 2.4.1 Esperanza Valley

The approximately 10 square mile Esperanza Valley is the largest alluvial valley in Vieques. The alluvial deposits extend from the vicinity of Ensenada Sombe to Bahia Tapon in Camp Garcia (Figure 2-5). This area likely has the greatest potential for ground-water development in Vieques. Until 1978, Puerto Rico Aqueduct and Sewer Authority (PRASA) operated a battery of 10 wells in the Valley. Groundwater withdrawals in the valley averaged about 425,000 gal/day. As pumpage increased with development of the well field, the salinity of the water increased.

The source of groundwater in Esperanza valley is rainfall recharged to the aquifer from ephemeral streams or direct infiltration in the basin. The elevation of the water table in the lower valley ranges from 10 to 100 ft. above mean sea level. Significant rises in ground-water potentiometric levels due to rainfall were monitored at observation wells in the valley, however long-term changes in potentiometric water levels were minimal and were related only to natural recharge and discharge. Figure 2-6 presents groundwater elevation contours for the Esperanza alluvial aquifer. The groundwater flow direction at the western property boundary of EMA and in the area of Camp Garcia is to the southeast.

Recharge to the alluvial aquifer occurs primarily throughout the island along the central volcanic contact. Along the south-central shoreline, recharge through outcrops of limestone rock is limited by the low permeability of the indurated and weathered limestone surface.

Aquifer tests in the Esperanza alluvial aquifer indicate transmissivity values ranging from 200 $ft^2/d$ near Camp Garcia to as much as 2,000 $ft^2/d$ east of Ensenada Sombe. Transmissivity is affected by the thickness of the surficial deposits and the hydraulic conductivity of the sediments. The hydraulic conductivity of the alluvium increases toward the coast where the amount of sand in the deposits increases. Alluvium thickness increases toward the sea from 0 to about 90 ft., decreasing toward the east where depth to the bedrock is about 30 ft. Hydraulic conductivity values for the alluvium were estimated at less than 1 ft/d along the north-central hills in the valley to as much as 35 ft/d near the coast. Storage coefficient values were assumed to be about 0.1 in the water-table zone and computed at above 0.006 in the semi-confined layer. The aquifer tests showed that the overlying clayey deposits release water in response to pumping from the alluvium.

### 2.4.2 Camp Garcia

Camp Garcia, located east of Esperanza Valley (Fig. 2-1), includes about five square miles of the U. S. Navy controlled land on Vieques. Bedrock in the Camp Garcia area is predominantly unweathered, highly impermeable granodiorite; the porosity is very low, and the potential for groundwater development is limited. Toward the coast, clayey alluvium overlies the granodiorite. Samples from wells in the Camp Garcia area show mostly saline water in the clayey alluvium. Historical data collected by Anderson show that prior to the development of the well field in Esperanza Valley in 1945, ground-water levels in the Camp Garcia area were about 10 ft. below land surface. From 1961 to 1965, declines from 2 to 20 ft. were recorded in three wells in the area. Well yields also declined from about 35 to 10 gal/min (Torres-Gonzalez, 1989).

### 2.4.3 Salt Water Intrusion

The maintenance of potable groundwater in Vieques island depends upon the quantity of water pumped and the location of wells. During the initial development stages of the Esperanza well field, ground-water quality was generally good, with chloride ion concentration seldom exceeding 100 mg/L. However, as uncontrolled development and pumpage proceeded, saline water intruded into the alluvial aquifers, with chloride concentration exceeding 200 mg/L.

Historical water-quality data from PRASA show the effects of saline water intrusion in the Esperanza alluvial aquifer. The chloride concentration at six of the wells increased from a background concentration of 100 mg/L to about 250 mg/L.

Water-quality data for Vieques indicate that in the Esperanza Valley, saline water intrusion occurred throughout most of the alluvial aquifer as a result of overpumpage and reduction of the thickness of the overlying freshwater lens. Proper groundwater management, initiated in 1977, has resulted in a nearly complete recovery of the aquifer to pre-developed conditions.

In spite of the observed improvements in the quality of the groundwater in Vieques, groundwater use may be limited for agricultural purposes (Torres-Gonzalez, 1989).

## 3.0 FIELD INVESTIGATION ACTIVITIES

This section presents the rationale and investigation techniques of the field investigations that were performed on the Navy property during August 1999. The field investigations included: soil sampling and analyses, groundwater monitoring well installation, groundwater sampling and analyses, piezometer installation, groundwater elevation monitoring and surveying. A detailed description of the field investigations is presented in the Work Plan provided as Appendix A.

### 3.1 Soils Investigation

#### 3.1.1 Investigation Rationale

One of the goals of the project was to assess if there are explosive compounds in the surface soil at the EMA western property boundary. The potential transport mechanisms for this occurrence include the transport through surface water runoff and transport through air dispersion of the constituents. To meet the goal, a strategy of surface soil sampling was developed which included:

- sampling the soils along the apparent storm drains which slope from the east to the west across the Navy property; and

- sampling the soils at the monitoring well locations along the property boundary.

#### 3.1.2 Sampling Procedures

A total of 32 surface soil samples were collected for laboratory analysis. Twenty-one of the samples were collected at storm drains located along the Navy facility western property line and the remaining 11 samples were collected directly adjacent to the monitoring wells. The sampling locations are shown on Figure 3-1. Visual descriptions of each sample are provided in Appendix B. A photo of each location is provided in Appendix C.

Soil sample locations at the storm drains were selected by visually surveying the drainage patterns along the EMA western property boundary. Driving south from the north end of the perimeter road, a total of 21 storm drains were identified that drain from Navy property to the west (off site). These 21 storm drains (culverts that are normally dry and only contain water during rain events) were sampled. An additional 18 storm drains were identified along the property boundary, however, these 18 storm drains flow from west to east (from offsite onto Navy property) and were not sampled.

The 32 surface soil samples were collected using a stainless steel spoon and/or hand auger. Samples were collected from 0-6 inches below ground surface. The soil was placed in a stainless steel bowl and then transferred to appropriate laboratory glass jars.

The spoon, hand auger, and bowl were decontaminated between each sample location using the following procedure:

- Rinse with potable water to remove most of the soil
- Wash with scrub brush using potable water and Alconox (non-phosphate soap)
- Rinse with potable water
- Rinse with isopropyl alcohol
- Rinse with laboratory grade deionized water
- Air dry

### 3.1.3 Laboratory Analytical Program

Soil samples collected for analyses were placed on ice and shipped via overnight mail to Savannah Laboratories located in Savannah, Georgia. The samples were analyzed for explosive residues including Nitroaromatics-Nitramines, PETN and Nitroglycerin in accordance with SW-846 Method 8330. It should be noted that the analysis for PETN and nitroglycerin have a separate preparation and analysis under SW-846 Method 8330. Due to this difference, the detection limits are higher and the units are presented in μg/kg dw. Chain-of-custody forms for the samples collected are provided in Appendix D.

Quality assurance/quality control (QA/QC) samples were also collected as discussed below:

- Duplicates - Field duplicate soil samples were collected at a frequency of 10 percent per sample matrix.
- Field Blank – A field blank was prepared by collecting a sample of analyte-free water in the area that soil sampling occurred.
- Equipment Blank—Equipment blanks were collected at a frequency of one per day.
- Matrix Spike/ Matrix Spike Duplicate (MS/MSD) were collected at a frequency of 1 per 20 field samples per matrix and submitted for analysis.

## 3.2 Groundwater Investigation

### 3.2.1 Investigation Rationale

The intent of the groundwater investigation was twofold: 1) assess if explosive compounds are present in groundwater at the property boundary; and 2) establish the flow direction of groundwater at the EMA western property boundary and assess if there is the potential for off-site migration of the compounds. To meet the first goal, eleven groundwater monitoring wells were installed at the property line such that groundwater samples could be obtained for laboratory analysis. To meet the second goal, eight piezometers were installed at varying distances west of the property line and groundwater elevation measurements were collected to assess the groundwater flow direction.

### 3.2.2 Scope of the Investigation

#### 3.2.2.1 Well Installation

Eleven monitoring wells were installed as a part of the groundwater investigation. The wells were installed along the north-south property line in the locations shown on Figure 3-2. All wells were logged in the field during drilling. Appendix E contains the boring logs. Well construction details are shown on Table 3-1 and the well construction diagrams are provided in Appendix F.

Nine monitoring wells were installed at the first encountered groundwater and will be utilized to assess the groundwater quality in the uppermost groundwater zone. Two monitoring wells (RCRA 4 and NW-8) were installed to evaluate the groundwater quality in the Esperenza Aquifer.

The monitoring wells are constructed of 2-inch diameter, Schedule 40, Polyvinyl Chloride (PVC) well casing and well screen. The annular space between the well screen borehole is filled with a silica sand pack that extends above the well screen. A bentonite seal is installed above the sand pack and the annular space above the bentonite seal is filled with a cement/bentonite grout. Each monitoring well is equipped with a protective surface casing, concrete pad and locking cap to prevent unauthorized access to the wells.

Four monitoring wells were installed within the alluvial unconsolidated deposits and were installed using either hollow stem auger or mud rotary drilling methods. During the hollow stem auger drilling, soil samples were collected at five-foot intervals using split spoon soil sampling methods. At monitoring well locations RCRA 4, NW-4 and NW-7 a running sand formation was encountered which required the installation of these wells by mud rotary drilling methods.

Seven monitoring wells were installed within the bedrock using either air rotary drilling or down-the-hole hammer drilling methods. During the drilling of the boreholes for these monitoring wells, drill cuttings were collected at approximately ten foot intervals or at changes in drilling conditions and examined for lithology. The lithologic logs are included in Appendix E.

Drill cuttings generated during monitoring well installation were collected and analyzed for TCLP hazardous waste characteristics. The method of disposal for these materials will be determined based on results of the TCLP analyses.

**Well Development Procedures**

The monitoring well development was performed using a combination of pumping and swabbing with a stainless steel Grundfos® submersible pump and/or bailing with a Teflon® bailer. Most of the wells produced enough water to be developed with the submersible pump; however, several

wells could not be developed by pumping due to the depth of groundwater and low recharge rates.

The following wells were developed using the submersible pump with swabbing: RCRA-1, RCRA-2, RCRA-3, RCRA-4 , NW-4, NW-7, and NW-8

The submersible pump was placed at the bottom of the screen and groundwater from the well was pumped until clear water (minimal turbidity) was produced. The pump was then moved up and down (swabbed) through the screened interval to force water in and out of the screen. The turbidity would increase when the pump was moved up to a new portion of the screen. Pumping and swabbing continued until clear, sediment-free water was generated.

Monitoring wells NW-1, NW-5, and NW-6 were developed by using a combination of pumping with the submersible pump and bailing with a Teflon® bailer. These wells were initially pumped with the submersible pump, but pumped dry and took approximately 12 to 24 hours (overnight) to fully recover. The wells were further developed by bailing until clear, sediment-free water was produced.

Well NW-3 was developed by bailing with the Teflon® bailer until clear, sediment-free water was produced.

Well development records are summarized in Table 3-2 and are provided in detail in Appendix H.

3.2.2.2 Well Purging and Sampling Procedures

The wells were either purged and sampled with a stainless steel Grundfos® submersible pump or with a Teflon® bailer, depending on the depth to water and water recharge rate of the well. The following wells were purged and sampled using low-flow sampling techniques with a submersible pump: RCRA-1, RCRA-2, RCRA-3, RCRA-4, NW-4, NW-7 and NW-8.

Prior to sampling, a minimum of 3 well volumes of water were purged from each well. The wells were pumped at a rate of approximately 0.25 to 0.5 gallons per minute. Water quality data, including temperature, conductivity, salinity, and pH, were monitored during purging and the well was sampled after the parameters stabilized (less than 10% fluctuation). Additional parameters including dissolved oxygen and turbidity were also measured at RCRA-1, RCRA-2, RCRA-3, RCRA-4, NW-4, NW-7, and NW-8.

After purging, the wells were sampled from the submersible pump. New, separate Tygon® tubing was used for each well. The pump and cables were decontaminated between wells by washing with potable water and Alconox and rinsing with potable water. Potable water was pumped through the submersible pump during rinsing.

The following wells were purged and sampled using a Teflon® bailer: NW-1, NW-3, NW-5, and NW-6.

The wells were purged using a clean decontaminated bailer. Dedicated bailers were used for each well. The volume purged varied with the production capability of the well. Wells NW-3, NW-5, and NW-6 were purged of a minimum of 3 well volumes. Due to the low capacity of well NW-1 (pumped dry and bailed dry), only one well volume was purged. Water quality parameters were monitored during purging including temperature, conductivity, and pH. At selected wells dissolved oxygen and turbidity were also monitored during purging. After purging, the wells were sampled using the dedicated Teflon® bailer.

3.2.2.3 Piezometer Installation

Eight piezometers were installed as part of the groundwater investigation program. The locations of the piezometers are shown on Figure 3-2.

Two piezometers, P-8 and P-9, were installed into the alluvial unconsolidated deposits to assess the groundwater flow in the uppermost groundwater zone and Esperanza Aquifer, respectively. The remaining six piezometers were installed to assess the groundwater flow within the bedrock.

The piezometers were installed using the same equipment and methodologies as those used for installing the wells. The lithologic logs for the piezometer borings are provided in Appendix F. Construction details of piezometer installation are summarized in Table 3-1 and the piezometer construction diagrams are provided in Appendix F.

The piezometers were developed in a similar manner to the wells. Well development records are provided in Appendix G.

3.2.2.4 Laboratory Analytical Program

Groundwater samples collected for analyses were placed on ice and shipped via overnight delivery to Savannah Laboratories located in Savannah, Georgia. The samples were analyzed for explosive residues including Nitroaromatics-Nitramines, PETN and Nitroglycerin in accordance with SW-846 Method 8330. Chain-of-custody forms for the samples collected are provided in Appendix D.

Quality assurance/quality control (QA/QC) samples were collected as discussed below:

- Duplicates—Field duplicates were collected at a frequency of 10 percent per sample matrix and analyzed for the same constituents as the groundwater samples.
- Field Blanks—Field blanks were prepared by collecting a sample of analyte-free water in the area that groundwater sampling was conducted. One field blank was collected each day wells were sampled.
- Equipment Blanks—Equipment blanks were prepared by pumping analyte-free water through the low-flow pump, collecting a sample of this water, and analyzing the sample for the constituents of concern. Equipment blanks were collected at a frequency of one per day.
- Matrix Spike/ Matrix Spike Duplicates (MS/MSD) were collected at a frequency of 1 per 20 field samples per matrix and submitted for analysis. Analysis results of the MS/MSDs

indicate the impact the sample matrix has on extracting the analyte for quantitative analyses.

## 3.3 Groundwater Elevation Measurements

Two complete sets of groundwater elevation measurements were obtained from the monitoring wells and piezometers on August 25, 1999 and August 26, 1999. Table 3-3 summarizes the results of these measurements.

## 3.4 Surveying

The monitoring well and piezometer locations were surveyed in the field using Global Positioning Satellite (GPS) techniques. The survey established the latitude and longitude coordinates for each of the locations. In addition, the elevation, in feet above mean sea level, was established to the nearest 0.01 feet. The locations of the soil samples were established using traditional surveying techniques. These locations were tied into the control points set for the GPS survey. The survey data is provided on Table 3-4.

# 4.0 INVESTIGATION RESULTS

This section presents the analytical results of surface soil samples, groundwater samples, and quality assurance/quality control (QA/QC) samples collected from August 16, 1999 through August 20, 1999. The findings of this investigation are discussed in the following subsections for soil samples, groundwater samples, and QA/QC samples, respectively. These samples were analyzed for explosive compounds, via High Performance Liquid Chromatography (HPLC) Method 8330.

To facilitate a comprehensive understanding of the findings from this investigation, the analytical results are discussed in the following subsections and are all inclusive of the media sampled. Complete data summary tables are provided in Appendix H.

## 4.1 Analytical Data Summary

### 4.1.1 Soil Results

Thirty-six surface soil samples including four duplicate samples were collected and analyzed for explosive compounds. No explosive compounds were detected in any of the surface soil samples collected as part of this investigation. In addition, complete data summary tables for explosive compounds are provided in Appendix H.

### 4.1.2 Groundwater Results

No explosive compounds were detected in any of the groundwater samples collected as part of this investigation. Complete data summary tables for explosive compounds are provided in Appendix H.

### 4.1.3 QA/QC Sample Results

The quality of the laboratory data received as part of this investigation has been assessed for its accuracy, precision, representativeness, and completeness with respect to prescribed requirements or specifications for laboratory analysis. These data quality evaluations were performed by an independent, third party, data validator. The data presented in this report was evaluated in accordance with the criteria established by the USEPA Region II guidelines, Laboratory Data

Validation Functional Guidelines for Evaluating Organic Analyses and Inorganic Analyses with Region II modifications, Level D data requirements, and professional judgement.

As part of the requirements for field quality control under the Naval Facilities Engineering Service Center (NFESC), two types of QA/QC blank samples were collected as part of this investigation: field blanks, and equipment rinsate blanks. No explosive compounds were detected on the QA/QC samples. Complete data summary tables are provided in Appendix I. Laboratory QC samples (extra volume collected for matrix spike/matrix spike duplicate [MS/MSD]) were collected in the field. In addition, to MS/MSD samples, laboratory QA/QC procedures include analysis of surrogate spikes, lab control standards/blanks, and continuing calibration standards/blanks. Laboratory and field duplicate sample results were compared during validation to determine the relative percent difference (RPD) for assessment of any variation of the measurement process and sampling techniques. All of the analytical data presented in this report has been qualified as required by the Data Validator.

Analysis of blank samples provides a measurement of potential contamination that has been introduced into a sample set during collection, transportation, preparation, and/or analysis of the samples.

*Field Blanks*

One field blank or ambient blank (Sample number AB-2) was collected as part of this investigation and analyzed for explosive compounds. No explosive compounds were found in the field blank.

*Equipment Rinsate Blanks*

Six equipment rinsate blanks were collected as part of this study and analyzed for explosive compounds. No explosive compounds were detected in any of the equipment rinsate blanks. The following equipment rinsate blanks were collected from the corresponding sampling equipment:

| Sample ID | Description |
|---|---|
| EQB-1 | Stainless steel sampling spoon and stainless steel bowl |
| EQB-2 | Stainless steel sampling spoon and stainless steel bowl |
| EQB-3 | Stainless steel sampling spoon and stainless steel bowl |
| EQB-4 | Grundfos submersible pump |
| EQB-5 | Grundfos submersible pump |
| EQB-6 | Teflon bailer |

## 4.2 Hydrogeologic Investigation Results

### 4.2.1 Site Geology

The area included in the investigation consists of a layer of unconsolidated gravel, sand, silt and clay. The gravel, sand, silt, and clay occur in various relative percentages with the unconsolidated layer throughout the study area. The unconsolidated layer varies also in thickness from approximately 50 to 5 feet and overlies a massive granite/granodiorite formation. Figure 4-1 presents the locations of cross sections A-A' and B-B' (Figures 4-2 and 4-3). The cross sections illustrate the occurrence and distribution of the local geology. As shown in the cross sections, the thickness of the unconsolidated layer decreases northward from wells NW-7 and NW-8, located along the Caribbean shoreline, to well NW-3, located at the highest elevation within the study area. Likewise, the thickness of the unconsolidated layer increases again northward from NW-3 toward NW-1 located near the Atlantic Ocean shoreline.

### 4.2.2 Groundwater Measurement Results

Groundwater elevation measurements were recorded on both August 25 and 26, 1999 and are presented in Table 3-4. Groundwater elevation contours and flow direction arrows for the bedrock water-bearing zone are presented in Figure 4-4. The depth to groundwater within the bedrock ranged from approximately 36 feet below ground surface (bgs) at NW-5 to 131 feet bgs at P-1. The bedrock potentiometric surface is located at an elevation significantly higher than the elevations where groundwater was originally encountered during drilling of the bedrock wells and piezometers. Also, groundwater occurrence within the bedrock formation was associated with secondary porosity features (i.e., fractures, joints). These data indicate the fractures and joints within the bedrock store the groundwater and that the recharge areas for the fractures and/or

joints are at higher elevations than the portions intersected by the wells and piezometers. This also indicates that the primary porosity of the bedrock formation is low enough to limit groundwater occurrence and movement to secondary porosity features (i.e., fractures, joints). The groundwater elevation data for the bedrock indicates that a groundwater flow divide exists within the bedrock at the approximate north/south mid point of the island: at the location of well NW-3 (see Figure 4-4). Generally, groundwater north of well NW-3 flows north toward the Atlantic Ocean and groundwater south of NW-3 flows south toward the Caribbean Sea. No data were collected for the bedrock aquifer during the Torres-Gonzalez study (U.S. Geological Survey Water Resource Investigations report 86-4100, 1989).

Groundwater elevation data for the alluvial water-bearing zone (Esperanza Valley) are presented in Table 3-4 and in Figure A-1 in Appendix J which provides results of groundwater flow calculations (3-point problems). The alluvial aquifer groundwater elevation data collected during this investigation indicate that groundwater flow is to the east in the area of the study wells (NW-8, RCRA-4 and P-8). These results differ slightly from the results of Torres-Gonzalez (U.S. Geological Survey Water Resource Investigations Report 86-4100, 1989) which indicate a southeast groundwater flow direction for the unconsolidated aquifer. The difference may be attributable to the limited area included in this investigation, the limited number of water level measurements recorded and/or the limited time span over which the water level measurements were recorded for this investigation.

# 5.0 BASELINE HUMAN HEALTH RISK ASSESSMENT AND ECOLOGICAL SCREENING EVALUATION

This section presents an evaluation of potential risk to both human and ecological receptors posed by the presence of explosive related chemical compounds in soil and groundwater. The goal of the assessment is to: 1) provide results consistent with USEPA approved methodologies for evaluating and documenting public health and environmental concerns at the site; 2) provide an analysis of the risks to agricultural land use, residential land use, cattle grazing and potable water supplies.

The following section (Section 5.1) briefly describes the components of the risk assessment process for both human health and ecological evaluations. However, it should be noted that no explosive related chemical compounds (as previously discussed in Section 4.0) were detected in soil or groundwater; therefore, there are no chemicals of potential concern (COPC) identified in soil or groundwater at Vieques Island. Consequently, no complete human or ecological exposure pathways, and no unacceptable risks are associated with the explosive related chemical compounds evaluated in this investigation.

## 5.1 Overview of the Risk Assessment Process

According to USEPA human health and ecological risk assessment guidance (USEPA's Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A, dated December 1989 and USEPA's Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, dated June 1997) a risk assessment is generally comprised of four major (and related) components. These components include: data evaluation/selection of chemicals of potential concern (COPCs); exposure assessment; toxicity assessment and risk characterization. The following subsections provide a brief overview of the risk assessment process by discussing each of the aforementioned components.

### 5.1.1 Data evaluation/selection of COPCs

Data evaluation/selection of COPCs is the first component of a risk assessment. COPCs are those constituents having the greatest potential to affect human health and the environment. They are selected by comparing constituent concentrations detected in environmental samples to regulatory criteria and toxicological benchmarks such as USEPA Region III - Risk Based Chemical of Concern Screening Values (COC values), USEPA Region III Biological Technical Assistance

Group (BTAG) screening levels. The following paragraphs provide descriptions of each of the aforementioned criteria. Constituents exceeding regulatory criteria are retained as COPCs for further evaluation. Chemicals detected at concentrations below regulatory criteria are not further evaluated unless other circumstances (i.e., frequency of detection or documented usage) warrant the reinclusion and further quantitative evaluation of chemicals not otherwise selected as COPCs.

*USEPA Region III Risk-Based COC Screening Concentrations*

Risk-Based COC Screening Concentrations were derived by USEPA, Region III in January of 1993 and provided in tabular format to support selection of COPCs and address two major limitations in the COPC selection process presented in Risk Assessment Guidance for Superfund (RAGS). First, using COC screening concentrations prioritizes chemical toxicity and focuses the risk assessment on those COPCs and potential exposure routes. Second, using the COC screening concentrations provides a direct comparison of potential risks associated with the presence of a COPC in a given medium.

COC screening concentrations were derived using conservative USEPA promulgated default values and the most recent toxicological criteria available. COC screening concentrations for potentially carcinogenic and noncarcinogenic chemicals were individually derived based on a target incremental lifetime cancer risk (ICR) of I X 10-06 and a target hazard quotient (HQ) of 0. 1, respectively. For potential carcinogens, the toxicity criteria applicable to the derivation of COC screening concentrations are chronic oral and inhalation cancer slope factors; for noncarcinogens, they are oral and inhalation reference doses. These toxicity criteria are subject to change as more updated information and results from the most recent toxicological/epidemiological studies become available. These changes are reported in USEPA's Integrated Risk Information System (IRIS), as well as other available sources. Therefore, the use of toxicity criteria in the derivation of COC screening concentrations requires that the screening concentrations be updated periodically to reflect changes in the toxicity criteria.

In March of 1994, the USEPA Region III published a second COC Screening Table (e.g., COC values) which was also based on an ICR of I x 10-" and a target HQ of 0.1. Subsequent publications of the table (i.e., Risk-Based Concentrations [RBCs]) have included an ICR of I x 10-06 but an HQ of 1.0, rather than 0.1. However, since the RBCs are derived using similar equations and USEPA promulgated default exposure assumptions that were used to derive the original set of COC screening concentrations (USEPA, 1993a) and COC values (USEPA, 1994a),

the COC values can be updated from these tables by using the carcinogenic RBCs issued quarterly by USEPA Region III and dividing the accompanying noncarcinogenic RBCs by a factor of 10 for those constituents not included in the original COC value screening table. An updated set of COC values can, therefore, be obtained each time the RBC Tables are updated. The COC values used in this baseline RA were derived from the RBC values issued by the USEPA Region III in October 1999.

*USEPA NAWQC*

Section 304(a)(1) of the Clean Water Act requires the USEPA to develop, publish, and revise criteria for water quality that reflect latest scientific knowledge. Freshwater and Saltwater NAWQC for the protection of aquatic life contain two expressions of allowable magnitude: a criterion maximum concentration (CMC) to protect against acute (short-term) effects and a criterion continuous concentration (CCC) to protect against chronic (long-term) effects.

*USEPA Region III BTAG Screening Levels*

Region III BTAG screening levels are highly conservative guidelines considered to be protective of the most sensitive organism in a given medium. The guidelines are based on the lowest toxicolgical value obtained from a variety of sources, including peer-reviewed literature and regulatory agency criteria (i.e., USEPA ambient water quality criteria). Currently, BTAG screening levels have been developed for marine and freshwater flora and fauna, sediment flora and fauna, and soil flora and fauna.

### 5.1.2 Exposure Assessment

The next step in the process involves evaluating the potential for exposure. The exposure assessment considers site specific information regarding current and future potential property use, site habitat, climatology and demographics information culminating in the development of a site conceptual model of potential exposure. The site conceptual model considers both primary sources of contamination and the potential for COPCs to migrate away from the source and affect other environmental media to which human and ecological receptors may be exposed. As a result, hypothetical current and future potential receptors and exposure pathways are identified for further evaluation. The identification of no COPCs indicates that there are no exposure pathways, and consequently, no receptors of concern.

### 5.1.3 Toxicity Assessment

Knowing COPCs and the potential for exposure, the toxicity of a constituent can be evaluated. The toxicity assessment characterizes the inherent toxicity of a chemical by a review of the most recent scientific data and USEPA databases. The nature and extent of potential human health and environmental effects associated with a particular type of exposure (i.e., dermal contact, ingestion, inhalation) are identified and a toxicological profile is developed for each COPC. It should be noted that the identification of no COPCs precludes the need for a toxicity assessment.

### 5.1.4 Risk Characterization

Finally, the risk characterization combines the information obtained from data collection/evaluation, exposure assessment and toxicity assessment to provide numerical estimates of human health and environmental risk posed by the presence of COPCs at the site. If one of the aforementioned components cannot be identified (i.e., no COPCs, no exposure or no quantifiable toxicity) quantitative estimates of risk to human health and the environment cannot be calculated. The identification of no COPCs precludes the need for the calculation and characterization of human health and environmental risks.

Section 5.2 describes the results of the human health and ecological risk assessments conducted to evaluate potential risks associated with explosives in soil and groundwater at Vieques Island.

## 5.2 Risk Assessment Results

As previously stated, none of the nitramine/nitroaromatic compounds were detected in soil or groundwater; therefore, no COPCs have been identified for these media. Consequently, the evaluation of exposure pathways, receptors, and chemical toxicity, as well as the calculation and characterization of risks are not necessary. Essentially, these results indicate that no human health or environmental risks are associated with explosives in soil or groundwater.

## 6.0 SUMMARY OF FINDINGS

The summary of findings presented herein is based on all available information with respect to physical conditions of the site and the evaluation of explosive compounds in surface soil and groundwater. As a result of evaluating explosive compounds in surface soil and groundwater, a determination that no unacceptable risk or threat to public health or the environment has been made. The following statements support this determination:

- Sampling locations were biased to areas where suspected contamination would be migrating offsite.

- Hydrogeologic data indicates groundwater flow in the bedrock is primarily to the north and south from the middle of the island. As a result, groundwater within bedrock is not likely to flow from Navy property to the west.

- Hydrogeologic data indicates groundwater flow in the alluvial deposits is primarily to the east. As a result, groundwater within the alluvial deposits is unlikely to flow from the Navy property to the west.

- No explosive related chemical compounds were detected in surface soil samples.

- No explosive related chemical compounds were detected in groundwater samples.

- The laboratory detection limits for the explosive related chemical compounds were all below the most conservative risk-based screening criteria. As a result, no COPCs could be identified.

- No human health or ecological risk exists with regard to explosive compounds.

## 7.0 REFERENCES

Torres-Gonzalez,. 1989. Reconnaissance of the Ground-Water Resources of Vieques Island, Puerto Rico. U.S. Geological Survey Water Resource Investigations Report 86-4100.

# TABLES

TABLE 3-1

SUMMARY OF WELL CONSTRUCTION DETAILS
HYDROGEOLOGICAL INVESTIGATION
VIEQUES ISLAND, PUERTO RICO

| Well Number | Date Installed | Top of Casing Elevation (Feet above MSL) | Boring Depth (Ft. bgs) | Well Depth (Ft. bgs) | PVC Riser (Ft. bgs) | Screen Interval Depth (Ft. bgs) | Depth to Bentonite (Ft. bgs) | Depth to Sandpack (Ft. bgs) |
|---|---|---|---|---|---|---|---|---|
| NW-1 | 8/14/99 | 114.096 | 135 | 134 | 124 | 124 - 134 | 107.0 | 109.2 |
| NW-3 | 8/6/99 | 354.382 | 197 | 197 | 187 | 187 - 197 | 177.0 | 182.0 |
| NW-4 | 8/17/99 | 35.99 | 80 | 80 | 70 | 70 - 80 | 55.0 | 57.0 |
| NW-5 | 8/10/99 | 107.808 | 118 | 118 | 108 | 108 - 118 | 103.6 | 106.0 |
| NW-6 | 8/12/99 | 90.726 | 144 | 144 | 124 | 124 - 144 | 105.2 | 111.2 |
| NW-7 | 8/17/99 | 4.103 | 81 | 81 | 71 | 71 - 81 | 60.0 | 64.0 |
| NW-8 | 8/3/99 | 4.154 | 27 | 15 | 5 | 5 - 15 | 2.0 | 4.0 |
| P-1 | 8/25/99 | 145.084 | 186 | 186 | 176 | 176 - 186 | 66.0 | 78.7 |
| P-2 | 8/18/99 | 116.255 | 105 | 102 | 92 | 92 - 102 | 50.0 | 84.0 |
| P-3 | 8/19/99 | 232.791 | 165 | 165 | 155 | 155 - 165 | 62.0 | 66.0 |
| P-5 | 8/19/99 | 296.819 | 144 | 144 | 134 | 134 - 144 | 54.0 | 60.0 |
| P-6 | 8/19/99 | 192.575 | 180.5 | 180.5 | 170.5 | 170.5 – 180.5 | 115 | 120.0 |
| P-7 | 8/14/99 | 68.029 | 94 | 94 | 84 | 84 - 94 | 77.0 | 79.0 |
| P-8 | 8/4/99 | 21.335 | 32 | 32 | 12 | 12 - 32 | 6.0 | 8.0 |
| P-9 | 8/18/99 | 21.618 | 86 | 86 | 70 | 70 - 80 | 63.0 | 55.0 |
| RCRA-1 | 8/18/99 | 101.241 | 65 | 64 | 54 | 54 - 64 | 46.0 | 49.5 |
| RCRA-2 | 8/8/99 | 257.46 | 64 | 64 | 54 | 54 - 64 | 44.5 | 49.5 |
| RCRA-3 | 8/14/99 | 153.937 | 69 | 69 | 59 | 59 - 69 | 48.0 | 53.8 |
| RCRA-4 | 8/11/99 | 36.141 | 49.5 | 49.5 | 39.5 | 39.5 - 49.5 | 30.0 | 37.0 |

Notes:

* Data estimated from accepted well construction.
MSL = Mean Sea Level
bgs = below ground surface

TABLE 3-2

**MONITORING WELL DEVELOPMENT SUMMARY**
**HYDROGEOLOGIC INVESTIGATION**
**VIEQUES ISLAND, PUERTO RICO**

| Well | Development Method | Development Completion Date | Approximate Gallons Developed | Number of Well Volumes Developed |
|---|---|---|---|---|
| RCRA-1 | Submersible Pump | 8/16/99 | 110 | 38.5 |
| RCRA-2 | Submersible Pump | 8/16/99 | 55 | 13 |
| RCRA-3 | Submersible Pump | 8/15/99 | 162 | 63.2 |
| RCRA-4 | Submersible Pump | 8/15/99 | 145 | 56.3 |
| NW-4 | Submersible Pump | 8/19/99 | 30 | 4 |
| NW-7 | Submersible Pump | 8/19/99 | 60 | 4.8 |
| NW-8 | Submersible Pump | 8/18/99 | 42 | 3.5 |
| NW-1 | Pump/ Bailer | 8/17/99 | 4 | 0.67 |
| NW-5 | Pump/ Bailer | 8/16/99 | 10 | 0.75 |
| NW-6 | Pump/ Bailer | 8/17/99 | 25 | 1.68 |
| NW-3 | Bailer | 8/19/99 | 14 | 1 |

Note: Wells NW-1, NW-5, and NW-6 pumped dry. Well NW-3 had a restriction and could not be pumped.

TABLE 3-3

GROUNDWATER ELEVATION MEASUREMENTS
HYDROGEOLOGIC INVESTIGATION
VIEQUES ISLAND, PUERTO RICO

| Point Id | DTW 8/25 | DTW 8/26 | ELEV 8/25 | ELEV 8/26 | Elevation (Feet) |
|---|---|---|---|---|---|
| NW-1 | 101.210 | 101.190 | 12.886 | 12.906 | 114.096 |
| NW-3 | 118.470 | 118.210 | 235.912 | 236.172 | 354.382 |
| NW-4 | 37.280 | 37.220 | -1.290 | -1.230 | 35.990 |
| NW-5 | 36.030 | 35.970 | 71.778 | 71.838 | 107.808 |
| NW-6 | 52.700 | 52.560 | 38.026 | 38.166 | 90.726 |
| NW-7 | 5.380 | 5.470 | -1.277 | -1.367 | 4.103 |
| NW-8 | 4.930 | 5.030 | -0.776 | -0.876 | 4.154 |
| P-1 | 132.000 | 131.130 | 13.084 | 13.954 | 145.084 |
| P-2 | 61.870 | 61.890 | 54.385 | 54.365 | 116.255 |
| P-3 | 82.390 | 82.020 | 150.401 | 150.771 | 232.791 |
| P-5 | 80.150 | 79.910 | 216.669 | 216.909 | 296.819 |
| P-6 | 102.910 | 93.030 | 89.665 | 99.545 | 192.575 |
| P-7 | 53.110 | 52.980 | 14.919 | 15.049 | 68.029 |
| P-8 | 24.870 | 24.810 | -3.535 | -3.475 | 21.335 |
| P-9 | 24.790 | 24.760 | -3.172 | -3.142 | 21.618 |
| RCRA-1 | 49.260 | 49.260 | 51.981 | 51.981 | 101.241 |
| RCRA-2 | 40.030 | 40.030 | 217.439 | 217.439 | 257.469 |
| RCRA-3 | 55.410 | 55.420 | 98.527 | 98.517 | 153.937 |
| RCRA-4 | 37.270 | 37.200 | -1.129 | -1.059 | 36.141 |
| G224-1 | | | | | 279.783 |
| G224-2 | | | | | 326.102 |
| G224-3 | | | | | 347.453 |

TABLE 3-4

WELL SURVEY DATA
HYDROGEOLOGICAL INVESTIGATION,
VIEQUES PUERTO RICO

| Point Id | Latitude (NAD 83) | Longitude (NAD 83) | Easting (Nad 27 Feet) | Northing (Nad 27 Feet) | Elevation (Feet) |
|---|---|---|---|---|---|
| NW-1 | 18° 09' 14.41641" N | 65° 25' 00.38766" W | 852761.949 | 118136.057 | 114.096 |
| NW-3 | 18° 07' 54.85133" N | 65° 25' 30.15492" W | 849935.643 | 110094.787 | 354.382 |
| NW-4 | 18° 06' 54.24112" N | 65° 26' 15.45805" W | 845599.755 | 103957.401 | 35.990 |
| NW-5 | 18° 07' 22.44578" N | 65° 26' 07.22030" W | 846378.807 | 106806.612 | 107.808 |
| NW-6 | 18° 07' 14.63050" N | 65° 26' 15.54214" W | 845580.479 | 106013.953 | 90.726 |
| NW-7 | 18° 06' 29.85009" N | 65° 26' 15.56954" W | 845602.359 | 101497.118 | 4.103 |
| NW-8 | 18° 06' 29.89526" N | 65° 26' 15.64556" W | 845595.002 | 101501.635 | 4.154 |
| P-1 | 18° 08' 58.23604" N | 65° 24' 17.83689" W | 856874.215 | 116526.879 | 145.084 |
| P-2 | 18° 08' 52.39909" N | 65° 24' 41.73599" W | 854572.873 | 115925.246 | 116.255 |
| P-3 | 18° 08' 19.27054" N | 65° 24' 56.24981" W | 853191.817 | 112575.918 | 232.791 |
| P-5 | 18° 07' 39.65922" N | 65° 25' 28.64940" W | 850089.265 | 108563.218 | 296.819 |
| P-6 | 18° 07' 32.73216" N | 65° 25' 32.03029" W | 849767.040 | 107862.720 | 192.575 |
| P-7 | 18° 07' 15.39599" N | 65° 25' 52.74394" W | 847778.879 | 106103.142 | 68.029 |
| P-8 | 18° 06' 57.61779" N | 65° 25' 43.06912" W | 848721.810 | 104315.033 | 21.335 |
| P-9 | 18° 06' 57.72842" N | 65° 25' 43.08706" W | 848720.019 | 104326.182 | 21.618 |
| RCRA-1 | 18° 08' 59.75460" N | 65° 24' 51.07721" W | 853667.958 | 116662.157 | 101.241 |
| RCRA-2 | 18° 08' 24.27608" N | 65° 25' 08.22378" W | 852034.287 | 113074.409 | 257.469 |
| RCRA-3 | 18° 07' 34.53996" N | 65° 25' 49.49817" W | 848081.364 | 108035.829 | 153.937 |
| RCRA-4 | 18° 06' 54.32223" N | 65° 26' 15.46458" W | 845599.081 | 103965.579 | 36.141 |
| G224-1 | 18° 08' 45.38406" N | 65° 25' 05.26389" W | 852307.943 | 115205.067 | 279.783 |
| G224-2 | 18° 08' 20.11205" N | 65° 25' 18.45408" W | 851050.030 | 112648.950 | 326.102 |
| G224-3 | 18° 07' 44.60218" N | 65° 25' 39.34349" W | 849055.157 | 109056.129 | 347.453 |

# FIGURES

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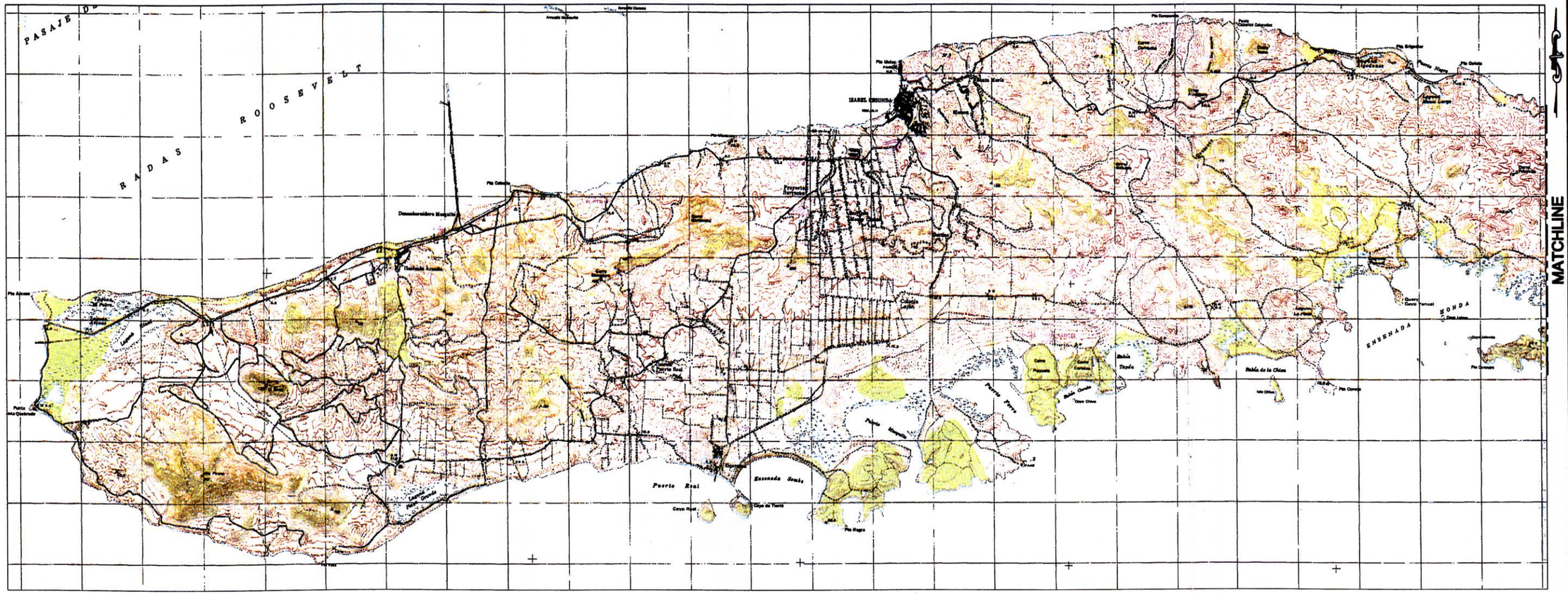
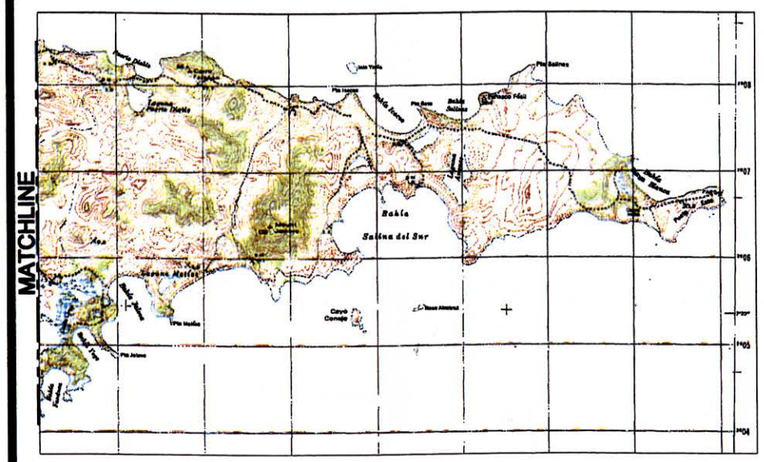


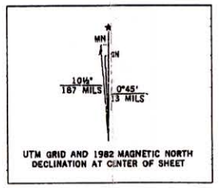
Mapped, edited, and published by the Geological Survey

Control by USGS, NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1941. Field checked 1943. Revised 1949

Polyconic projection. Puerto Rico Datum, 1940 adjustment
2000-meter grid ticks based on Puerto Rico coordinate system
1000-meter Universal Transverse Mercator grid, zone 20

Revisions shown in purple and woodland compiled from aerial photograph taken 1977 and other sources
This information not field checked. Map edited 1982

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1951
PHOTOREVISED 1982
DMA 1522 III NE-SERIES E835

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1 CM = 700 M

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**FIGURE 2-1**
**REGIONAL LOCATION MAP**

**VIEQUES ISLAND**
**PUERTO RICO**

00179EB1Y

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**LEGEND**

- WATER
- DISTRICTS
- CONTOUR
- SWAMP
- SHORELINE
- STATE ROUTE
- SECONDARY ROAD
- NON-NAVY OWNED LAND
- EMA - EASTERN MANOUVER AREA

0 300 900 1500

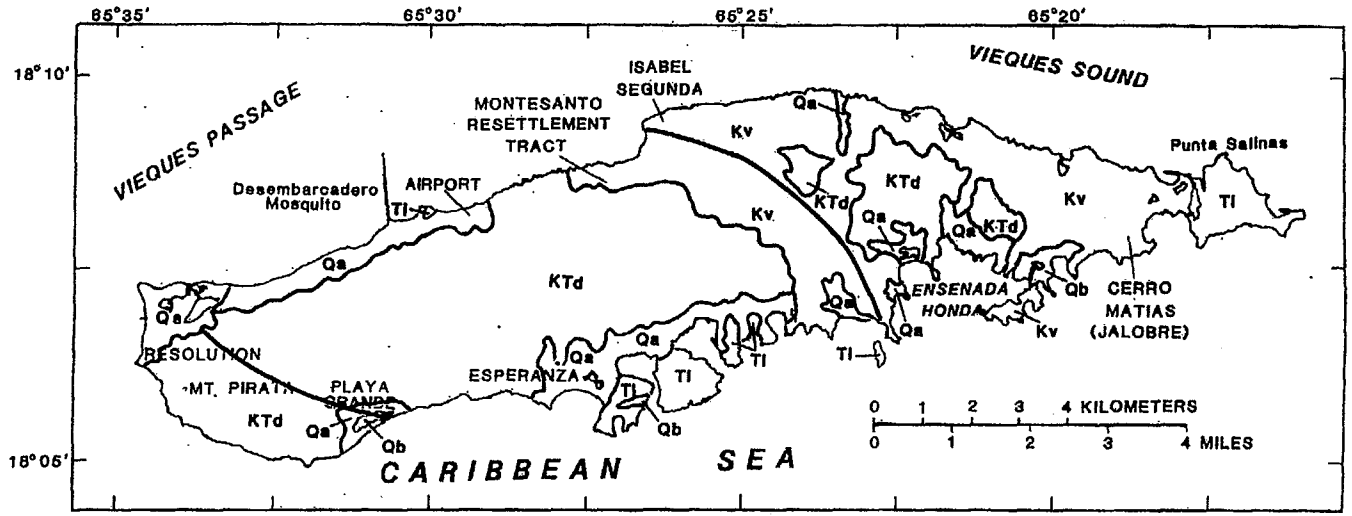
1 CM = 300 M

Baker

**FIGURE 2-2**
**SITE LOCATION MAP**

**VIEQUES ISLAND**
**PUERTO RICO**

2138006V




EXPLANATION

| | | |
|---|---|---|
| QUATERNARY | Qa | ALLUVIAL DEPOSITS, SAND, SILT, CLAY, GRAVEL FLOOD PLAIN, TERRACE DEPOSITS, AND PIEDMONT FAN DEPOSITS |
| | Qb | BEACH AND DUNE DEPOSITS, LARGELY CALCITE, QUARTZ AND VOLCANIC ROCKS, AND FRAGMENT SAND WITH LOCAL MAGNETITE |
| | Qs | SWAMP AND MARSH DEPOSITS, ORGANIC MUCK, SANDY OR SILTY, AND PEAT |
| TERTIARY | Tl | MARINE SEDIMENTARY ROCKS, UNDIVIDED |
| CRETACEOUS | Kv | SANDSTONE, SILTSTONE, CONGLOMERATE, LAVA, TUFF, AND TUFFACEOUS BRECCIA. LARGELY DEPOSITED IN MARINE ENVIRONMENT. EXTENSIVE DEEP WEATHERING. SOME LIMESTONE |
| | KTd | PLUTONIC ROCKS, LARGELY GRANIDIORITE, AND QUARTZ DIORITE. LOCALLY DEEPLY WEATHERED |

CONTACT

FAULT

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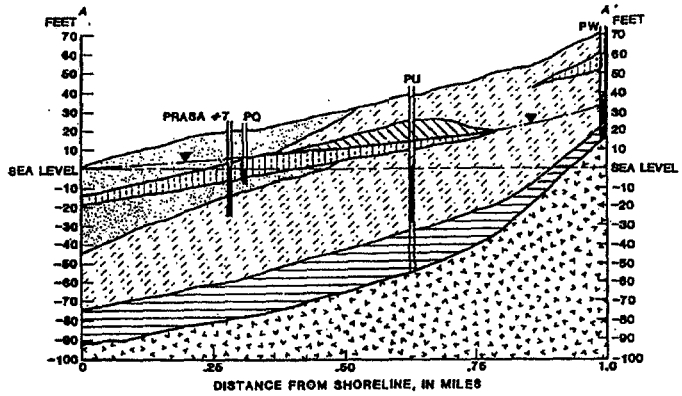
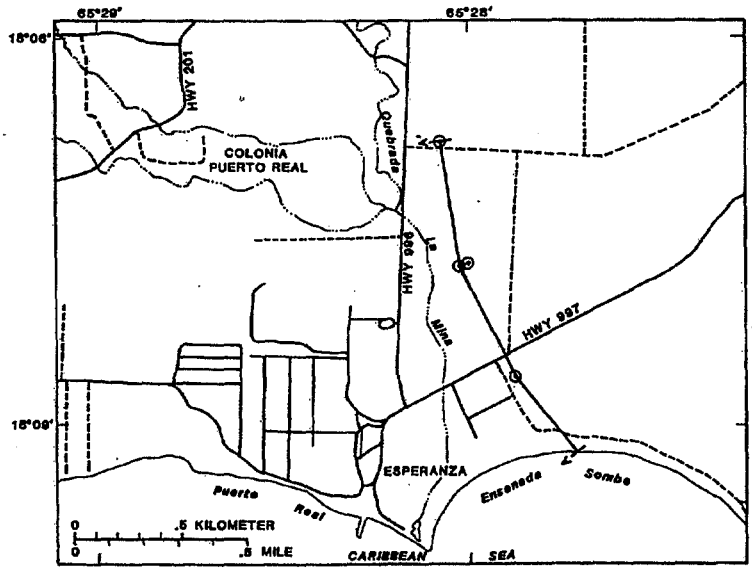
**FIGURE 2-3**
**GENERALIZED GEOLOGY OF VIEQUES ISLAND**

**VIEQUES ISLAND**
**PUERTO RICO**

SOURCE:
TORRES-GONZALES, S. 1969. RECONNAISSANCE OF THE GROUNDWATER RESOURCES OF VIEQUES ISLAND, PUERTO RICO. U.S.G.S. WATER-RESOURCE INVESTIGATIONS, REPORT 68-410.




SOURCE:
TORRES-GONZALES, S. 1988. RECONNAISSANCE OF THE GROUNDWATER RESOURCES OF VIEQUES ISLAND, PUERTO RICO. U.S.G.S. WATER-RESOURCE INVESTIGATIONS, REPORT 88-410.

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# FIGURE 2-4
# HYDROGEOLOGIC CROSS-SECTION A-A' OF THE AQUIFER OF THE ESPERANZA VALLEY

## VIEQUES ISLAND
## PUERTO RICO

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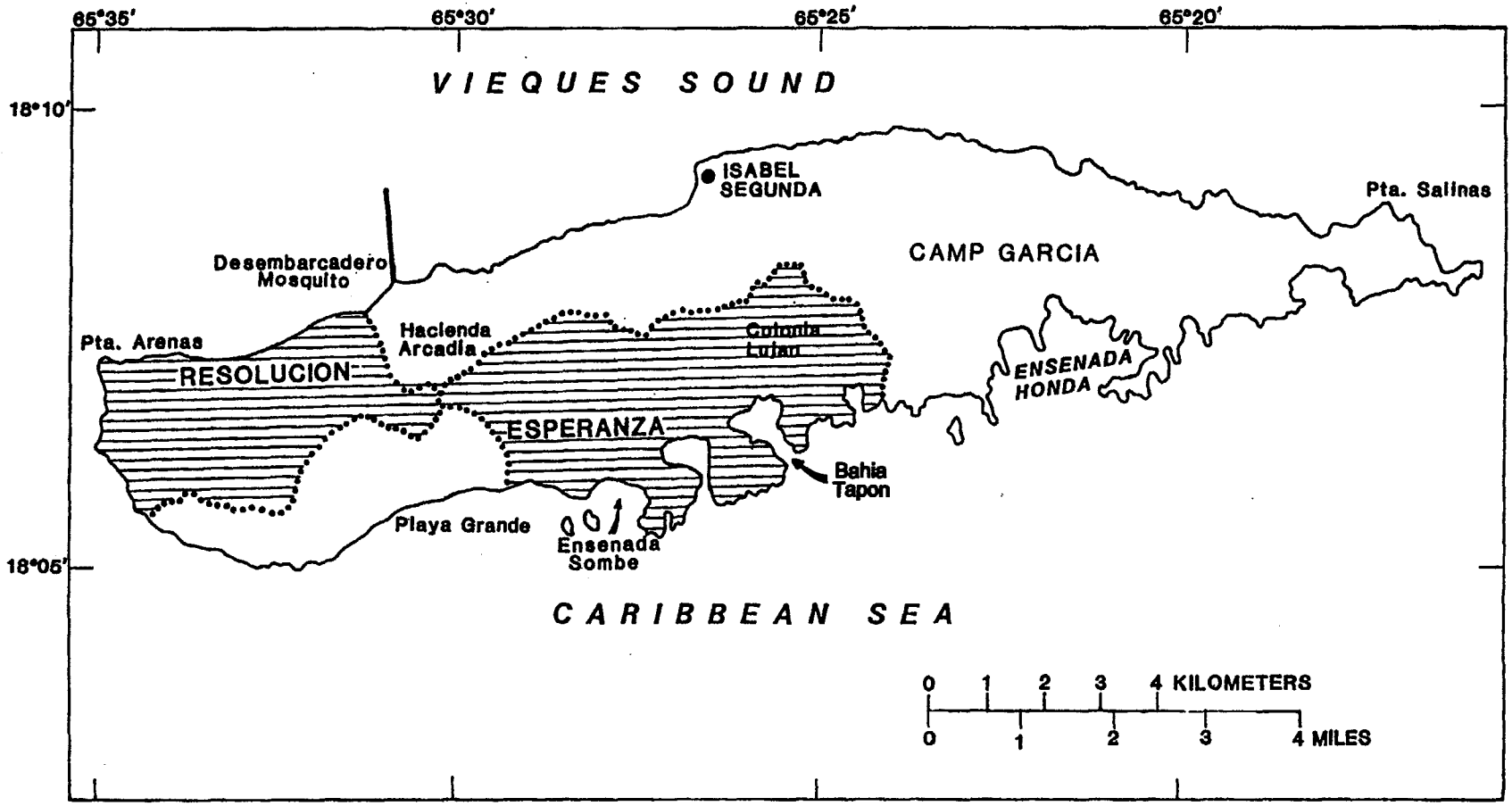


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**FIGURE 2-5**
**THE LOCATION OF THE ESPERANZA VALLEY, VIEQUES ISLAND**

**VIEQUES ISLAND**
**PUERTO RICO**

SOURCE:
TORRES-GONZALES, S. 1989. RECONNAISSANCE OF THE GROUNDWATER RESOURCES OF VIEQUES ISLAND, PUERTO RICO. U.S.G.S. WATER-RESOURCE INVESTIGATIONS, REPORT 88-410.

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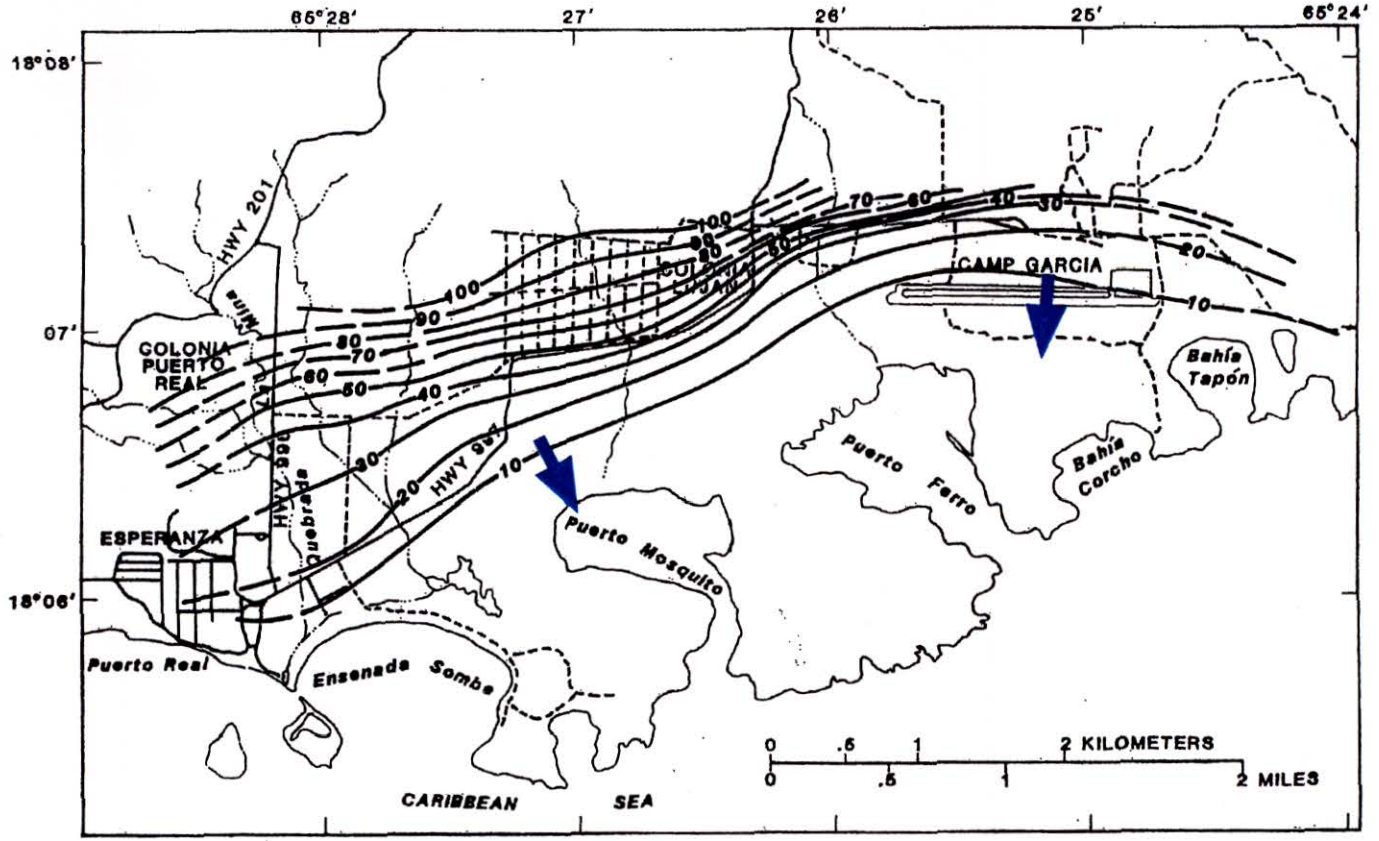


Baker

**FIGURE 2-6**
**GROUNDWATER FLOW DIRECTION OF THE ESPERANZA ALLUVIAL AQUIFER - APRIL 1983**

**VIEQUES ISLAND**
**PUERTO RICO**

SOURCE:
TORRES-GONZALES, S. 1989. RECONNAISSANCE OF THE GROUNDWATER RESOURCES OF VIEQUES ISLAND, PUERTO RICO. U.S.G.S. WATER-RESOURCE INVESTIGATIONS, REPORT 88-410.

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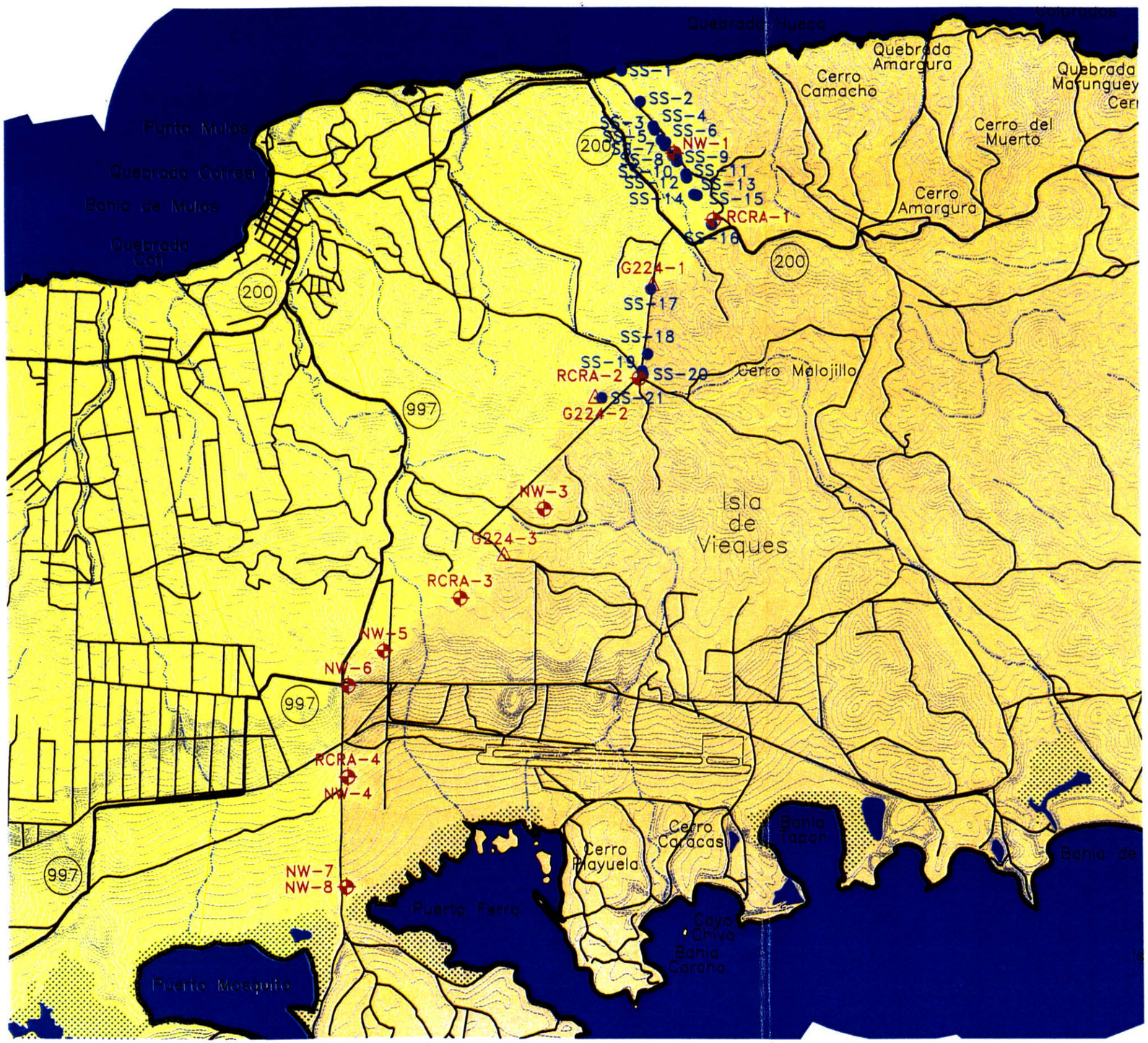



## LEGEND

- WATER
- DISTRICTS
- CONTOUR
- SWAMP
- SHORELINE
- STATE ROUTE
- SECONDARY ROAD
- NON-NAVY OWNED LAND
- EMA - EASTERN MANOUVER AREA

- SOIL SAMPLE LOCATION (MONITORING WELL)
- SOIL SAMPLE LOCATION

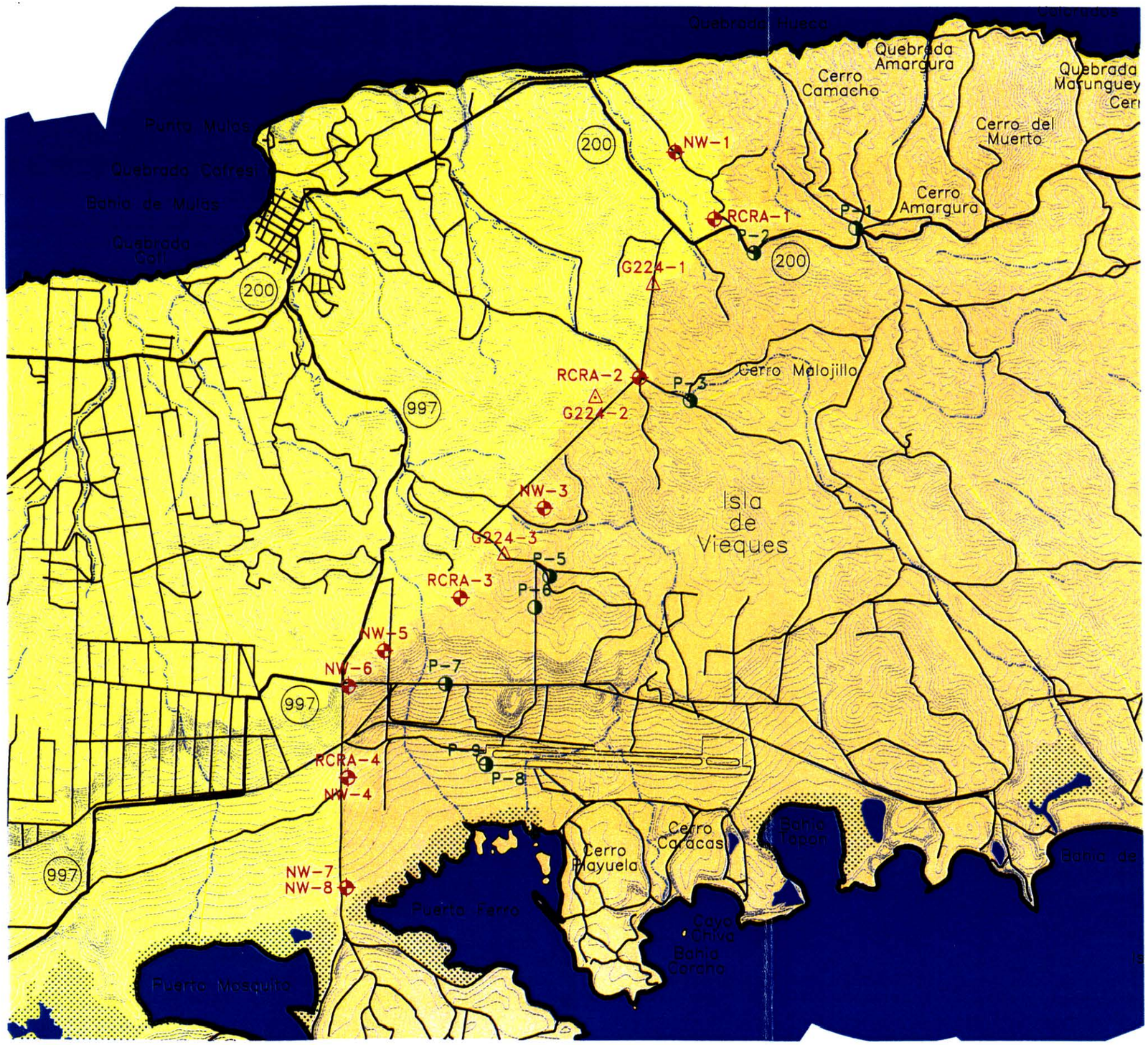
0 300 900 1500
1 CM = 300 M

Baker

**FIGURE 3-1**
**SOIL SAMPLE LOCATION MAP**

**VIEQUES ISLAND**
**PUERTO RICO**

2138010V




## LEGEND

- WATER
- DISTRICTS
- CONTOUR
- SWAMP
- SHORELINE
- STATE ROUTE
- SECONDARY ROAD
- NON-NAVY OWNED LAND
- EMA - EASTERN MANOUVER AREA

- PIEZOMETER LOCATION
- MONITORING WELL LOCATION

0 300 900 1500

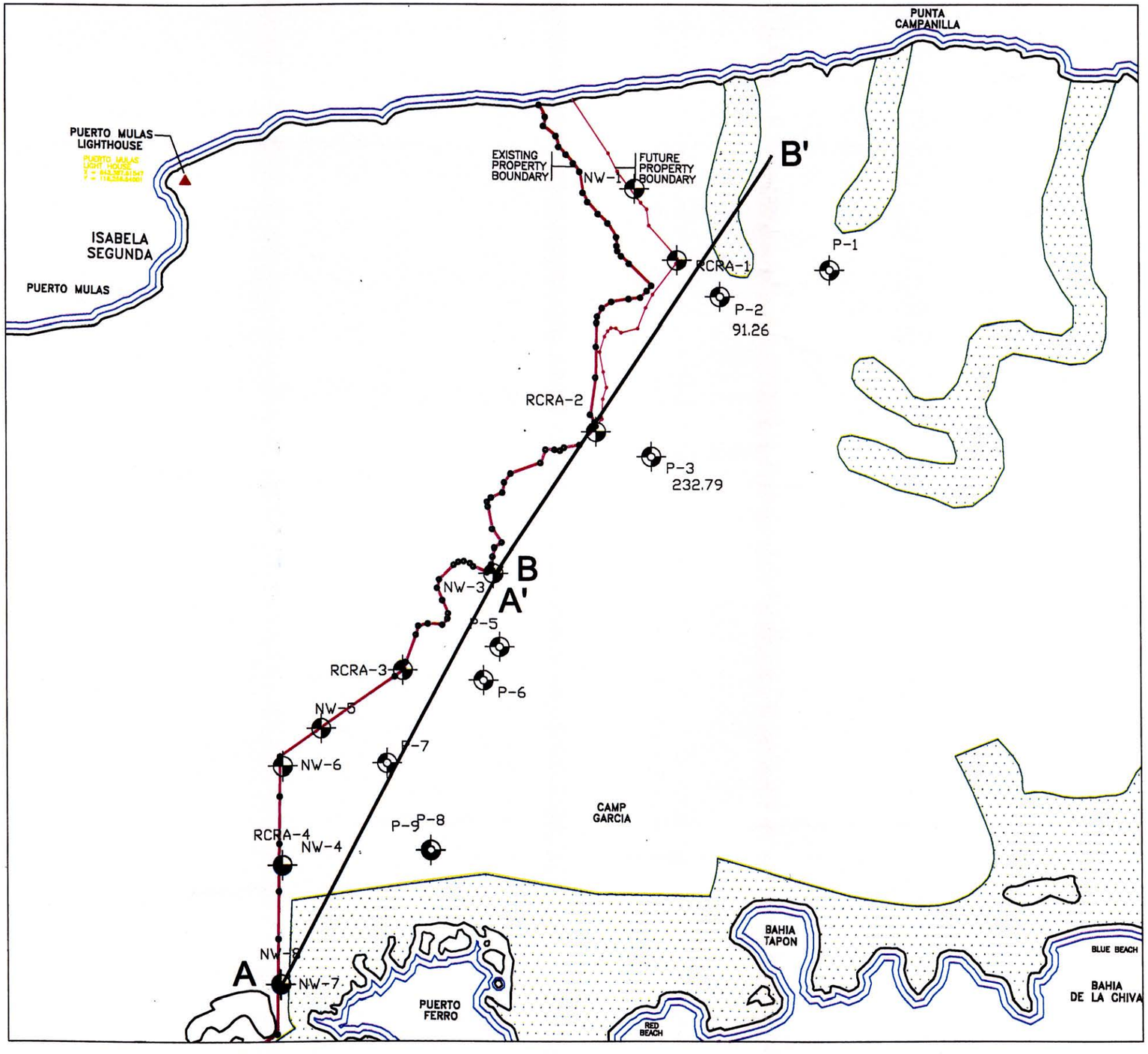
1 CM = 300 M

Baker

**FIGURE 3-2**
**WELL AND PIEZOMETER LOCATION MAP**

**VIEQUES ISLAND**
**PUERTO RICO**

2138X03




**LEGEND**

RCRA-1 MONITORING WELL

P-1 PIEZOMETER

SHORELINE

A —— A' HYDROGEOLOGIC CROSS-SECTION

AFWTF PROPERTY LINE

2400 0 1200 2400

1 inch = 2400 ft.

Baker

**FIGURE 4-1**
**HYDROGEOLOGIC CROSS-SECTION LOCATION MAP**

**VIEQUES ISLAND**
**PUERTO RICO**

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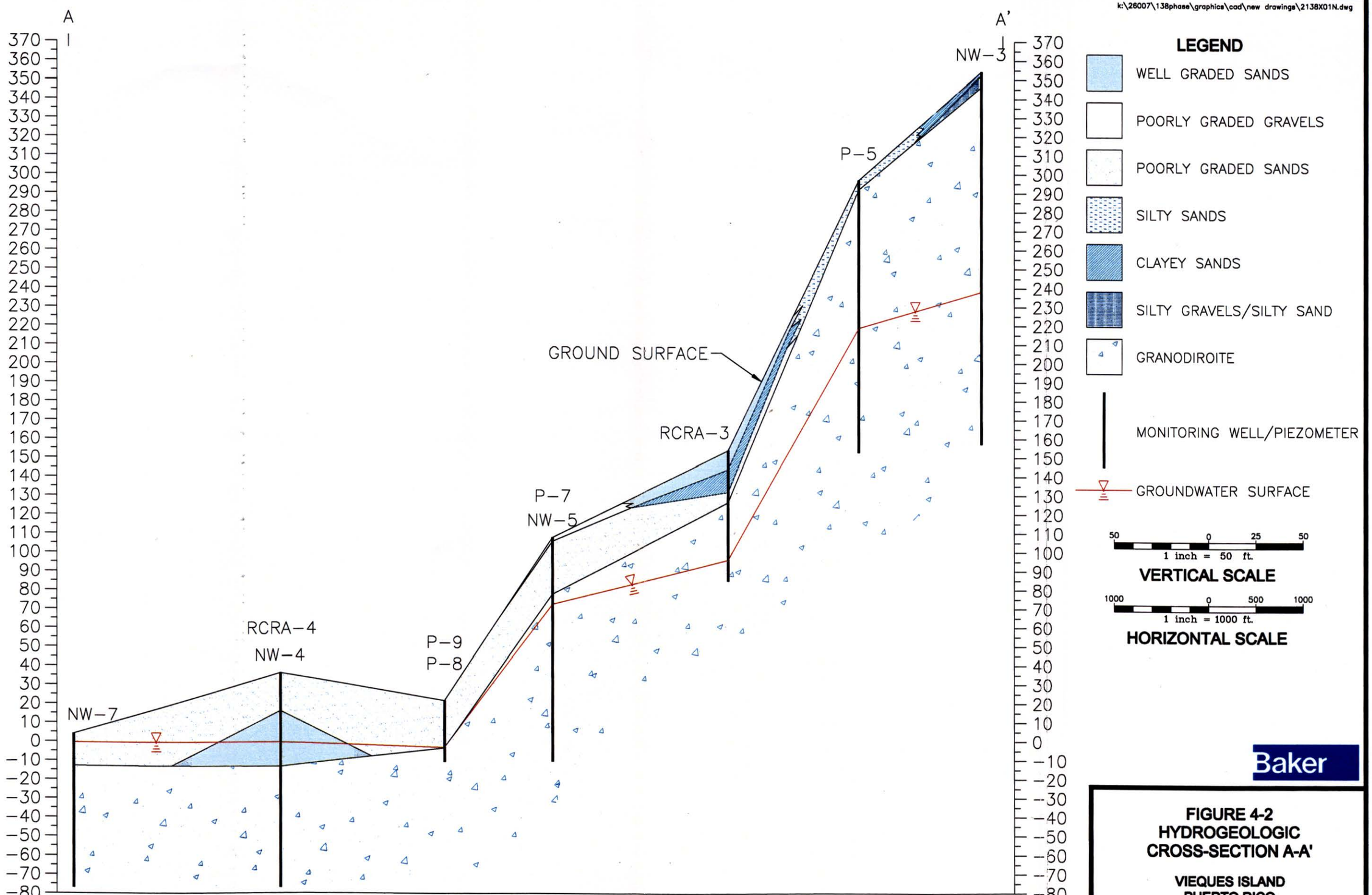
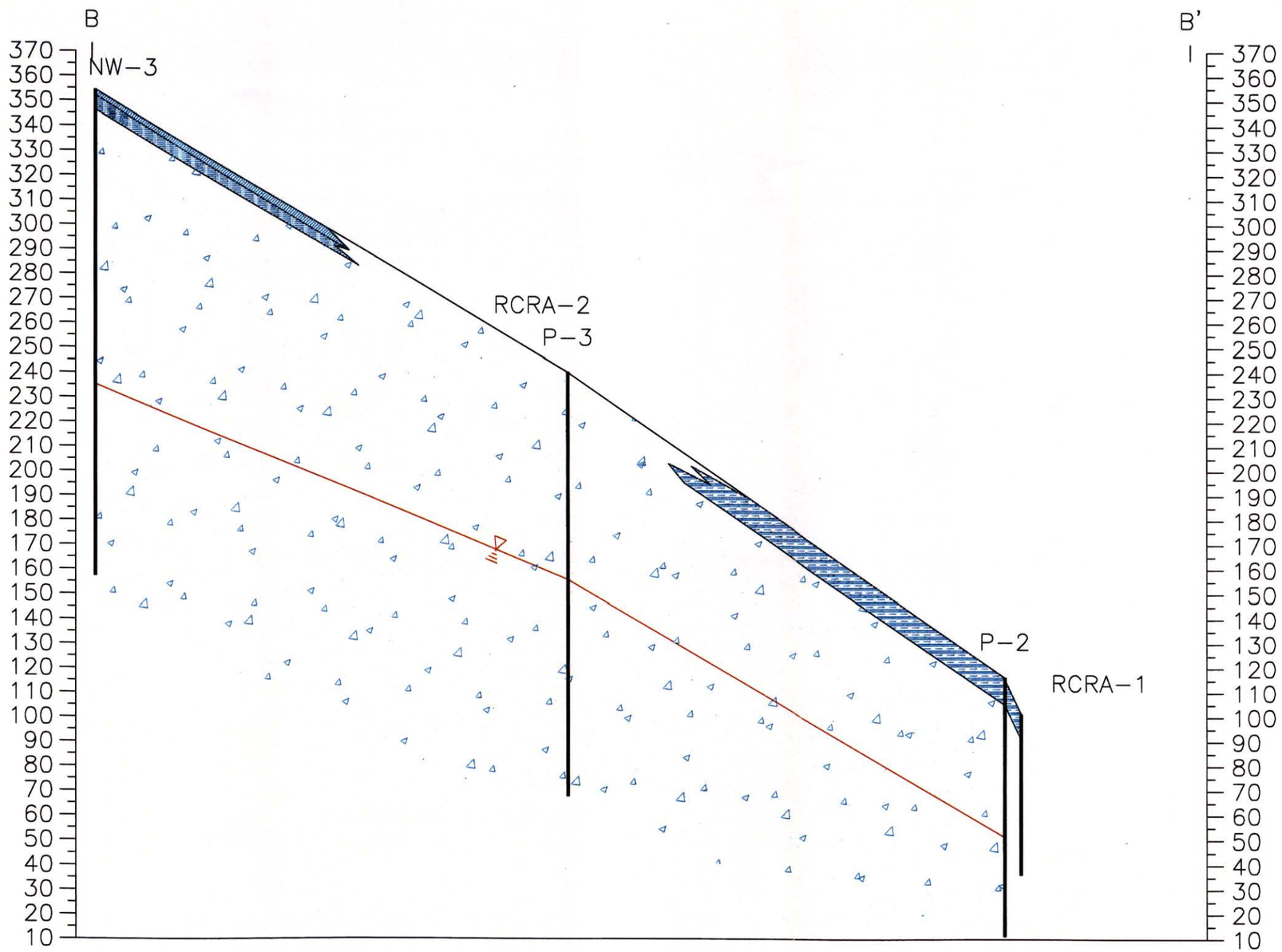



**FIGURE 4-2**
**HYDROGEOLOGIC CROSS-SECTION A-A'**

**VIEQUES ISLAND**
**PUERTO RICO**

2138X02N




**LEGEND**

- SANDY CLAY/SILTY CLAY
- CLAYEY SANDS
- SILTY GRAVELS/SILTY SAND
- GRANODIROITE
- MONITORING WELL/PIEZOMETER
- GROUNDWATER SURFACE

50 0 25 50

1 inch = 50 ft.

**VERTICAL SCALE**

1000 0 500 1000

1 inch = 1000 ft.

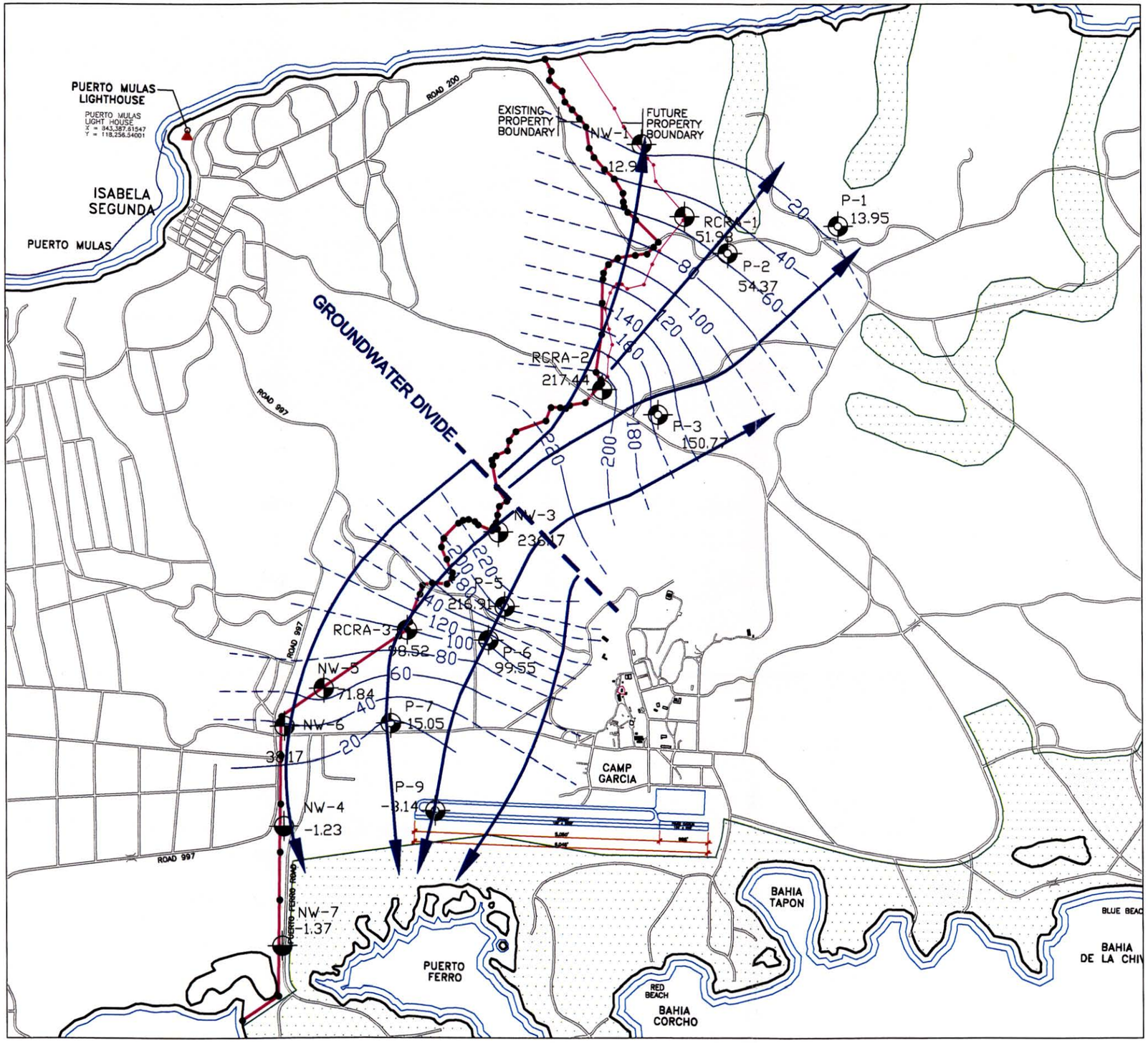
**HORIZONTAL SCALE**

Baker

**FIGURE 4-3**
**HYDROGEOLOGIC CROSS-SECTION B-B'**

**VIEQUES ISLAND**
**PUERTO RICO**

2138004N




**LEGEND**

- AFWTF PROPERTY LINE
- --20-- INFERRED GROUNDWATER ELEVATION CONTOURS
- —40— INTERPRETED GROUNDWATER ELEVATION CONTOURS
- INTERPRETED GROUNDWATER FLOW DIRECTION
- NW-1 12.91 MONITORING WELL WITH POSTED GROUNDWATER ELEVATION (MSL)
- P-1 13.95 PIEZOMETER WITH POSTED GROUNDWATER ELEVATION (MSL)

0 900 3600 6000
1 CM = 900 M

Baker

**FIGURE 4-4**
**GROUNDWATER CONTOUR MAP**

**VIEQUES ISLAND**
**PUERTO RICO**

# APPENDIX A
# WORKPLAN FOR HYDROGEOLOGIC INVESTIGATION AT NAVY FACILITY, VIEQUES ISLAND, PUERTO RICO

# Final
# Work Plan for Hydrogeologic Investigation at Navy Facility, Vieques Island, Puerto Rico

Prepared for

## United States Navy

**Roosevelt Roads Naval Station**
**Ceiba, Puerto Rico**

Contract No. N6247-95-D-6007

**August 1999**

Prepared by

**CH2MHILL**

**Baker** Environmental, Inc.

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1-1 Site Location Map

**Appendix**

Groundwater Sampling Procedure—Low Stress Purging and Sampling

# Acronyms and Abbreviations

| | |
|---|---|
| ASTM | American Standard of Testing Materials |
| BLS | Below Land Surface |
| BTEX | Benzene, Toluene, Ethylbenzene, and Total Xylenes |
| CFR | Code of Federal Register |
| COC | Chain-of-Custody |
| DOT | Department of Transportation |
| EPA | Environmental Protection Agency |
| NGVD | National Geodetic Vertical Datum |
| NSGA | Naval Securities Group Activity |
| ORS | Oil Recovery System |
| OVA | Organic Vapor Analyzer |
| PHA | Portable Hydrocarbon Analyzer |
| PPM | Parts per Million |
| PRASA | Puerto Rico Aqueduct and Sewer Authority |
| PVC | Poly Vinyl Chloride |
| QA/QC | Quality Assurance/Quality Control |
| SC | Site Characterization |
| TPH | Total Petroleum Hydrocarbons |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| UST | Underground Storage Tank |
| VOA | Volatile Organic Aromatics |

SECTION 1

# Introduction

Pursuant to Contract Number N62470-95-D-6007, CH2M HILL and Baker Environmental Inc. were retained by the United States Navy (Navy) to perform a Hydrogeologic Investigation at Navy-owned property located on Vieques Island, Puerto Rico. This Work Plan presents the procedures to be followed during the field investigations and laboratory procedures for analysis of soil and groundwater samples.

## 1.1 Site Background

### 1.1.1 Site Description

Vieques Island has a land area of approximately 33,000 acres and is located in the Caribbean Sea approximately seven miles southeast of Puerto Rico. The Navy's facility (Navy Facility) is located on the eastern one-third of Vieques Island. The facility includes both the Atlantic Fleet Weapons Training Facility (AFWTF) comprising 3,600 acres, and the adjacent and wholly contiguous Eastern Maneuver Area (EMA) comprising 11,000 acres. Both are under the command of U.S. Naval Station Roosevelt Roads (NSRR). Camp Garcia is located in the southeastern part of the EMA.

The AFWTF, located on the far eastern tip of the island, provides facilities and schedules naval gunfire support and air-to-ground ordnance delivery training for Atlantic Fleet ships, NATO ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic, conducts training for Marine amphibious units, battalion landing teams and combat engineering units in the EMA. On occasion, naval units of allied nations having a presence in the Caribbean and the Puerto Rican National Guard also utilize the EMA.

The training areas have been in continuous use since World War II when the Navy acquired title to the land. Recently, there have been allegations that ordnance-derived constituents may have migrated (via groundwater, surface water air emissions) from the Navy property to the western two-thirds of Vieques Island. In addition, as part of a RCRA Facility Investigation, the United States Environmental Protection Agency (USEPA) has requested the Navy to complete a "baseline" groundwater investigation along the western property boundary of the Navy Facility. The groundwater baseline investigation is to be designed to establish baseline groundwater quality and regional groundwater flow patterns along the western perimeter of the Navy's Facility.

### 1.1.2 Site Hydrogeology

The geology at the Navy Facility on Vieques Island is characterized by volcanic and plutonic bedrock overlain by alluvial unconsolidated sediments and patches of limestone. The volcanic bedrock consists primarily of andesites of Cretaceous age (Briggs and Akers, 1965). The plutonic bedrock consists largely of granodiorite and quartz-diorite that is exposed over a large percentage of the island. The alluvium consists of a mixture of sand, silt, and clay. These sediments form the Esperanza Aquifer which is a potential water supply aquifer that extends from Ensenada Samba to the Bahia Tapon in Camp Garcia (Gonzalez, 1989).

The bedrock, exposed at the northern part of the Navy Facility, is predominantly unweathered, highly impermeable, granodiorite with low porosity and low potential for groundwater supply development. In the southern part of Camp Garcia the bedrock is overlain by alluvium that make up the eastern extent of the Esperanza Aquifer. The alluvium consists mostly of clay. Groundwater samples from the alluvium indicate that the water is saline. The elevation of the ground water in the vicinity of Camp Garcia ranges from 10 to 70 feet above mean sea level, decreasing in elevation to the south (Gonzalez, 1989). At the northern part of Vieques the groundwater flow is likely in a northerly direction towards the Atlantic Ocean.

## 1.2 Project Objectives

The objectives of the hydrogeologic field investigation are to assess the groundwater flow directions along the western boundary of the Navy Facility and analyze the groundwater and soil to assess if they contain explosive related contaminants that may migrate offsite from the Navy Property.

The specific objectives of the hydrogeologic investigation are to:

- Install eleven shallow groundwater monitoring wells along the western property boundary of the Navy Facility along with eight piezometers set back from the property line to delineate the direction(s) of groundwater flowing onto and off of the Navy Facility.
- Sample the eleven monitoring wells and analyze the samples to assess if explosive related constituents are present on the groundwater and potentially migrating offsite.
- Sample the four shallow groundwater monitoring wells, requested by USEPA in a Draft Consent Order to assess the quality of the groundwater along the property boundary.
- Install and sample two deep wells in the Esperanza Alluvial Aquifer to assess if explosive related constituents are present in the Esperanza aquifer and potentially migrating offsite.
- Collect surface soil samples at the ephemeral streams that cross the property boundary and at the shallow monitoring well locations. The samples will be analyzed to assess if explosive related constituents are potentially migrating offsite via overland flow of surface water or air transport.
- Evaluate the data from the investigation to assess environmental risks to agricultural land use, residential land use, cattle grazing, and potable water supply use.

In accordance with a Draft Consent Order, the Navy will submit to USEPA the results of the "baseline" groundwater investigation along the western perimeter of the Navy Facility. The baseline groundwater investigation shall be designed to "establish baseline groundwater quality, regional groundwater flow patterns along the western perimeter of the Navy Facility, and to determine whether activities at the Navy's Facility have impacted groundwater at the western perimeter of the Facility; and if such impacts are indicated, are they currently, or in the future, likely to migrate off-site into the non-Navy owned areas of Vieques Island?"

A Draft Work Plan for the Hydrogeologic Investigation was submitted to the Navy in August 1999 to provide a preliminary scope of work for the hydrogeologic investigation. This Final Work Plan provides the final scope of work that was implemented. The Draft Work Plan was revised based on observations made during the initial site visit and refinement of the project objectives.

SECTION 2

# Field Procedures

The USEPA has approved a RCRA Facility Investigation work plan (RFI Work Plan) for the initial work at Roosevelt Roads under the Corrective Action program (Baker, 1995). This work plan addressed all the necessary technical elements including provision of the following separate plans:

- Project Management Plan
- Data Collection Quality Assurance Plan
- Data Management Plan
- Health and Safety Plan.

Together these plans provided all the details regarding field investigation techniques, laboratory analyses, data validation, and data evaluation needed to fulfill the requirements of this hydrogeologic investigation. Because this document is in place and approved, it will form the basis of this work plan. All the investigation tasks described in subsequent sections of this plan will be performed in accordance with the techniques and methodologies provided in the original approved plan with the exceptions as noted in this work plan.

## 2.1 Utility Location

Prior to initiating fieldwork, the proposed soil borings and monitoring well locations were provided to the Public Works Department. The Public Works Department indicated that they were not aware of any underground utilities at the proposed work areas.

## 2.2 Soil and Groundwater Sampling

### 2.2.1 Soil sampling

Surface soil samples will be collected at the eleven proposed monitoring well locations and the 21 locations where storm drains direct surface water runoff across the property line in a east to west direction. The proposed monitoring well locations and surface soil sample locations are shown in Figure 1.

The soil samples will be collected at a depth of 0-6" using a new stainless steel spoon. A description of each sample will be included in the Hydrogeologic Report. Sampling procedures will conform to Navy specifications described in the RFI Work Plan. The soil samples will be analyzed for RCRA Appendix IX metals and explosive related constituents including Nitroaromatics-Nitroamines, PETN, Nitroglycerin, picric acid and perchlorate.

Duplicate samples will be collected (10 percent frequency) to ensure laboratory QA/QC.

### 2.2.2 Monitoring Wells/ Piezometers

A total of eleven monitoring wells and eight piezometers will be installed on the Navy Facility. The locations are shown in Figure 1. The shallow monitoring wells will be installed at the first

encountered groundwater and will be utilized to assess the groundwater quality along the property boundary. The shallow piezometers will be installed at the same depth as the shallow monitoring wells and will be utilized, in conjunction with the monitoring wells, to assess the groundwater flow direction(s) along the property boundary.

Two monitoring wells, NW-4 and NW-7, will be installed to evaluate the groundwater quality in the Esperenza Aquifer. Piezometer P-9, along with these two wells, will be utilized to assess the flow direction in the Esperanza Aquifer.

The wells and piezometers will be constructed of 2-inch diameter, Schedule 40, PVC (Poly Vinyl Chloride).The monitoring wells installed within the alluvium will be installed using either hollow stem auger or mud rotary drilling methods. The monitoring wells installed within the bedrock will be installed using either direct air rotary drilling or down-the-hole hammer drilling methods.

Monitoring well and surface pad construction will follow the Navy's monitoring well installation requirements described in the RFI Work Plan. A lithologic log and monitoring well construction diagram will be completed for each monitoring well constructed and included in the Hydrogeologic Report.

Drill cuttings generated during monitoring well installation will be collected and disposed of in the manner described in The RFI Work Plan and based on TLCP laboratory analyses. If a monitoring well requires abandonment, the borehole will be abandoned by grouting the borehole from bottom to top with cement grout using the tremie method. Monitoring well development also will be completed in accordance with the Navy's requirements in the RFI Work Plan.

The Draft Work Plan proposed twelve monitoring wells, however, field observations identified a relativly steep slope to the north of well RCRA-2, suggesting a northerly flow direction of groundwater. As a result one of the proposed monitoring locations (NW-2) was deleted. One of the piezometer locations (P-4) proposed in the Draft Work Plan was deleted due to inaccessability of this location.

### 2.2.3 Equipment Decontamination

The drilling rig and associated equipment used to complete the monitoring wells will be decontaminated prior to installing each soil boring and monitoring well by removing loose soil and then by high-pressure washing the equipment. Potable water will be used for pressure washing. Equipment decontamination will be conducted in temporary decontamination pads constructed on short wooden walls and covered with plastic sheeting. The location of these temporary pads will be determined in the field. Wastewater from the decontamination area(s) will be pumped into USEPA-approved 55-gallon drums pending laboratory analysis and proper disposal.

The split-spoon samplers will be cleaned between each use by scrubbing off the remaining soil with a brush in soapy water and then rinsing them in fresh water.

## 2.3 Groundwater Elevation Survey

The horizontal locations and elevations of the monitoring wells and piezometers will be surveyed using a global positioning system (GPS) or standard surveying techniques. The well elevations will be surveyed by a licensed surveyor and referenced to National Geodetic Vertical Datum (NGVD).

A round of water levels will be collected from the eleven monitoring wells and eight piezometers to characterize the direction of ground water flow. The water levels will be measured after the

groundwater levels have reached equilibrium and within a three-hour period to minimize tidal effects of the groundwater levels.

## 2.4 Groundwater Sampling

Groundwater samples will be collected from monitoring wells that are constructed at each site. Monitoring wells will be allowed to stabilize after drilling and installation for 24 hours prior to purging and sampling.

### 2.4.1 Groundwater Sampling Procedures

Prior to performing groundwater sampling, depth to groundwater will be obtained using an electronic water level probe. The water level will be measured to the nearest 0.01 foot from the top of the PVC well casing.

Where practical, groundwater samples will be collected from the wells using low flow groundwater purging and sampling procedure (See Appendix). At locations where the groundwater depths are greater than thirty feet, higher flow pumps and bailers may be utilized for well purging and groundwater sampling. Immediately following collection, groundwater samples will be placed into appropriate laboratory-prepared sample containers. Appropriate chain-of-custody (COC) documentation will accompany the samples to the laboratory.

In addition to the environmental samples, quality assurance/quality control (QA/QC) samples will also be collected as discussed below:

- Duplicates—Duplicates for groundwater samples will be collected and split and sent to the laboratory. Field duplicates should be collected at a frequency of 10 percent per sample matrix. The laboratory will not be informed of the origin of duplicate samples.
- Trip Blanks—Trip blanks are defined as analyte-free water samples, which originate from the laboratory, are taken to the sampling site, and then returned to the laboratory with the VOA samples. One trip blank will accompany each cooler that contains samples for VOC analysis
- Field Blank—Field blanks are prepared by collecting a sample of analyte-free water in the area that groundwater sampling is occurring. One field blank will be collected each day wells are being sampled.
- Equipment Blank—An equipment blank is prepared by pumping analyte-free water through the low-flow pump, collecting a sample of this water, and analyzing the sample for the constituents of concern. One equipment blank will be collected at a frequency of one per day.
- Matrix Spike/ Matrix Spike Duplicate (MS/MSD) will be collected at a frequency of 1 per 20 field samples per matrix and submitted for analysis. Analysis of the MS/MSDs indicates the impact the matrix has on extracting the analyte for analyses.

### 2.4.2 Sample Handling and Transportation

The subcontracted laboratory will deliver to the site new, clean, contaminant-free polyethylene and glass containers with preservatives, labels, and COC documents.

### 2.4.3 Sample Documentation in the Field

Five types of documentation will be used in tracking and shipping analytical samples:

- Field log book;
- Sample labels
- COC records
- Custody seals on the coolers containing samples
- Commercial carrier airbills

At minimum, the label for each sample bottle will contain the following information:

- Site name
- Sample number
- Date and time of collection
- Sampler's initials
- Sample preservation and preservative used
- General types of analyses to be conducted

The sample information, as well as the analysis to be performed on the sample, will be entered in the field logbook in ink for each sampling point. Any errors in the field log will not be erased; instead a single line will be drawn through the error and initialed by the person completing the log.

Additionally, the following items will be entered into the logbook:

- Dates and times of site entry
- Sample depth and number
- Names of field personnel on site
- Names of visitors on site
- Field conditions
- Description of activities
- Sampling remarks and observations
- QA/QC samples collected
- List of photographs taken

Custody of the samples will be maintained from the time of sampling until the time they are forwarded to the laboratory. A sample is considered to be in an individual's possession if:

- It is in the sampler's possession or it is in the samplers' view after being in his or her possession.
- It was in the sampler's possession and then locked or sealed to prevent tampering.
- It is in a secure place.

The COC records will be used to record the custody of samples at all times. The following information shall be entered on the COC record:

- Project name.
- Signature of sampler.
- Baker sample number, date and time of collection, and grab or composite sample designation.
- Signatures of individuals involved in sample transfer.
- Sample matrix.
- The tracking number on the commercial airbill.

Field personnel will complete the COC records in ink and send the COC Form with each cooler forwarded from the site to the laboratory. Any errors on the COC records will not be erased; instead, a line will be drawn through the error and initialed by the person completing the form. The original copy will be placed in a sealed bag and put inside the appropriate cooler.

If the sample cooler is to be shipped by commercial air carrier, the cooler will be secured with custody seals so that the seals will be broken if the cooler is opened. The commercial carrier is not required to sign the COC record as long as the custody seals remain intact and the COC record remains in the cooler.

The laboratory sample custodian, or his designated representative, will accept the sample shipment, and then sign and date the COC record upon sample receipt. The original COC record will be returned with the final data report. The laboratory will be responsible for maintaining internal logbooks and records that provide a custody record during sampling preparation and analysis.

### 2.4.4 Equipment Decontamination

Sampling equipment that enters the monitoring well will be decontaminated with a non-phosphate soapy water scrub, water rinse, isopropyl alcohol rinse, and followed by a distilled-water rinse.

SECTION 3

# Laboratory Procedures

## 3.1 Soils

Soil samples (including the duplicate samples) will be analyzed for the following:

- Ordnance residues (including Nitroaromatics-Nitroamines, PETN and Nitroglycerin)- Test Methods for Evaluating Solid Waste SW-846, Third Edition, November 1986 (SW-846) Method 8330.
- Explosive related constituents perchlorate and picric acid.
- RCRA Appendix IX metals using SW-846 methods 6010, 7470 and 7471.

In addition to the environmental samples, QA/QC samples will also be analyzed. The QA/QC samples will consist of duplicates (10% of samples), and MS/MSD samples (one per twenty field samples).

## 3.2 Groundwater

The groundwater samples from the monitoring wells will be analyzed for the following:

- Ordnance residues (including Nitroaromatics-Nitroamines, PETN and Nitroglycerin)- Test Methods for Evaluating Solid Waste SW-846, Third Edition, November 1986 (SW-846) Method 8330.
- Explosive related constituents perchlorate and picric acid.
- RCRA Appendix IX metals using SW-846 methods 6010, 7470 and 7471.

In addition to the environmental samples, QA/QC samples will also be analyzed. The QA/QC samples will consist of duplicates (10 percent of samples), field blanks (one per source per event), equipment blanks (one per day), trip blanks (one per cooler containing samples for VOC analysis), and MS/MSD samples (one per twenty field samples per media).

The Draft Work Plan proposed sampling and analyzing the RCRA wells for the full list of Appendix IX constituents. However, the Navy postponed this work task until the Final Consent Order is issued.

SECTION 4

# Hydrogeologic Investigation Report

The Hydrogeologic Investigation Report will include the following items:

1.0 Introduction

1.1 Site Description

1.2 Summary of Previous Investigations

2.0 Field Investigation Activities

2.1 Sample Locations (number and type of samples, sampling strategy)

2.2 Summary of Technical assumptions and limitations.

2.2 Sampling Methods (sampling procedures, analytical methods)

3.0 Summary of Investigation Results

3.1 Assessment of Groundwater Flow Conditions

3.2 Assessment of Soil conditions

3.3 Analytical Data Summary

3.4 Comparison to Human Health Risk Assessment Screening Levels

The interpretation is limited to comparing measured sample concentrations to the USEPA Region III risk-based concentration (RBC) screening values. The evaluation will also include, if necessary, calculation of risks to potential receptors for agricultural use, residential use, cattle grazing use, and potable water use.

Supporting figures will be incorporated into the document to show the location of the sampling locations, and locations of samples exceeding the screening criteria. Tables will be incorporated to present analytical results that exceed selected screening values, including residential and industrial RBCs.

SECTION 5

# References


Baker, 1995. Final RCRA Facility Investigation, Naval Station Roosevelt Roads, Puerto Rico, September 14, 1995.

Briggs, R. P., and J.P. Akers, Hydrogeologic Map of Puerto Rico And Adjacent Islands U.S. Geological Survey Hydrologic Investigations Atlas HA-1965.

CH2M HILL Inc and Baker Environmental Inc. Draft Work Plan Hydrogeologic Investigation US Navy Facility Vieques, Puerto Rico. August 1999.

Gonzalez, S.T., Reconnaissance of the Groundwater Resources of Vieques Island, Puerto Rico U. S. Geological Survey Water Resources Investigations Report 86-4100.

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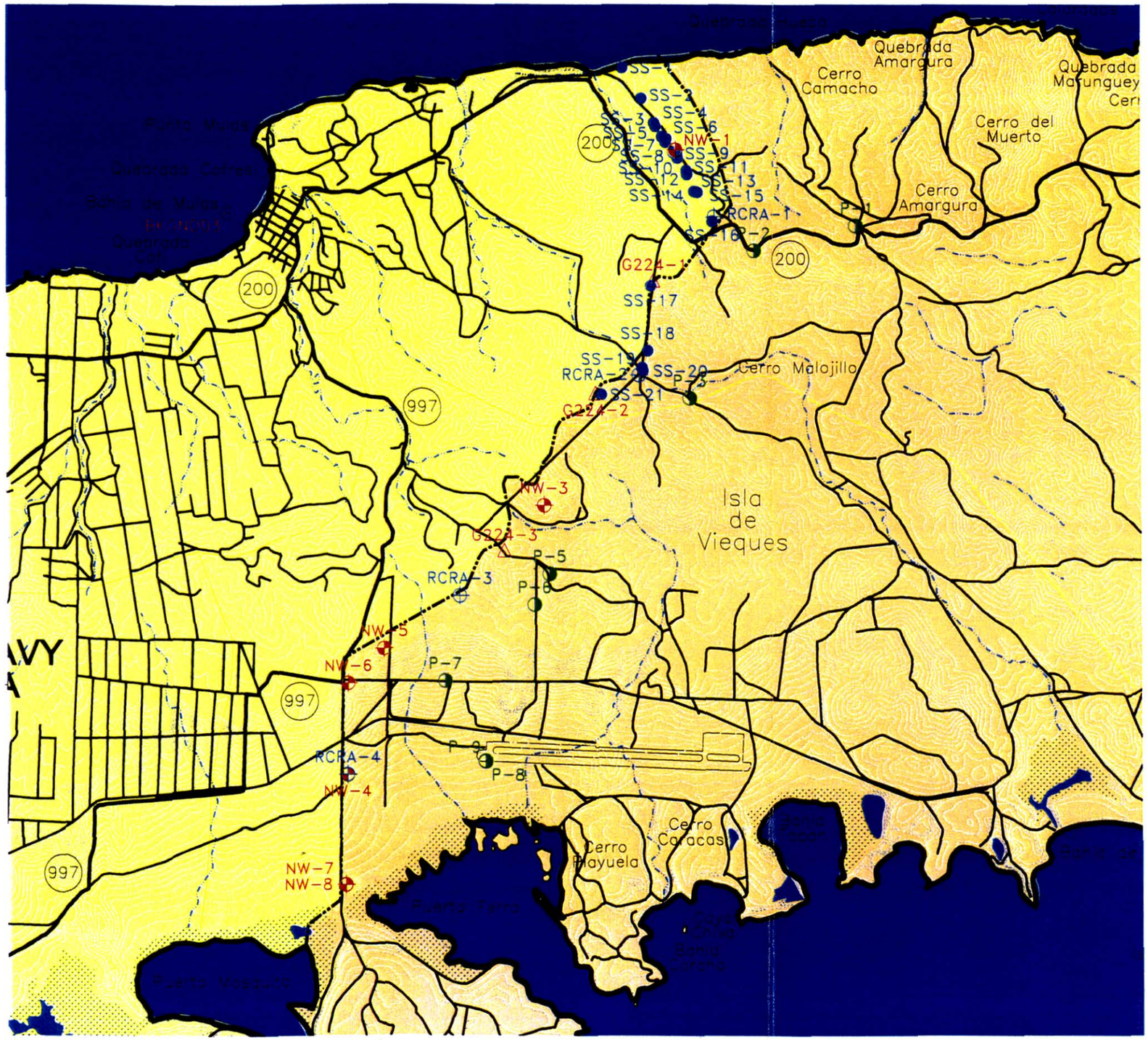


## LEGEND

- WATER
- DISTRICTS
- CONTOUR
- MARSH
- SHORELINE
- STATE ROUTE
- SECONDARY ROAD
- STREAM
- NON-NAVY OWNED LAND
- EMA - EASTERN MANEUVER AREA
- NW-1 MONITORING WELL LOCATION
- SS-1 SOIL SAMPLE LOCATION
- P-1 PIEZOMETER LOCATION

0 300 900 1500

1 CM = 300 M

**FIGURE 1**
**HYDROGEOLOGIC INVESTIGATION SAMPLING PLAN**

**VIEQUES ISLAND**
**PUERTO RICO**

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# Appendix

# U.S. ENVIRONMENTAL PROTECTION AGENCY
# REGION II

## GROUND WATER SAMPLING PROCEDURE
## LOW STRESS (Low Flow) PURGING AND SAMPLING

## I. SCOPE & APPLICATION

This Low Stress (or Low-Flow) Purging and Sampling Procedure is the EPA Region II standard method for collecting low stress (low flow) ground water samples from monitoring wells. Low stress Purging and Sampling results in collection of ground water samples from monitoring wells that are representative of ground water conditions in the geological formation. This is accomplished by minimizing stress on the geological formation and minimizing disturbance of sediment that has collected in the well. The procedure applies to monitoring wells that have an inner casing with a diameter of 2.0 inches or greater, and maximum screened intervals of ten feet unless multiple intervals are sampled. The procedure is appropriate for collection of groundwater samples that will be analyzed for volatile and semi-volatile organic compounds (VOCs and SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and microbiological and other contaminants in association with all EPA programs.

This procedure does not address the collection of light or dense non-aqueous phase liquids (LNAPL or DNAPL) samples, and should be used for aqueous samples only. For sampling NAPLs, the reader is referred to the following EPA publications: DNAPL Site Evaluation (Cohen & Mercer, 1993) and the RCRA Ground-Water Monitoring: Draft Technical Guidance (EPA/530-R-93-001), and references therein.

## II. METHOD SUMMARY

The purpose of the low stress purging and sampling procedure is to collect ground water samples from monitoring wells that are representative of ground water conditions in the geological formation. This is accomplished by setting the intake velocity of the sampling pump to a flow rate that limits drawdown inside the well casing.

Sampling at the prescribed (low) flow rate has three primary benefits. First, it minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity (i.e., low concentration of suspended particles). Typically, this saves time and analytical costs by eliminating the need for collecting and analyzing an additional filtered sample from the same well. Second, this procedure minimizes aeration of the ground water during sample collection, which improves the sample quality for VOC analysis. Third, in most cases the procedure significantly reduces the volume of ground water purged from a well and the costs associated with its proper treatment and disposal.

## III. ADDRESSING POTENTIAL PROBLEMS

Problems that may be encountered using this technique include a) difficulty in sampling wells with insufficient yield; b) failure of one or more key indicator parameters to stabilize; c) cascading of water and/or formation of air bubbles in the tubing; and d) cross-contamination between wells.

Insufficient Yield Wells with insufficient yield (i.e., low recharge rate of the well) may dewater during purging. Care should be taken to avoid loss of pressure in the tubing line due to dewatering of the well below the level of the pump's intake. Purging should be interrupted before the water level in the well drops below the top of the pump, as this may induce cascading of the sand pack. Pumping the well dry should therefore be avoided to the extent possible in all cases. Sampling should commence as soon as the volume in the well has recovered sufficiently to allow collection of samples. Alternatively, ground water samples may be obtained with techniques designed for the unsaturated zone, such as lysimeters.

Failure to Stabilize Key Indicator Parameters

If one or more key indicator parameters fails to stabilize after 4 hours, one of four options should be considered: a) continue purging in an attempt to achieve stabilization; b) discontinue purging, do not collect samples, and document attempts to reach stabilization in the log book; c) discontinue purging, collect samples, and document attempts to reach stabilization in the log book; or d) Secure the well, purge and collect samples the next day (preferred). The key indicator parameter for samples to be analyzed for VOCs is dissolved oxygen. The key indicator parameter or all other samples is turbidity.

Cascading

To prevent cascading and/or air bubble formation in the tubing, care should be taken to ensure that the flow rate is sufficient to maintain pump suction. Minimize the length and diameter of tubing (i.e., 1/4 or 3/8 inch ID) to ensure that the tubing remains filled with ground water during sampling.

Cross-Contamination

To prevent cross-contamination between wells, it is strongly recommended that dedicated, in-place pumps be used. As an alternative, the potential for cross-contamination can be reduced by performing the more thorough "daily" decontamination procedures between sampling of each well in addition to the start of each sampling day (see Section VII, below).

Equipment Failure

Adequate equipment should be on-hand so that equipment failures do not adversely impact sampling activities.

## IV. PLANNING DOCUMENTATION AND EQUIPMENT

- Approved site-specific Field Sampling Plan/Quality Assurance Project Plan (QAPP). This plan must specify the type of pump and other equipment to be used. The QAPP must also specify the depth to which the pump intake should be lowered in each well. Generally, the target depth will correspond to the mid-point of the most permeable zone in the screened interval. Borehole geologic and geophysical logs can be used to help select the most permeable zone. However, in some cases, other criteria may be used to select the target depth for the pump intake. In all cases, the target depth must be approved by the EPA hydrogeologist or EPA project scientist.

- Well construction data, location map, field data from last sampling event.

- Polyethylene sheeting.

- Flame Ionization Detector (FID) and Photo Ionization Detector (PID).

- Adjustable rate, positive displacement ground water sampling pump (e.g., centrifugal or bladder pumps constructed of stainless steel or Teflon). A peristaltic pump may only be used for inorganic sample collection.

- Interface probe or equivalent device for determining the presence or absence of NAPL.

- Teflon or Teflon-lined polyethylene tubing to collect samples for organic analysis. Teflon or Teflon-lined polyethylene, PVC, Tygon or polyethylene tubing to collect samples for inorganic analysis. Sufficient tubing of the appropriate material must be available so that each well has dedicated tubing.

- Water level measuring device, minimum 0.01 foot accuracy, (electronic preferred for tracking water level drawdown during all pumping operations).

- Flow measurement supplies (e.g., graduated cylinder and stop watch or in-line flow meter).

- Power source (generator, nitrogen tank, etc.).

- Monitoring instruments for indicator parameters. Eh and dissolved oxygen must be monitored in-line using an instrument with a continuous readout display. Specific conductance, pH, and temperature may be monitored either in-line or using separate probes. A nephalometer is used to measure turbidity.

- Decontamination supplies (see Section VII, below).

- Logbook (see Section VIII, below).

- Sample bottles.

- Sample preservation supplies (as required by the analytical methods).

- Sample tags or labels, chain of custody.

## V. SAMPLING PROCEDURES

Pre-Sampling Activities

1. Start at the well known or believed to have the least contaminated ground water and proceed systematically to the well with the most contaminated ground water. Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations.

2. Lay out sheet of polyethylene for placement of monitoring and sampling equipment.

3. Measure VOCs at the rim of the unopened well with a PID and FID instrument and record the reading in the field log book.

4. Remove well cap.

5. Measure VOCs at the rim of the opened well with a PID and an FID instrument and record the reading in the field log book.

6. If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one. Note that the reference point should be surveyed for correction of ground water elevations to the mean geodesic datum (MSL).

7. Measure and record the depth to water (to 0.01 ft) in all wells to be sampled prior to purging. Care should be taken to minimize disturbance in the water column and dislodging of any particulate matter attached to the sides or settled at the bottom of the well.

8. If desired, measure and record the depth of any NAPLs using an interface probe. Care should be taken to minimize disturbance of any sediment that has accumulated at the bottom of the well. Record the observations in the log book. If LNAPLs and/or DNAPLs are detected, install the pump at this time, as described in step 9, below. Allow the well to sit for several days between the measurement or sampling of any DNAPLs and the low-stress purging and sampling of the ground water.

Sampling Procedures

9. Install Pump: Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified for that well in the EPA-approved QAPP or a depth otherwise approved by the EPA hydrogeologist or EPA project scientist. The pump intake must be kept at least two (2) feet above the bottom of the well to prevent disturbance and resuspension of any sediment or NAPL present in the bottom of the well. Record the depth to which the pump is lowered.

10. Measure Water Level: Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

11. Purge Well: Start pumping the well at 200 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

12. Monitor Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):

+0.1 for pH
+3% for specific conductance (conductivity)
+10 mv for redox potential
+10% for DO and turbidity

Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.

13. Collect Samples: Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft. VOC samples must be collected first and directly into sample containers. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container.

Ground water samples to be analyzed for volatile organic compounds (VOCs) require pH adjustment. The appropriate EPA Program Guidance should be consulted to determine whether pH adjustment is necessary. If pH adjustment is necessary for VOC sample preservation, the amount of acid to be added to each sample vial prior to sampling should be determined, drop by drop, on a separate and equal volume of water (e.g., 40 ml). Groundwater purged from the well prior to sampling can be used for this purpose.

14. Remove Pump and Tubing: After collection of the samples, the tubing, unless permanently installed, must be properly discarded or dedicated to the well for resampling by hanging the tubing inside the well.

15. Measure and record well depth.

16. Close and lock the well.

## VI. FIELD QUALITY CONTROL SAMPLES

Quality control samples must be collected to determine if sample collection and handling procedures have adversely affected the quality of the ground water samples. The appropriate EPA Program Guidance should be consulted in preparing the field QC sample requirements of the site-specific QAPP.

All field quality control samples must be prepared exactly as regular investigation samples with regard to sample volume, containers, and preservation. The following quality control samples should be collected during the sampling event:

- Field duplicates
- Trip blanks for VOCs only
- Equipment blank (not necessary if equipment is dedicated to the well)

As noted above, ground water samples should be collected systematically from wells with the lowest level of contamination through to wells with highest level of contamination. The equipment blank should be collected after sampling from the most contaminated well.

## VII. DECONTAMINATION

Non-disposable sampling equipment, including the pump and support cable and electrical wires which contact the sample, must be decontaminated thoroughly each day before use ("daily decon") and after each well is sampled ("between-well decon"). Dedicated, in-place pumps and tubing must be thoroughly decontaminated using "daily decon" procedures (see #17, below) prior to their initial use. For centrifugal pumps, it is strongly recommended that non-disposable sampling equipment, including the pump and support cable and electrical wires in contact with the sample, be decontaminated thoroughly each day before use ("daily decon").

EPA's field experience indicates that the life of centrifugal pumps may be extended by removing entrained grit. This also permits inspection and replacement of the cooling water in centrifugal pumps. All non-dedicated sampling equipment (pumps, tubing, etc.) must be decontaminated after each well is sampled ("between-well decon," see #18 on the following page).

17. Daily Decon

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

D) Disassemble pump.

E) Wash pump parts: Place the disassembled parts of the pump into a deep basin containing 8 to 10 gallons of non-phosphate detergent solution. Scrub all pump parts with a test tube brush.

F) Rinse pump parts with potable water.

G) Rinse the following pump parts with distilled/ deionized water: inlet screen, the shaft, the suction interconnector, the motor lead assembly, and the stator housing.

H) Place impeller assembly in a large glass beaker and rinse with 1% nitric acid ($HNO3$).

I) Rinse impeller assembly with potable water.

J) Place impeller assembly in a large glass bleaker and rinse with isopropanol.

K) Rinse impeller assembly with distilled/deionized water.

18. Between-Well Decon

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

D) Final Rinse: Operate pump in a deep basin of distilled/deionized water to pump out 1 to 2 gallons of this final rinse water.

## VIII. FIELD LOG BOOK

A field log book must be kept each time ground water monitoring activities are conducted in the field. The field log book should document the following:

- Well identification number and physical condition.
- Well depth, and measurement technique.
- Static water level depth, date, time, and measurement technique.
- Presence and thickness of immiscible liquid layers and detection method.
- Collection method for immiscible liquid layers.
- Pumping rate, drawdown, indicator parameters values, and clock time, at three to five minute intervals; calculate or measure total volume pumped.
- Well sampling sequence and time of sample collection.
- Types of sample bottles used and sample identification numbers.
- Preservatives used.
- Parameters requested for analysis.
- Field observations of sampling event.
- Name of sample collector(s).
- Weather conditions.
- QA/QC data for field instruments.

## IX. REFERENCES

Cohen, R.M. and J.W. Mercer, 1993, DNAPL Site Evaluation, C.K. Smoley Press, Boca Raton, Florida.

Puls, R.W. and M.J. Barcelona, 1996, Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures, EPA/540/S-95/504.

U.S. EPA, 1993, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001.

U.S. EPA Region II, 1989, CERCLA Quality Assurance Manual.

# APPENDIX B
# SURFACE SOIL SAMPLE DESCRIPTIONS

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-1-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW-1
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/smaller pebbles w/ coarse sand. Some root material present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | RCRA-1-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : RCRA-1
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/ small pebbles w/ coarse sand. Abundant root material present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | RCRA-2-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : RCRA-2

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/large to small pebbles/rocks. Samples had abundant root material and some clay material also. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-3-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW-3
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/ large to small pebbles/rocks. Samples had abundant root material and some clay present also. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | RCRA-3-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : RCRA-3
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/ large pebbles. Abundant root material and some clay and sand present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-5-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW-5

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/ large pebbles. Abundant root material and some clay present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-6-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW-6
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/large pebbles. Abundant root material and clay present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | RCRA-4-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : RCRA-4

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/16/99 END: 8/16/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/ large pebbles. Abundant root material and some sand seen. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-8-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW-8
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown, abundant organic matter, loose with some sand. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-7-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW-7

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown, some organic matter, loose w/ some sand present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | NAVY-4-SS | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : NW_4

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : A. Chang

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Light brown w/ large pebbles. Loose, some sand present. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-01 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-1
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Fine loam, dry light brown, some organics (roots), trace pebbles. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-02 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-2

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, fine to very fine, dry, light brown, trace organics, trace pebbles. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-03 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-3

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, fine, trace volcanic rock dacite/ andesite, dry. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-04 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-4

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/17/99 END: 8/17/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, fine, trace volcanic rock dacite/ andesite, dry. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-05 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-5

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, fine, tan some pebbles, volcanic rock (andesite). | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-06 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-6

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, fine, tan, some volcanic rock, dacite, dry. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-07 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-7

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, fine, tan, some rock, dry. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-08 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-8

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : M. Clasen

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, tan, trace roots, trace rock, dry. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-09 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-9
ELEVATION : DRILLING CONTRACTOR : NA
DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon
WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, tan, fine, some roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-10 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-10

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, tan, fine, some roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-11 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-11

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, tan, fine, some rock pebbles (more than trace). | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-12 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-12

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, tan, fine, trace roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-13 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-13

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, tan, fine, trace roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-14 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-14

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, medium brown, fine, some rocks | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-15 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-15

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, medium brown, fine, trace rocks, trace roots | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-16 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-16

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, dry, medium brown, fine, trace rocks, trace roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-17 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-17

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, clayey, medium brown, trace rocks, trace roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-18 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-18

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, fine, medium brown, some roots. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-19 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-19

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Rip-rap for culvert, very rocky, damp. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-20 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-20

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, medium brown, fine, some roots, dry. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

| PROJECT NUMBER | BORING NUMBER | |
|---|---|---|
| 154413.DE.DE | SS-21 | SHEET 1 OF 1 |

# SOIL BORING LOG

PROJECT : Hydrogeologic Investigation Vieques Island LOCATION : SS-21

ELEVATION : DRILLING CONTRACTOR : NA

DRILLING METHOD AND EQUIPMENT USED : hand auger and/or SST spoon

WATER LEVELS : NA START : 8/18/99 END: 8/18/1999 LOGGER : K. Swanson

| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | RECOVERY (IN) | #/TYPE | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N) | CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY. | COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole |
|---|---|---|---|---|---|---|
| 0 | 6" | NA | NA | NA | Sandy loam, medium brown, fine, much rip-rap. | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |

# APPENDIX C
# SURFACE SOIL SAMPLE LOCATIONS PHOTOS

**SS-1 Looking North**

**SS-1 Looking South**

**SS-1 Looking East**



00179ERHV

**SS-2 Looking North**

**SS-2 Looking East**

**SS-2 Looking West**

**SS-3 Looking North**

**SS-3 Looking South**

**SS-2 Looking West**

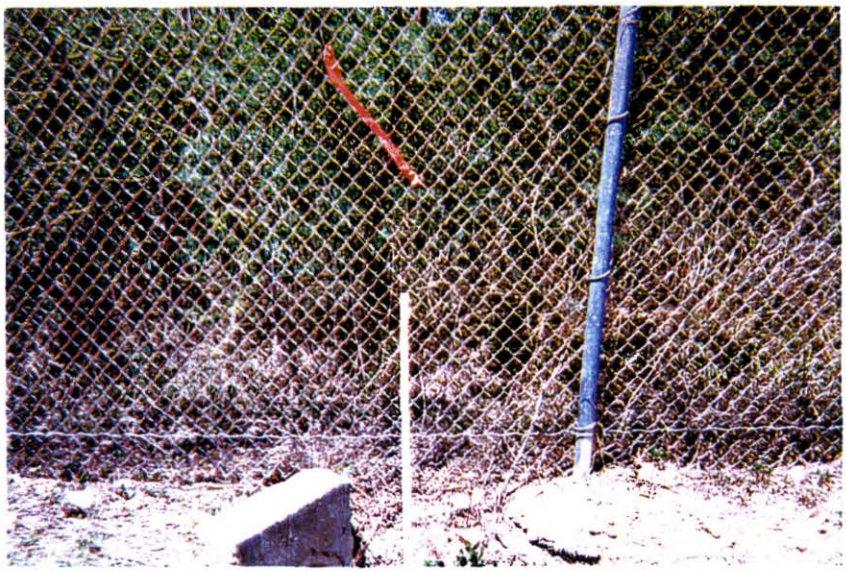
**SS-4 Looking North**

**SS-4 Looking South**

**SS-4 Looking West**

**SS-5 Looking North**

**SS-5 Looking South**



**SS-5 Looking West**

**SS-6 Looking North**

**SS-6 Looking East**

**SS-6 Looking West**

**SS-7 Looking North**

**SS-7 Looking South**

**SS-7 Looking West**

**SS-8 Looking North**

**SS-8 Looking South**

**SS-8 Looking West**

**SS-9 Looking North**

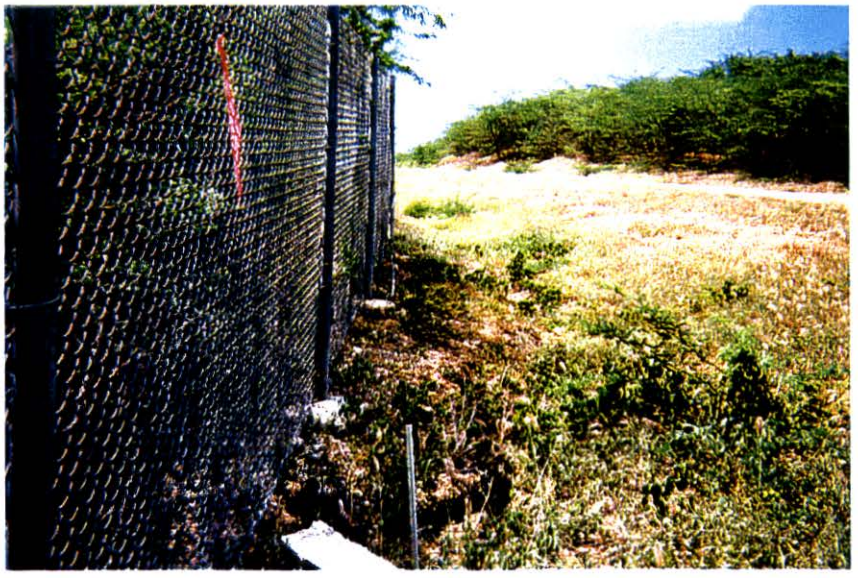
**SS-9 Looking South**

**SS-9 Looking East**

**SS-10 Looking North**

**SS-10 Looking South**

**SS-10 Looking West**



**SS-11 Looking North**

**SS-11 Looking South**

**SS-11 Looking West**

**SS-12 Looking North**

**SS-12 Looking South**

**SS-12 Looking West**

**SS-13 Looking North**

**SS-13 Looking South**

**SS-13 Looking West**

**SS-14 Looking North**

**SS-14 Looking South**

**SS-14 Looking West**

**SS-15 Looking North**

**SS-15 Looking East**

**SS-15 Looking West**

**SS-16 Looking North**

**SS-16 Looking South**

**SS-16 Looking West**

**SS-17 Looking North**

**SS-17 Looking South**

**SS-17 Looking West**

**SS-18 Looking North**

**SS-18 Looking South**

**SS-18 Looking East**

**SS-19 Looking North**

**SS-19 Looking South**

**SS-19 Looking West**

**SS-20 Looking North**

**SS-20 Looking East**

**SS-20 Looking West**

**SS-12 Looking North**

**SS-12 Looking South**

**SS-12 Looking West**

# APPENDIX D
# CHAIN-OF-CUSTODY FORMS

**CH2MHILL** FAX

CH2M Hill/SAN
Tel 210-377-3081
Fax 210-349-8944

| | | | |
|---|---|---|---|
| **To:** | Marty Clasen | **From:** | Allyie Chang |
| **Company:** | CH2M Hill/TPA | **Date:** | August 27, 1999 |
| **Fax No.:** | 813-874-3056 | **Total Pages:** | 21 |
| **Voice No.:** | 813-874-0777 | | |

**Message:**

Marty,

I am faxing you COCs as requested by Rick Morales. Also, I have summarized the field sampling activities by date and an explanation of the sample designations.

Summary of Sampling Activities

8-16-99: Began surface soil sampling for Navy-1, RCRA-1, RCRA-2, Navy-3, RCRA-3, Navy-5, Navy-6, and RCRA-4. Sampled for explosive residue (had extra volume for total metals analysis.)

8-17-99: Continued surface soil sampling for Navy-8, Navy-7, and Navy-4. Also, started perimeter sampling for SS-01 thru SS-04 (formerly the SD locations.) Sampled for explosive residue (had extra volume for total metals analysis.)

8-18-99: Continued perimeter surface soil sampling for SS-01 (metals only), SS-02 (metals only), SS-03 (metals only), SS-04 (metals only), and SS-04 thru SS-21. Also, collected water samples for Navy-5, Navy-6, RCRA-1, RCRA-2, and RCRA-3. Sampled soil samples for explosive residue and total metals. RCRA wells were sampled for Appendix 9 and Secondary drinking water parameters. Navy wells were sampled for Appendix 9 compounds and Salinity. Shipped all soil samples and water samples that had 48 hour holding time on 8-18.

8-19-99: Continued collection of water samples for RCRA-4, Navy-8, and Navy-3. Shipped water samples collected on 8-18 and 8-19. RCRA wells were sampled for Appendix 9 and Secondary drinking water parameters. Navy wells were sampled for Appendix 9 compounds and Salinity. Shipped water samples on 8-19.

8-20-99: Continued collection of water samples for Navy-1, Navy-7, and Navy-4. Navy wells were sampled for Appendix 9 compounds and Salinity. Shipped these samples out on 8-20.

Please call if pages are missing or illegible or if you receive this fax in error.

8-23-99 thru 8-25-99: IDW samples collected for TCLP parameters.

<u>Sample designation</u>

Samples with -GW suffix are groundwater samples
Samples with -SS suffix are surface soil samples
Samples with -STCLP suffix are composite soil samples for TCLP analysis.
Samples with -WTCLP suffix are purge water samples for TCLP analysis.

Let me know if you have any questions or need anything else. Have a good weekend.

-Allyie

Please call if pages are missing or illegible or if you receive this fax in error.

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☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504)


## ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

* SEND ONLY AS HR. SAMPLES

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) PR | SAMPLER(s) NAME | PHONE / FAX |
|---|---|---|

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|

CLIENT ADDRESS (CITY, STATE, ZIP)

☐ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Due Date:

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: LAB FILTER AG, MI=TALS, 20 DW PARAMETERS, SALINITY, MBAS, ODOR, VOC TRT

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | NUMBER OF CONTAINERS SUBMITTED | REMARKS |
|---|---|---|---|---|---|
| 08.18.99 | 1530 | | NAVY-5-GW | | STATION: NAVY- |
| 08.18.99 | 1445 | | NAVY-6-GW | | STATION: NAVY- |
| 08.18.99 | 1400 | | RCRA-1-GW | | |
| 08.18.99 | 1115 | | RCRA-2-GW | | |
| 08.18.99 | 1115 | | RCRA-2-GWD | | |
| 08.18.99 | 1115 | | RCRA-2-GWMS | | |
| 08.18.99 | 1115 | | RCRA-2-GWMSD | | |
| 08.18.99 | 1555 | | RCRA-3-GW | | |
| [redacted] | | | | | |
| [redacted] | | | | | |
| 08.18.99 | 1056 | | EQB-4 | | |
| 08.18.99 | 1057 | | TB-1 | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| S. Campbell | 8/2/99 | | | 08.18.99 | | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| | | | | | | | | |

## LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

RB

**SL** SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD


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☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (904) 878-
☐ 414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: (954) 421-
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-


PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER

PROJECT LOC. (State): PR | SAMPLER(s) NAME: R. Swanson / M. Clausen | PHONE | FAX

CLIENT NAME: CH2M HILL | CLIENT PROJECT MANAGER: John Tomic / CH2M HILL / WDC

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE | REQUIRED ANALYSES | PAGE 2

STANDARD REPORT DELIVERY ☐ | EXPEDITED DELIVERY(s) ☐ | Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | SW8330 | TOTAL METALS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 8-18-99 | 1355 | | SS-11 | | | | | 1 | 1 | |
| 8-18-99 | 1400 | | SS-12 | | | | | 1 | 1 | |
| 8-18-99 | 1405 | | SS-13 | | | | | 1 | 1 | |
| 8-18-99 | 1445 | | SS-14 | | | | | 1 | 1 | |
| 8-18-99 | 1455 | | SS-15 | | | | | 1 | 1 | |
| 8-18-99 | 1505 | | SS-16 | | | | | 1 | 1 | |
| 8-18-99 | 1505 | | SS-16-FD | | | | | 1 | 1 | |
| 8-18-99 | 1520 | | SS-17 | | | | | 1 | 1 | |
| 8-18-99 | 1530 | | SS-18 | | | | | 1 | 1 | |
| 8-18-99 | 1540 | | SS-19 | | | | | 1 | 1 | |
| 8-18-99 | 1550 | | SS-20 | | | | | 1 | 1 | |
| 8-18-99 | 1550 | | SS-20-FD | | | | | 1 | 1 | |
| 8-18-99 | 1605 | | SS-21 | | | | | 1 | 1 | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE |
|---|---|---|---|---|---|---|---|
| [signature] | 8/18/99 | | [signature] | 8/18/99 | 1830 | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** |
| EMPTY CONTAINERS | | | | | | | |

LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

3 - PLY 1 (ORIGINAL) WILL BE RETURNED TO YOU WITH ANALYSIS RESULTS

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☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
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☐ 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 | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | K. Swanson / M. Clause | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | John Tomic / Chris Hicks |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMI-SOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: 5030B / TOTAL METALS

PAGE 3 OF

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due:

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMI-SOLID | AIR | NONAQUEOUS LIQUID | 5030B | TOTAL METALS | | | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-18-98 | 1430 | | EQB-3 | X | | | | 1 | 1 | | | | | | | | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | [signature] | 08-18-99 | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

Serial Number 116154

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# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE: | PROJECT NO.: | P.O. NUMBER:

PROJECT LOC. (State): PR | SAMPLER(s) NAME: K. Swanson / A. Chang | PHONE: | FAX:

CLIENT NAME: CH2M HILL | CLIENT PROJECT MANAGER:

CLIENT ADDRESS (CITY, STATE, ZIP):

MATRIX TYPE | REQUIRED ANALYSES | PAGE 1 | C

( ) STANDARD REPORT DELIVERY

( ) EXPEDITED REP DELIVERY (surch

Date Due:

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | SW8330 | ~~PAH~~ | ~~PCB~~ | ~~PCB (AROCLOR)~~ | ~~PESTICIDES~~ | TOTAL METALS | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | X | X | X | X | X | | | | | | |
| 08-16-99 | 16:11 | | NAVY-1-SS | X | | | | 1 | 1 | 1 | 1 | 1 | | | ALIAS | NW-1 | | STATION: NAVY- 10-16 |
| 08-16-99 | 16:36 | | RCRA-1-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | STATION: RCRA-1 ( |
| 08-16-99 | 16:52 | | RCRA-2-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | STATION: RCRA-2 (0 |
| 08-16-99 | 17:20 | | NAVY-3-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | ALIAS | NW-3 | | STATION: NAVY-3 ( |
| 08-16-99 | 17:20 | | NAVY-3-SSD | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | FIELD DUPLI |
| 08-16-99 | 17:20 | | NAVY-3-SSms | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | MATRIX SPI |
| 08-16-99 | 17:20 | | NAVY-3-SSMSD | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | MATRIX SPIKE DU |
| 08-16-99 | 17:40 | | RCRA-3-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | STATION: RCRA-3 ( |
| 08-16-99 | 17:55 | | NAVY-5-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | ALIAS | NW-5 | | STATION: NAVY-5 10-16 |
| 08-16-99 | 18:00 | | NAVY-6-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | ALIAS | NW-6 | | STATION: NAVY-6 10-16 |
| 08-16-99 | 18:20 | | RCRA-4-SS | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | STATION: RCRA-4 10-16 |
| | | | | | | | | | | | | | | | | | | |
| 08-16-99 | 16:21 | | EQB-1 | X | | | | X | | | | X | | | | | | EQUIPMENT BLA |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| S. Campbell | 7/30/99 | | | 08-18-99 | | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| EMPTY CONTAINERS. | | | | | | | | |

LABORATORY USE ONLY

| RECEIVED F[illegible] BORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | C[illegible]Y SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ( ) YES ( ) NO | | | |

Serial Number 6153

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☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-70
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-11


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | K. SWANSON / A. CHANG | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: SW8330 / ~~Pesticides~~ / ~~Herbicides~~ / ~~Pesticides~~ / ~~Herbicides~~ / TOTAL METALS

PAGE 2

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surch

Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | SW8330 | ~~Pesticides~~ | ~~Herbicides~~ | TOTAL METALS | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | X | X | X | X | X | | | | |
| 08-17-99 | 14:08 | | NAVY-8-SS | X | | | | | | | 1 | | ALIAS: NW-8 | | | STATION: NAVY-8 |
| 08-17-99 | 14:16 | | NAVY-7-SS | X | | | | | | | 1 | | ALIAS: NW-7 | | | STATION: NAVY-7 |
| 08-17-99 | 14:48 | | NAVY-4-SS | X | | | | | | | 1 | | ALIAS: NW-4 | | | STATION: NAVY-4 |
| | | | PERIMETER SAMPLING | | | | | | | | | | | | | |
| 08-17-99 | 17:37 | | SS-01 | | | | | | | | 1 | | | | | |
| 08-17-99 | 17:51 | | SS-02 | | | | | | | | 1 | | | | | |
| 08-17-99 | 17:54 | | SS-03 | | | | | | | | 1 | | | | | |
| 08-17-99 | 18:07 | | SS-04 | | | | | | | | 1 | | | | | |
| 08-17-99 | 1355 | | EQB-2 | X | | | | X | X | X | | | | | | EQUIPMENT BLANK |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| S. Campbell | 7/30/99 | | | 08-18-99 | | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| EMPTY CONTAINERS | | | | | | | | |

**LABORATORY USE ONLY**

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

Serial Number 116156

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# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD


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☐ 414 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


PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER

PROJECT LOC. (state): PR | SAMPLER(s) NAME: K. SWANSON / M. CLAGEN | PHONE | FAX

CLIENT NAME: CH2M HILL | CLIENT PROJECT MANAGER: John Tomic / CH2M HILL (WX)

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE | REQUIRED ANALYSES | PAGE 1 OF 1

☐ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | SW8330 | ~~Phenol~~ TOTAL MTZ-TMS | | | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18.99 | 10:50 | | SS-01 | X | | | | | 1 | | | | | | | | | |
| 18.99 | 10:55 | | SS02 | | | | | | 1 | | | | | | | | | |
| 18.99 | 11:00 | | SS03 | | | | | | 1 | | | | | | | | | |
| 18.99 | 11:05 | | SS-04 | | | | | | 1 | | | | | | | | | |
| 18.99 | 11:10 | | SS-05 | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 11:25 | | SS-06 | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 11:25 | | SS-06-FD | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 11:25 | | SS-06-MS | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 11:25 | | SS-06-MSD | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 11:55 | | SS-07 | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 12:05 | | SS08 | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 1340 | | SS-09 | | | | | 1 | 1 | | | | | | | | | |
| 18.99 | 1345 | | SS-10 | | | | | 1 | 1 | | | | | | | | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| S. Campbell | 7/30/99 | | | 08-18-99 | | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| EMPTY CONTAINERS | | | | | | | | |

**LABORATORY USE ONLY**

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

[redacted]RIES
ENVIRONMENTAL SERVICES, INC.

102 LaRoche Avenue, Savannah, GA 31404 — Phone: [redacted]
2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: [redacted]
414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: [redacted]
900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6533 — Fax: (334) [redacted]
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

GP LABS

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | A. Chang / R. Morales | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | John Tomic / CH2M HILL / NDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE — REQUIRED ANALYSES — PAGE 1 OF

STANDARD REPORT DELIVE[redacted]
EXPEDITED [redacted] DELIVERY(su[redacted]
Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | PCBs, Pesticides, Herbicides | NUMBER OF CONTAINERS SUBMITTED | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 8.18.99 | 15:30 | NAVY-5-GW | X | | | | | 2 | |
| 8.18.99 | 1445 | NAVY-6-GW | | | | | | 2 | |
| 8.18.99 | 1400 | RCRA-1-GW | | | | | | 2 | |
| 8.18.99 | 1115 | RCRA-2-GW | | | | | | 2 | |
| 8.18.99 | 1115 | RCRA-2-GWD | | | | | | 2 | |
| 8.18.99 | 1115 | RCRA-2-GWMS | | | | | | 2 | |
| 8.18.99 | 1115 | RCRA-2-GWMSD | | | | | | 2 | |
| 8.18.99 | 1555 | RCRA-3 | | | | | | 2 | |
| 08/18/99 | 1056 | EQB4 | | | | | | | |
| 08/18/99 | 1057 | T | | | | | | | |

PRESERVATIVE

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | 8.19.99 | 2100 | | | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

[redacted]

[redacted] ENVIRONMENTAL SERVICES, INC.

[redacted] REQUEST AND CHAIN OF CUSTODY RECORD

GP LABS

[redacted] FL 32301 Phone: [redacted] Fax: [redacted]
[redacted] FL 33442 Phone: (954) 421-7400 Fax: [redacted]
[redacted] AL 36693 Phone: (334) 666-6633 Fax: [redacted]
8712 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

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | K. Swanson / A. Chang | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| Citizen Hill | |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: [redacted] / [redacted] / [redacted] / ACIDIC ACID / DEACETOHEXATE

PAGE 1 OF 2

STANDARD REPORT DELIVERY

EXPEDITED REPORT DELIVERY (surcharge)

Date Due: _____

PRESERVATIVE

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | [redacted] | [redacted] | [redacted] | NUMBER OF CONTAINERS SUBMITTED | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08-16-99 | 16:11 | NAVY-1-SS | X | | | | | | | 1 | | | | ALIAS | NW-1 | STATION: NAVY-1 (0-6) |
| 08-16-99 | 16:36 | RCRA-1-SS | | | | | | | | 1 | | | | | | STATION: RCRA-1 (0- |
| 08-16-99 | 16:52 | RCRA-2-SS | | | | | | | | 1 | | | | | | STATION: RCRA-2 (0-6 |
| 08-16-99 | 17:20 | NAVY-3-SS | | | | | | | | 1 | | | | ALIAS | NW-3 | STATION: NAVY-3 (0-6 |
| 08-16-99 | 17:20 | NAVY-3-SSD | | | | | | | | 1 | | | | | | FIELD DUPLI |
| 08-16-99 | 17:20 | NAVY-3-SSMS | | | | | | | | 1 | | | | | | MATRIX SP |
| 08-16-99 | 17:20 | NAVY-3-SSMSD | | | | | | | | 1 | | | | | | MATRIX SPIKE DU |
| 08-16-99 | 17:40 | RCRA-3-SS | | | | | | | | 1 | | | | | | STATION: RCRA-3 ( |
| 08-16-99 | 17:55 | NAVY-5-SS | | | | | | | | 1 | | | | ALIAS | NW-5 | STATION: NAVY-5 (0-6) |
| 08-16-99 | 18:00 | NAVY-6-SS | | | | | | | | 1 | | | | ALIAS | NW-6 | STATION: NAVY-6 (0-6) |
| 08-16-99 | 18:20 | RCRA-4-SS | | | | | | | | 1 | | | | | | STATION: RCRA-4 (0-6) |
| 08-16-99 | 16:21 | EQB-1 | X | | | X | | | | X | | | | | | EQUIPMENT BLANK |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | 7/30/99 | | | 08-12-99 | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

[redacted]

# REQUEST AND CHAIN OF CUSTODY RECORD

GP LABS

[redacted] FL 33442
[redacted] AL 36693
6712 Benjamin Road, Suite 100, Tampa, FL 33634
100 Alpha Drive, Suite 110, Destrehan, LA 70047

[redacted]
Phone: [redacted]
Phone: (334) [redacted]
Phone: (813) 885-7427 Fax: (813) 885-704
Phone: (504) 764-1100 Fax: (504) 725-116

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

MATRIX TYPE | REQUIRED ANALYSES | PAGE 2 OF

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | K. SWANSON / A. CHANG | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | |

CLIENT ADDRESS (CITY, STATE, ZIP)

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | [redacted] | [redacted] | [redacted] | PICRIC ACID/ DELIVERABLES | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PRESERVATIVE | | | | | | | | | | |
| | | | | | | | NUMBER OF CONTAINERS SUBMITTED | | | | | | | | | | |
| 08-17-99 | 14:08 | NAVY-8-SS | X | | | | | | | 1 | | | | ALIAS: NW-8 | | | STATION: NAVY-8 (0 |
| 08-17-99 | 14:16 | NAVY-7-SS | X | | | | | | | 1 | | | | ALIAS: NW-7 | | | STATION: NAVY-7 (0 |
| 08-17-99 | 14:48 | NAVY-4-SS | X | | | | | | | 1 | | | | ALIAS: NW-4 | | | STATION: NAVY-4 (0 |
| | | PERIMETER SAMPLING | | | | | | | | | | | | | | | |
| 08-17-99 | 17:37 | SS-01 | | | | | | | | ↓ | | | | | | | |
| 08-17-99 | 17:51 | SS-02 | | | | | | | | | | | | | | | |
| 08-17-99 | 17:56 | SS-03 | | | | | | | | | | | | | | | |
| 08-17-99 | 18:07 | SS-04 | | | | | | | | ↓ | | | | | | | |
| 08-17-99 | 1355 | EQB-2 | X | | | | | X | X | 2 | | | | | | | EQUIPMENT BLANK-1 |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| ~~EMPTY CONTAINERS~~ | 7/30/99 | | | 08-18-99 | | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| EMPTY CONTAINERS | | | | | | | | |

BB

**SL** ~~SAVANNAH~~ LABORATORIES & ENVIRONMENTAL SERVICES, INC.


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


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

GP LABS

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | K. Swanson / M. Clausen | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | John Tonic / CH2M HILL WDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE — REQUIRED ANALYSES — 1 OF 2

☐ EXP DEL

Date Due.

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | PICRIC ACID PERCHLORATE | | | | | | | | | | NUMBER OF CONTAINERS SUBMITTED | REM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ~~8/18/99~~ | | | ~~SS-01~~ | X | | | 1 | | | | | | | | | | | | |
| ~~8/18/99~~ | | | ~~SS-02~~ | X | | | 1 | | | | | | | | | | | | |
| ~~8/18/99~~ | | | ~~SS-03~~ | X | | | 1 | | | | | | | | | | | | |
| ~~8/18/99~~ | | | ~~SS-04~~ | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1110 | | SS-05 | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1125 | | SS-06 | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1125 | | SS-06-FD | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1125 | | SS-06-MS | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1125 | | SS-06-MSD | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1155 | | SS-07 | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1205 | | SS-08 | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1340 | | SS-09 | X | | | 1 | | | | | | | | | | | | |
| 8/18/99 | 1345 | | SS-10 | X | | | 1 | | | | | | | | | | | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DA |
|---|---|---|---|---|---|---|---|
| [signature] | 8/18/99 | | [signature] | 8/18/99 | 1830 | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DA** |
| | | | | | | | |

LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES | | | |

2 - SEND PLIES 1 AND 2 WITH SAMPLES TO SAVANNAH LABORATORIES.
3 - PLY 1 (ORIGINAL) WILL BE RETURNED TO YOU WITH ANALYTICAL REPORT.

**SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.**


☐ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) [illegible]58 — Fax: (91
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (90
☐ 414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: (95
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (33
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (81
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (50


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

GP LABS

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | K. Swanson / M. Clausen | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | John Tomic / CH2M HILL / [illegible] |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: Picric Acid / Perchlorate

20F2

☐ EXPE DELIV

Date Due

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | Picric Acid / Perchlorate | NUMBER OF CONTAINERS SUBMITTED | REM |
|---|---|---|---|---|---|---|---|---|---|---|
| 8/18/99 | 1355 | | SS-11 | | X | | | X | 1 | |
| 8/18/99 | 1400 | | SS-12 | | X | | | X | 1 | |
| 8/18/99 | 1405 | | SS-13 | | X | | | X | 1 | |
| 8/18/99 | 1445 | | SS-14 | | X | | | X | 1 | |
| 8/18/99 | 1455 | | SS-15 | | X | | | X | 1 | |
| 8/18/99 | 1505 | | SS-16 | | X | | | X | 1 | |
| 8/18/99 | 1505 | | SS-16-FD | | X | | | X | 1 | |
| 8/18/99 | 1520 | | SS-17 | | X | | | X | 1 | |
| 8/18/99 | 1530 | | SS-18 | | X | | | X | 1 | |
| 8/18/99 | 1540 | | SS-19 | | X | | | X | 1 | |
| 8/18/99 | 1550 | | SS-20 | | X | | | X | 1 | |
| 8/18/99 | 1550 | | SS-20-FD | | X | | | X | 1 | |
| 8/18/99 | 1605 | | SS-21 | | X | | | X | 1 | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DA |
|---|---|---|---|---|---|---|---|
| L. Campbell | 8/18/99 | | | 08.18.99 | 18:30 | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DA** |
| | | | | | | | |

## LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

2 - SEND PLIES 1 AND 2 WITH SAMPLES TO SAVANNAH LABORATORIES.
3 - PLY 1 (ORIGINAL) WILL BE RETURNED TO YOU WITH ANALYTICAL REPORT.

**SL** SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.


☒ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (904) 878-9
☐ 414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: (954) 421-2
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | A Chanty / R Montalvo | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| Citizen Hill | John Tomk / Citizen Hill / WDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: AG, DW METALS — LAB FILTER AG METALS — [redacted] — 8270, 8141, 8081, 8151 — 8330 — SULFIDE — CYANIDE — [redacted] — [redacted] — VOC-AG

PRESERVATIVE: HNO3 — — — — — NaOH/NaOH — — HCl — —

STANDARD REPORT DELIVERY ☐ — EXPEDITED REPORT DELIVERY (surcharge) ☐ — Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | AG, DW METALS | LAB FILTER AG METALS | [redacted] | 8270, 8141, 8081, 8151 | 8330 | SULFIDE | CYANIDE | [redacted] | [redacted] | VOC-AG | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08-18-99 | 1530 | | NAVY-5-GW | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | STATION: NAVY-6 |
| 08-18-99 | 1445 | | NAVY-6-GW | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | STATION: NAVY-6 |
| 08-18-99 | 1400 | | RCRA-1-GW | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| 08-18-99 | 1115 | | RCRA-2-GW | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| 08-18-99 | 1115 | | RCRA-2-GWD | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| 08-18-99 | 1115 | | RCRA-2-GWMS | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| 08-18-99 | 1115 | | RCRA-2-GWMSD | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| 08-18-99 | 1555 | | RCRA-3-GW | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| ~~08-18-99~~ | | | ~~RCRA-4-GW~~ | | | | | ~~1~~ | ~~1~~ | | ~~9~~ | ~~2~~ | ~~1~~ | ~~1~~ | | | | ~~3~~ | NOT DONE TODAY |
| | | | | | | | | | | | | | | | | | | | |
| ~~08-18-99~~ | | | ~~AB1 AB2~~ | | | | | ~~1~~ | ~~1~~ | | ~~9~~ | ~~2~~ | ~~1~~ | ~~1~~ | | | | ~~3~~ | NOT DONE TODAY |
| 08-18-99 | 1056 | | EQB-4 | | | | | 1 | 1 | | 9 | 2 | 1 | 1 | | | | 3 | |
| 08-18-99 | 1057 | | TB-1 | | | | | | | | | | | | | | | 3 | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| S. Campbell | 8/21/99 | | | 08-19-99 | 2100 | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| | | | | | | | | |

**LABORATORY USE ONLY**

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

Serial Number 1034

# SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.


5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-016
2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (904) 878-950
414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: (954) 421-258
900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-669
6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-704
100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-116


## ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE / FAX |
|---|---|---|
| FL | | |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | JOHN TOMC CH2M HILL |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES — PAGE 1 OF

STANDARD REPORT DELIVERY

EXPEDITED REPORT DELIVERY (surcharge)

Date Due

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQ | SOLID | AIR | NONAQ LIQ | AQ: OW ME TALS | VOC FILTER-HG | METALS | 20 DRINKING METALS | SALINITY | 8270 (GC/MS) 8081 8151 | 8330 | SULFIDE | CYANIDE | MBAS | ODOR | VOC-HAG | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HNO3 | — | — | — | — | ~~HNO3~~ | NaOH | — | — | HCL | | | |
| 08.19.99 | 9:50 | | RCRA-4-GW | | | | | 1 | 1 | 1 | 9 | 2 | 1 | 1 | 1 | 1 | 3 | | | |
| 08.19.99 | 1255 | | NAVY-8-GW | | | | | 1 | 1 | — | 9 | 2 | 1 | 1 | — | — | 3 | | | |
| 08.19.99 | 1400 | | NAVY-3-GW | | | | | 1 | 1 | — | 9 | 2 | 1 | 1 | — | — | 3 | | | |
| 08.19.99 | 755 | | AB-2 | | | | | 1 | 1 | 1 | 9 | 2 | 1 | 1 | 1 | 1 | 3 | | | |
| 08.19.99 | 1015 | | EQB-5 | | | | | 1 | 1 | 1 | 9 | 2 | 1 | 1 | 1 | 1 | 3 | | | |
| | | | AB-1 SAMPLE NOT USED | | | | | | | | | | | | | | | | | AB 08.19.99 |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| | 08.19.99 | 2100 | | | | | | |
| **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** | **RECEIVED BY: (SIGNATURE)** | **DATE** | **TIME** |
| | | | | | | | | |

## LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

**SL** ~~SAVANNAH~~ LABORATORIES & ENVIRONMENTAL SERVICES, INC.


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414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: (954) 421-25
900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-66
6712 Benjamin Road, Suite 103, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-70
100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-11


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

GP LABS

PROJECT REFERENCE | PROJECT NO | PO NUMBER

PROJECT LOC. (State): PR

SAMPLER(s) NAME: A. Chazy / R. Morales | PHONE | FAX

CLIENT NAME: CH2M HILL

CLIENT PROJECT MANAGER: John Tomic / CH2M HILL / WDC

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE | REQUIRED ANALYSES | PAGE C

STANDARD REPORT DELIVERY

EXPEDITED REPORT DELIVERY (surcha

Date Due

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | ~~Air Bubbles~~ | PERCHLORATE | NUMBER OF CONTAINERS SUBMITTED | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | X | X | | |
| 08-19-99 | 9:50 | | RCRA-4-GW | X | | | | 1 | 1 | | |
| 08-19-99 | 1255 | | NAV4-8-GW | X | | | | 1 | 1 | | |
| 08-19-99 | 1400 | | NAV4-3-GW | X | | | | 1 | 1 | | |
| 08-19-99 | 755 | | AB-2 | X | | | | 1 | 1 | | |
| 08-19-99 | 1015 | | EQB-5 | X | | | | 1 | 1 | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY (SIGNATURE) | DATE | TIME | RELINQUISHED BY (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| Kathleen Elson | 8/19/99 | 17:30 | | | | | | |

| RECEIVED BY (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

## LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

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☐ 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: | PROJECT NO.: | P.O. NUMBER:

PROJECT LOC. (STATE): PR | SAMPLER(s) NAME: M CLASSEN / K SWANSON / A CLEMENT | PHONE: | FAX:

CLIENT NAME: CH2M HILL | CLIENT PROJECT MANAGER: JOHN TOMMC / WDC

CLIENT ADDRESS (CITY, STATE, ZIP):

☐ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

REQUIRED ANALYSES — PAGE ___ OF ___

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | MATRIX TYPE: AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | A9 METALS | A9 FILTER METALS | SW8270, 8141, 8081/82 | 8151 | 8310 | SULFIDE | CYANIDE | VOC-A9 | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HNO3 | – | – | – | ZN AC | NAOH | HCL | | |
| 08-20-99 | 0950 | | NAV4-1-GW | X | | | | 1 | 1 | 9 | 2 | 1 | 1 | 3 | | |
| 08-20-99 | 1345 | | NAV4-7-GW | X | | | | 1 | 1 | 9 | 2 | 1 | 1 | 3 | | |
| 08-20-99 | 1550 | | NAV4-4-GW | X | | | | 1 | 1 | 9 | 2 | 1 | 1 | 3 | | |
| 08-20-99 | 0845 | | EQB-6 | X | | | | 1 | 1 | 9 | 2 | 1 | 1 | 3 | | |
| 08-20-99 | | | TB-2 LAB | X | | | | | | | | | | 3 | | |

H2O
08-20-99

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| | 08-20-99 | 20:00 | | | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

## LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

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# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

| PROJECT REFERENCE | PROJECT NO. | P.O NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | MCLASGH/K SWANSON/A [illegible] | FAX |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | JOHN TOMIC/WDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE — REQUIRED ANALYSES — PAGE OF

☐ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due

| SAMPLE DATE | SAMPLE TIME | SL NO. | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMI-SOLID | AIR | NONAQUEOUS LIQUID (oil, solvent, etc) | PERCHLORATE | PICRIC ACID | NUMBER OF CONTAINERS SUBMITTED | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 08-20-99 | 0950 | | NAVY-1-GW | X | | | | 1 | 1 | | |
| 08-20-99 | 1345 | | NAVY-7-GW | X | | | | 1 | 1 | | |
| 08-20-99 | 1550 | | NAVY-4-GW | X | | | | 1 | 1 | | |
| 08-20-99 | 0845 | | EQB-6 | X | | | | 1 | 1 | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| [signature] | 08-20-99 | | | | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

## LABORATORY USE ONLY

| RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT | CUSTODY SEAL NO. | SL LOG NO. | LABORATORY REMARKS: |
|---|---|---|---|---|---|---|
| | | | ☐ YES ☐ NO | | | |

Serial Number 20918

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☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-1


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

IDW SAMPLING – VIEQUES, P.R.

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | A. Chang / K. Swanson / R. Morales | |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | John Tomic / CH2M HILL / WDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: RCRA-SCN, COD, FPT / TCLP-MN(METALS/P/H) / TCLP-VOCS

PAGE 1

☐ STANDAR REPORT DELIVERY

☐ EXPEDITED RE DELIVERY (surc

Date Due: _____

PRESERVATIVE: — / — / —

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | RCRA-SCN, COD, FPT | TCLP-MN(METALS/P/H) | TCLP-VOCS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 8/25/99 | 0935 | P-8/9-STCLP | | X | | 1 | 1 | 2 | | label on bottle 8/24/99 |
| 8/25/99 | 1020 | P-7-STCLP | | | | 1 | 1 | 2 | | " " " " |
| 8/25/99 | 0930 | P-1-STCLP | | | | 1 | 1 | 2 | | |
| 8/25/99 | 0855 | P-6-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 1630 | P-5-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 1805 | NAVY-5-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 1640 | RCRA-3-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 1150 | NAVY-6-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 1450 | NAVY/RCRA-4-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 1420 | NAVY-7/8-STCLP | | | | 1 | 1 | 2 | | |
| 8/23/99 | 1520 | RCRA-1-STCLP | | | | 1 | 1 | 2 | | |
| 8/24/99 | 0820 | RCRA-2-STCLP | | | | 1 | 1 | 2 | | |
| 8/23/99 | 1440 | NAVY-1-STCLP | | | | 1 | 1 | 2 | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | T |
|---|---|---|---|---|---|---|---|---|
| [illegible] | 8/26/99 | | | | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | T |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

Serial Number 120918

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☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6
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☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-1


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

IDW SAMPLING – VIEQUES, P.R.

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | A. Chang / K. Swanson / A. Fuentes | |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| CH2M HILL | John Tomic / CH2M HILL / WDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: RCRA-SCAN COMPLETE (VOA/B/A/H) / TCLP-MET (VOA/B/A/H) / TCLP-VOCS

PAGE 1

STANDAR REPORT DELIVERY ☐

EXPEDITED RE DELIVERY (surc ☐

Date Due: _____

PRESERVATIVE: — / — / —

NUMBER OF CONTAINERS SUBMITTED

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | RCRA-SCAN COMPLETE | TCLP-MET | TCLP-VOCS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 8/25/99 | 0935 | P-8/9-STCLP | X | | | 1 | 1 | 2 | | label on bottle inc 8/24/99 |
| 8/25/99 | 1020 | P-7-STCLP | X | | | 1 | 1 | 2 | | " " " " |
| 8/25/99 | 0930 | P-1-STCLP | X | | | 1 | 1 | 2 | | |
| 8/25/99 | 0855 | P-6-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 1630 | P-5-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 1805 | NAVY-5-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 1640 | RCRA-3-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 1150 | NAVY-6-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 1450 | NAVY/RCRA-4-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 1420 | NAVY-7/8-STCLP | X | | | 1 | 1 | 2 | | |
| 8/23/99 | 1520 | RCRA-1-STCLP | X | | | 1 | 1 | 2 | | |
| 8/24/99 | 0820 | RCRA-2-STCLP | X | | | 1 | 1 | 2 | | |
| 8/23/99 | 1440 | NAVY-1-STCLP | X | | | 1 | 1 | 2 | | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | T |
|---|---|---|---|---|---|---|---|---|
| [signature] | 8/29/99 | | | | | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | T |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) [illegible] — Fax: (912) 352-0166
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414 SW 12th Avenue, Deerfield Beach, FL 33442 — Phone: (954) 421-7400 — Fax: (954) 421-2564
900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) [illegible] — Fax: (334) [illegible]
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100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-1183

# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

IDW SAMPLING – VIEQUES, PR.

PROJECT REFERENCE: | PROJECT NO.: | P.O. NUMBER:

PROJECT LOC. (State): PR | SAMPLER(s) NAME: ALLYE CHANG / KATIE SWANG / JAY PICKMONTALES | PHONE:

CLIENT NAME: CH2M HILL | CLIENT PROJECT MANAGER: JOHN TOMIC/WDC

CLIENT ADDRESS (CITY, STATE, ZIP):

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: PAGE 1 OF 1

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | TCLP-METALS | TCLP-PEST/HERBS | TCLP-SEMI-VOLS | FPT | TCLP-VOCS | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | PRESERVATIVE | — | — | — | | | |
| 8-24-99 | 0905 | NAVY-3-WTCLP | 1 | 5 | 1 | 1 | 3 | ONLY SUBMITTED 4-1 AMOUNTS |
| 8-24-99 | 1045 | NAVY-1-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1210 | NAVY-6-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1420 | NAVY-8-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1430 | NAVY-7-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1455 | RCRA-4-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1640 | NAVY-4-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1640 | RCRA-3-WTCLP | 1 | 5 | 1 | 1 | 3 | |
| 08-24-99 | 1805 | NAVY-5-WTCLP | 1 | 4 | 1 | 1 | 3 | ONLY SUBMITTED 4-1 AMOUNTS. |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| S. Campbell | 8/26/99 | | | 08/25/99 | 2000 | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

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☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100


# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

IDW SAMPLING - VIEQUES, P.R.

| PROJECT REFERENCE | PROJECT NO. | P.O. NUMBER |
|---|---|---|
| | | |

| PROJECT LOC. (State) | SAMPLER(s) NAME | PHONE |
|---|---|---|
| PR | A. Chang / K. Swanson / R. Morales | |

| CLIENT NAME | CLIENT PROJECT MANAGER |
|---|---|
| | John Tomic / CH2M HILL / WDC |

CLIENT ADDRESS (CITY, STATE, ZIP)

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES — PAGE 2 OF 2

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due: _____

| SAMPLE DATE | SAMPLE TIME | SAMPLE IDENTIFICATION | AQUEOUS (WATER) | SOLID OR SEMISOLID | AIR | NONAQUEOUS LIQUID | PAC-SEN, CORS, FPT (PRESERVATIVE: 1) | TCLP-NV (HCL/SW/O/HA) (PRESERVATIVE: 1) | TCLP-VOCS (PRESERVATIVE: 2) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 8/24/99 | 0910 | NAVY-3-STCLP | X | | | | 1 | 1 | 2 | |
| 8/24/99 | 0835 | P-3-STCLP | X | | | | 1 | 1 | 2 | |

| RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME | RELINQUISHED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| SIFT CONTAINERS | 8/24/99 | | | 08.25.99 | 2000 | | | |

| RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME | RECEIVED BY: (SIGNATURE) | DATE | TIME |
|---|---|---|---|---|---|---|---|---|
| EMPTY CONTAINERS | | | | | | | | |

# APPENDIX E
# MONITORING WELL AND PIEZOMETER BORING LOGS

# MONITORING WELL

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-3
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: 354.382 TOP OF PVC CASING: 354.382

| Rig: Reich 600; see remarks | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | | 6" | | | 8/6/99 | 180' | partly cloudy,humid, | NA |
| Length | | 20' | | | 8/7/99 | 197' | high of 90 | 190-197' |
| Type | | PVC | | | 8/8/99 | NA | | 115' |
| Hammer Wt. | | | | | | | | |
| Fall | | | | | | | | |

**Remarks:** Used Reich 600, air rotary/ hammer rig (water well rig), logged hole from cuttings

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen(0.01 slot) | 2" | 187'bgs. | 197'bgs. |
| Sch 40 PVC riser | 2" | 3'abs. | 187'bgs. |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 2 | R-N | | | | | Sandy Loam 0-2', little clay | | |
| 3 4 5 6 7 8 | R-N | | | | | Rock fragments of basalt 2-8' | | |
| 9 10 | R-N | | | | | **Bedrock**; granitic(granodiorite) grey | cement/ grout to surface | |
| | | | | | | Match to Sheet 2 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Javier BORING NO.: NW-3 SHEET 1 OF 11

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | switched to air hammer @10' | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | R-N | | | | | **Granitic rock** @ 20',grey blew hole, dry | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | **Granitic rock** light brown in color@30' | cement/ grout to surface | |
| 30 | R-N | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 2 OF 11

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | R-N | | | | | **Granitic rock** blew hole, no water | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | **Granitic rock**, grey to blue-grey color of fines, yellow-green | | |
| 49 | | | | | | mineral in rock frags(olivene? basaltic?) | cement/ grout to surface | |
| 50 | R-N | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 3 OF 11

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-3

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | | | | | | | | |
| 56 | | | | | | | | |
| 57 | | | | | | | | |
| 58 | | | | | | Blue-grey **granitic rock** sample consists of mostly sand with trace rock frags(hammer crushing granite into sand and other fines) | | |
| 59 | | | | | | | | |
| 60 | | R-N | | | | | | |
| 61 | | | | | | | | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | | | | | | | | |
| 65 | | | | | | | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | **Granitic rock**, same as above | cement/ grout to surface | |
| 70 | | R-N | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Javier BORING NO.: NW-3 SHEET 4 OF 11

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | | | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | | | | | | | | |
| 76 | | | | | | | | |
| 77 | | | | | | | | |
| 78 | | | | | | | | |
| 79 | | | | | | **Granitic rock**, same as above yellow-green mineral present | | |
| 80 | R-N | | | | | blew hole, no water | | |
| 81 | | | | | | | | |
| 82 | | | | | | | | |
| 83 | | | | | | | | |
| 84 | | | | | | | | |
| 85 | | | | | | | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | | | | | | **Granitic rock**, same as above | cement/ grout to surface | |
| 90 | R-N | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 5 OF 11

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 91 | | | | | | | | |
| 92 | | | | | | | | |
| 93 | | | | | | | | |
| 94 | | | | | | | | |
| 95 | | | | | | | | |
| 96 | | | | | | | | |
| 97 | | | | | | | | |
| 98 | | | | | | | | |
| 99 | | | | | | **Granitic rock**, same as above finer grained cuttings indicating harder rock | | |
| 100 | | R-N | | | | blew hole, no water | | |
| 101 | | | | | | | | |
| 102 | | | | | | | | |
| 103 | | | | | | | | |
| 104 | | | | | | | | |
| 105 | | | | | | | | |
| 106 | | | | | | | | |
| 107 | | | | | | | | |
| 108 | | | | | | | | |
| 109 | | | | | | **Granitic rock**, same as above coarser grained cuttings with yellow-green mineral present | | cement/ grout |
| 110 | | R-N | | | | | | to surface |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 6 OF 11

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 111 | | | | | | | | |
| 112 | | | | | | | | |
| 113 | | | | | | | | |
| 114 | | | | | | | | |
| 115 | | | | | | | | |
| 116 | | | | | | | | |
| 117 | | | | | | | | |
| 118 | | | | | | | | |
| 119 | | | | | | **Granitic rock**, same as above | | |
| | | | | | | finer grained cuttings, harder rock | | |
| 120 | | R-N | | | | blew hole, no water | | |
| 121 | | | | | | | | |
| 122 | | | | | | | | |
| 123 | | | | | | | | |
| 124 | | | | | | | | |
| 125 | | | | | | | | |
| 126 | | | | | | | | |
| 127 | | | | | | | | |
| | | | | | | **Granitic rock**, with less yellow- | | |
| 128 | | | | | | green mineral present, | | |
| | | | | | | even finer cuttings | | |
| 129 | | | | | | blew hole, unsure of the presence | cement/ | |
| | | | | | | of water, drill water? | grout | |
| 130 | | R-N | | | | | to | |
| | | | | | | | surface | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 7 OF11

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 131 | | | | | | | | |
| 132 | | | | | | | | |
| 133 | | | | | | | | |
| 134 | | | | | | | | |
| 135 | | | | | | | | |
| 136 | | | | | | | | |
| 137 | | | | | | | | |
| 138 | | | | | | **Same as above**; drilled to 140' without circulating water, cuttings all dry; no indication of water | | |
| 139 | | | | | | | | |
| 140 | | R-N | | | | | | |
| 141 | | | | | | | | |
| 142 | | | | | | | | |
| 143 | | | | | | | | |
| 144 | | | | | | | | |
| 145 | | | | | | | | |
| 146 | | | | | | | | |
| 147 | | | | | | | | |
| 148 | | | | | | **Granitic** material with yellow-green mineral throughout medium to coarse sand sized cuttings | | |
| 149 | | | | | | blew hole,no water | cement/ grout to surface | |
| 150 | | R-N | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 8 OF 11

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 151 | | | | | | | | |
| 152 | | | | | | | | |
| 153 | | | | | | | | |
| 154 | | | | | | | | |
| 155 | | | | | | | | |
| 156 | | | | | | | | |
| 157 | | | | | | | | |
| 158 | | | | | | | | |
| 159 | | | | | | **Same as above;** blew hole, no water | | |
| 160 | | R-N | | | | | | |
| 161 | | | | | | | | |
| 162 | | | | | | | | |
| 163 | | | | | | | | |
| 164 | | | | | | | | |
| 165 | | | | | | | | |
| 166 | | | | | | | | |
| 167 | | | | | | | | |
| 168 | | | | | | **Same as above;** except fine to medium grained sand sized cuttings | | |
| 169 | | | | | | finer than 150' to 160' blew hole, no water | cement/ grout to surface | |
| 170 | | R-N | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 9 OF 11

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 171 | | | | | | | | |
| 172 | | | | | | | | |
| 173 | | | | | | | | |
| 174 | | | | | | | | |
| 175 | | | | | | | cement/ grout to surface | |
| 176 | | | | | | | | |
| 177 | | | | | | | | |
| 178 | | | | | | | Bentonite Pellets | |
| 179 | | | | | | **Same as above;** decided to let hole sit, see if water accumulates | | |
| 180 | R-N | | | | | End of day 8/6/99 | | |
| 181 | | | | | | Start 8/7/99 blew hole @ 180', no water | | |
| 182 | | | | | | | | |
| 183 | | | | | | | Sand #1 | |
| 184 | | | | | | | | |
| 185 | | | | | | | | |
| 186 | | | | | | at 190'; encountered cuttings with iron staining and large size, | | |
| 187 | | | | | | indicated disolution along or groundwater flow along a | | |
| 188 | | | | | | fracture, water increases, blew hole twice and got water | PVC screen .01 slot | |
| 189 | | | | | | cleaned hole and removed rods Water level @ 190' exactly | | |
| 190 | R-N | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 10 OF 11

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 191 | | | | | | | | |
| 192 | | | | | | | PVC screen .01 slot | |
| 193 | | | | | | Encountered a more productive fracture/ making water; water return rate indicated about 5-10 gal/min (Javier G.) | | |
| 194 | | | | | | blew hole to clean out cuttings, water level rising continuously, let well sit overnite | | |
| 195 | | | | | | | | |
| 196 | | | | | | water level @ 115' bgs. @0730 on 8/8/99 | | |
| 197 | | R-N | | | | | | |
| 198 | | | | | | boring terminated @ 197' bgs. | | |
| 199 | | | | | | | | |
| 200 | | | | | | | | |
| 201 | | | | | | | | |
| 202 | | | | | | | | |
| 203 | | | | | | | | |
| 204 | | | | | | | | |
| 205 | | | | | | | | |
| 206 | | | | | | | | |
| 207 | | | | | | | | |
| 208 | | | | | | | | |
| 209 | | | | | | | | |
| 210 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-3 SHEET 11 OF 11

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: N W-4
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: Mobile B-56 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/16/99 | 80'bgs | | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

**Remarks:** Air rotary drilling started at 27'bgs and logged using cuttings

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen (.01slot) | 2" | 70'bgs | 80'bgs |
| Sch 40 PVC riser | 2" | 3'ags | 70'bgs |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | cement/ grout | |
| 4 | | | | | | | | |
| 5 | R-N | | | | | fine to medium Sand, Silty-clay, occasional gravel, yellowish-brown | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joel Morales
DRILLER: Osvaldo BORING NO.: NW-4 SHEET 1 OF 5

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-4

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | R-N | | | | | fine Sand, yellowish-brown matrix, 5/1 10yr, quartz, some mafic minerals(very fine) | cement/ grout to surface | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | R-N | | | | | Same as above | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | R-N | | | | | olive matrix, coarse sand, quartz, some mafics apparently from Granodiorite | | |
| 26 | | | | | | | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joel Morales

DRILLER: Osvaldo BORING NO.: NW-4 SHEET 2 OF 5

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-4

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | cement/ grout to surface | |
| 32 | | | | | | | | |
| 33 | R-N | | | | | | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | **Same as above** | | |
| 45 | | | | | | | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joel Morales

DRILLER: Osvaldo BORING NO.: NW-4 SHEET 3 OF 5

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-4

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | Same as above with some green material | cement/ grout to surface | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | R-N | | | | | | bentonite | |
| 56 | | | | | | | | |
| 57 | | | | | | | gravel to bottom | |
| 58 | | | | | | | | |
| 59 | | | | | | | | |
| 60 | | | | | | | | |
| 61 | | | | | | | | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | R-N | | | | | Same as above | | |
| 65 | | | | | | | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | | |
| 70 | | | | | | | top of screen | |

DRILLING CO.: SoilTech BAKER REP.: Joel Morales
DRILLER: Osvaldo BORING NO.: NW-4 SHEET 4 OF 5

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-4

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | dark greenish grey matrix, same minerals as above, granodiorite | | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | | | | | | | | |
| 76 | R-N | | | | | | | |
| 77 | | | | | | | | |
| 78 | | | | | | | | |
| 79 | | | | | | | | |
| 80 | | | | | | Granodiorite | | |
| 81 | | | | | | boring terminated @ 80'bgs | | |
| 82 | | | | | | | | |
| 83 | | | | | | | | |
| 84 | | | | | | | | |
| 85 | | | | | | | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | | | | | | | | |
| 90 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joel Morales

DRILLER: Osvaldo BORING NO.: NW-4 SHEET 5 OF 5

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-5
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: Reich 600; see remarks | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | | 6" | | | 8/10/99 | 118.2' bgs. | Partly cloudy, hot,humid | 112.6' bgs. |
| Length | | 20' | | | | | PM Sunny,hot, humid | |
| Type | | PVC | | | | | 90 | |
| Hammer Wt. | | | | | | | | |
| Fall | | | | | | | | |

**Remarks:** Used Reich 600, air rotary/ hammer rig (water well rig), logged hole from cuttings

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen(0.01 slot) | 2" | 108.2'bgs. | 118.2'bgs. |
| Sch 40 PVC riser | 2" | 3'abs. | 108.2'bgs. |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | A-N | | | | | slow drilling thru coarse gravel | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | S-1 | 0.8/2.0 40% | 11 25 50/3 | | | some white sand, loose coarse brown-red sand small gravel with minerals dry, no odor | | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | easier drilling | | |
| 9 | | | | | | | cement/ grout to surface | |
| 10 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Javier BORING NO.: NW-5 SHEET 1 OF 7

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-5

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | S-N | 0% | 50/0 | | | no recovery | | |
| 12 | | | | | | | | |
| 13 | A-N | | | | | dry cuttings, easy drilling | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | S-2 | 5% | 50/2 | | | loose brown-red sand with some white sand, very small gravel, dry, no odor | | |
| 17 | | | | | | | | |
| 18 | A-N | | | | | Dry, sandy, easy drilling | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | S-3 | 5% | 50/2 | | | brown sand,pebbles,dry, no odor<br>Refusal @ 21.5'bgs. | | |
| 22 | R-N | | | | | boulder?, unable to advance | | |
| 23 | | | | | | drilled thru rock 23-24' | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | R-N | | | | | alternating hard and soft rock layers from 23-30' | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | Bedrock @ 30' | cement/ grout to surface | |
| 30 | | | | | | | | |
| | | | | | | Match to Sheet 3 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-5 SHEET 2 OF 7

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | |
| 32 | R-N | | | | | Quartzos granite; very hard/ competent bedrock | | |
| 33 | | | | | | fine to medium grained sand sized cuttings | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | Same as above; except larger grained cuttings; | | |
| 39 | | | | | | coarse to medium sand sized cuttings | | |
| 40 | R-N | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | Limited (6"long) fracture evident by iron staining | | |
| 49 | | | | | | dry, no water | cement/ grout | |
| 50 | R-N | | | | | | to surface | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-5 SHEET 3 OF 7

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | | | | | | | | |
| 56 | | | | | | | | |
| 57 | | | | | | | | |
| 58 | | | | | | | | |
| 59 | | | | | | Softer material, greener color: olivene,softer larger, med. Grained sand sized cuttings | | |
| 60 | | R-N | | | | | | |
| 61 | | | | | | | | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | | | | | | | | |
| 65 | | | | | | | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | cement/ grout to surface | |
| 70 | | R-N | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-5 SHEET 4 OF 7

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | | | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | | | | | | | | |
| 76 | | | | | | | | |
| 77 | | | | | | | | |
| 78 | | | | | | | | |
| 79 | | | | | | Harder material, grey color: black and white minerals ??? and quartz | | |
| 80 | | R-N | | | | | | |
| 81 | | | | | | | | |
| 82 | | R-N | | | | Intersected fracture @ 82'; minor water production | | |
| 83 | | | | | | | | |
| 84 | | | | | | | | |
| 85 | | | | | | | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | | | | | | | cement/ grout to surface | |
| 90 | | R-N | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-5 SHEET 5 OF 7

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 91 | | | | | | Continued from Sheet 5 | | |
| 92 | | | | | | | | |
| 93 | | | | | | | | |
| 94 | | | | | | | | |
| 95 | | | | | | | | |
| 96 | | | | | | Drilling deeper does not increase water production from fracture @ 82', very limited in extent and only storing percolating water, drys up when blowing hole | | |
| 97 | | | | | | | | |
| 98 | | | | | | | | |
| 99 | | | | | | | | |
| 100 | | R-N | | | | **Same as above** | | |
| 101 | | | | | | | | |
| 102 | | | | | | | cement/ grout to surface | |
| 103 | | | | | | | | |
| 104 | | | | | | | Bentonite pellets | |
| 105 | | | | | | | | |
| 106 | | | | | | | | |
| 107 | | | | | | | Sand #1 to bottom of hole | |
| 108 | | | | | | | | |
| 109 | | | | | | | top of screen | |
| 110 | | R-N | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-5 SHEET 6 OF 7

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 111 | | | | | | Continued from Sheet 6 | | |
| 112 | | | | | | Intersected large fracture @ 111' more olivene, softer rock | | |
| 113 | | | | | | | | |
| 114 | | | | | | | | |
| 115 | | | | | | | | |
| 116 | | | | | | water productivity @ fracture approx. 2' of water | PVC screen .01 slot | |
| 117 | | | | | | water production maintained after blowing hole twice | | |
| 118 | | | | | | | | |
| 119 | | | | | | boring terminated @118.2'bgs | | |
| 120 | | | | | | | | |
| 121 | | | | | | | | |
| 122 | | | | | | | | |
| 123 | | | | | | | | |
| 124 | | | | | | | | |
| 125 | | | | | | | | |
| 126 | | | | | | | | |
| 127 | | | | | | | | |
| 128 | | | | | | | | |
| 129 | | | | | | | | |
| 130 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Javier BORING NO.: NW-5 SHEET 7 OF7

**INSUFFICIENT DATA SET FOR NW-6**

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: N W-7
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: Mobile B-56 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/14/99 | 69.0'bgs | | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

**Remarks:** Air rotary drilling started at 27'bgs and logged using cuttings

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen (.01slot) | 2" | 71'bgs | 81'bgs |
| Sch 40 PVC riser | 2" | 3'ags | 71'bgs |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 2 3 4 5 | A-N | | | | | Dry, brown, coarse to fine **SAND**, and gravel | cement/ grout | |
| 6 7 | S-1 | 0.5/2.0 25% | 6 6 6 8 | | | coarse to fine **SAND** and fine gravel (pebbles), some granitic some sedimentary | | |
| 8 9 10 | A-N | | | | | Dry, coarse to fine **SAND** | | |
| | S-2 | | 12 | | | Match to Sheet 2 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: NW-7 SHEET 1 OF 5

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-7

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 12 | S-2 | .33/2.0 17% | 12 13 13 | | | Dry, dense **SAND**, no odor | cement/ grout to surface | |
| 13 14 15 | A-N | | | | | Same | | |
| 16 17 | S-3 | 0.12/2.0 6% | 50/2" | | | Moist, **SAND**, no odor poor recovery due to obstruction at 16-ft. | | |
| 18 19 20 | A-N | | | | | SAND and fine gravel (granitic) auger cuttings, weathered **Bedrock** | | |
| 21 | S-4 | 0% | 100/0" | | | No recovery due to **bedrock** obstruction at 21.25 - ft | | |
| 22 23 | S-5 | 0% | 100/0" | | | No recovery | | |
| 24 25 | A-N | | | | | Auger cuttings medium to fine gravel of granitic origin - **Bedrock** | | |
| 26 27 | S-6 | 0.12/2.0 6% | 50/2" | | | Dry, fine gravel of granitic origin no odor | | |
| 28 29 30 | R-N | | | | | 1" inch of advancement after 30 min. of hollow stem augering will continue borehole advancement with air rotory rig | | |

Match to Sheet 3

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: NW-7

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-7

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | Continued from Sheet 2 | cement/ grout to surface | |
| 32 | | | | | | | | |
| 33 | R-N | | | | | | | |
| 34 | | | | | | light yellowish-brown matrix, coarse sand, some dark rock fragments | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | **Same as above** | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: NW-7 SHEET 3 OF 5

Baker
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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-7

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | cement/ | |
| 52 | | | | | | | grout to | |
| 53 | | | | | | | surface | |
| 54 | | | | | | | | |
| 55 | R-N | | | | | Same as above | | |
| 56 | | | | | | | | |
| 57 | | | | | | | | |
| 58 | | | | | | | | |
| 59 | | | | | | | | |
| 60 | | | | | | | | |
| 61 | | | | | | | bentonite | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | | | | | | | | |
| 65 | R-N | | | | | | gravel to bottom | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | | |
| 70 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: NW-7 SHEET 4 OF 5

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: NW-7

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | coarse sand, light yellowish-brown | top of screen | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | | | | | | | | |
| 76 | R-N | | | | | | | |
| 77 | | | | | | | | |
| 78 | | | | | | | | |
| 79 | | | | | | | | |
| 80 | | | | | | Granodiorite? | | |
| 81 | | | | | | | | |
| 82 | | | | | | boring terminated @ 81'bgs | | |
| 83 | | | | | | | | |
| 84 | | | | | | | | |
| 85 | | | | | | | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | | | | | | | | |
| 90 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: NW-7 SHEET 5 OF 5

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: N W-8
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING: 4.154

| Rig: Mobile B-56 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/3/99 | 27 | sunny, humid, 90 | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

**Remarks:**

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen(.01slot) | 2" | 5'bgs. | 15'bgs. |
| Sch 40 PVC riser | 2" | 3'abs. | 5'bgs. |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | A-N | | | | | sandy **LOAM** | cement/ grout | |
| 2 | | | | | | | | |
| 3 | | | | | | | bentonite | |
| 4 | | | | | | | | |
| 5 | | | | | | | sand to bottom | |
| 6 | S-1 | 1.83/2.0 92% | 3 5 8 10 | | | Moist, taupe, medium dense, **SAND**, some clay no odor | top of screen | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | **SAND** | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| | S-2 | | 3 | | | Match to Sheet 2 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: NW-8 SHEET 1 OF 2

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: NW-8

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | S-2 | 1.5/2.0 75% | 8 9 11 | | | Wet, medium dense **SAND,** and gravel; water @ 7.7-ft | | |
| 12 | | | | | | | | |
| 13 | A-N | | | | | **SAND** and gravel | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | S-3 | 1.5/2.0 75% | 10 5 6 10 | | | Wet, medium dense **SAND,** little clay | bottom of screen at 15' | |
| 17 | | | | | | | | |
| 18 | A-N | | | | | Wet, **SAND** and clay | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | S-4 | 1.8/2.0 90% | 50/2" | | | Wet, **SAND** and gravel | | |
| 27 | | | | | | | | |
| 28 | | | | | | boring terminated @ 27-ft. Bgs | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: NW-8 SHEET 2 OF 2

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-1
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: CME-55 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/13/99 | 65.0'bgs | | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

Remarks:

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | R-N | | | | | Moderately weathered, 5/6 10yr yellowish brown, granodiorite look alike material, matrix olive-green (olivine material) oxide material on faces of fragments | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joe Morales
DRILLER: Osvaldo BORING NO.: RCRA-1 SHEET 1 OF 4

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: RCRA-1

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | R-N | | | | | Same as above | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | R-N | | | | | Same as above | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | cement/ grout to surface | |
| 30 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joe Morales

DRILLER: Osvaldo BORING NO.: RCRA-1 SHEET 2 OF 4

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-1

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | | |
| 35 | R-N | | | | | Same as above | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | R-N | | | | | Same as above | cement/ grout to surface | |
| 46 | | | | | | | | |
| 47 | | | | | | | Bentonite | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | gravel to bottom | |

DRILLING CO.: SoilTech BAKER REP.: Joe Morales
DRILLER: Osvaldo BORING NO.: RCRA-1 SHEET 3 OF 4

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-1

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | Same as above except more fines in the cuttings, yellowish brown in color, 5/4 10yr | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | | | | | | | | |
| 56 | R-N | | | | | | top of screen | |
| 57 | | | | | | | | |
| 58 | | | | | | | | |
| 59 | | | | | | | | |
| 60 | | | | | | | | |
| 61 | | | | | | Same as above without the fines | | |
| 62 | | | | | | | | |
| 63 | R-N | | | | | | | |
| 64 | | | | | | | | |
| 65 | | | | | | | bottom of screen | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | | |
| 70 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joe Morales
DRILLER: Javier BORING NO.: RCRA-1 SHEET 4 OF 4

# INSUFFICIENT DATA SET FOR RCRA-2

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-3
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING: 153.937

| Rig: CME-55 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/6/99 | 69.0'bgs. | | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

Remarks:

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | A-N | | | | | Brown-Red Sandy cuttings, dry | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | S-1 | 1.5/2.0 75% | 10 9 9 9 | | | Brown-Red Sand with dense upper interval, loose lower interval, sedimentary throughout dry, no odor | | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| | S-2 | | 9 | | | Match to Sheet 2 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: RCRA-3 SHEET 1 OF 4

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-3

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | S-2 | 1.5/2.0 75% | 8 7 5 | | | Some clay with sand (light grey) dense thoughout entire interval 11-12' Reddish sand, very small gravel, dry, no odor | | |
| 12 | | | | | | | | |
| 13 | A-N | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | S-3 | 1.6/2.1 80% | 6 5 8 12 | | | dense red-brown Sand, some white sand dispersed throughout sample, dry, no odor | | |
| 17 | | | | | | | | |
| 18 | A-N | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | S-4 | 1.5/2.0 75% | 9 9 12 11 | | | dense red-brown sand, some clay, dry / some moisture within clay lense @ 21', no odor | | |
| 22 | | | | | | | | |
| 23 | A-N | | | | | | | |
| 24 | | | | | | drilling harder @ 24' | | |
| 25 | | | | | | | | |
| 26 | S-5 | 1.3/2.0 65% | 20 24 50/5" | | | grey-brown Sand @ 25-26'bgs dense throughout sample, greyish Sand with small gravel, some iron staining, dry, no odor | | |
| 27 | | | | | | Rig bouncing (boulder?) | | |
| 28 | | | | | | refusal @ 27.5'bgs | | |
| 29 | | | | | | | | |
| 30 | | | | | | Match to Sheet 3 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: RCRA-3 SHEET 2 OF 4

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-3

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | Continued from Sheet 2 | cement/ grout | |
| 32 | | | | | | | | |
| 33 | R-N | | | | | | | |
| 34 | | | | | | | | |
| 35 | | | | | | medium to coarse cuttings, **Granodiorite** composition, quartz and feldspar | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | **Same as above**, except with pyrite, more whites, less fines | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | | | |
| 49 | | | | | | | bentonite | |
| 50 | | | | | | darker because of oxide material more brown in rock frags | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: RCRA-3 SHEET 3 OF 4

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | Continued from Sheet 2 | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | R-N | | | | | | gravel to bottom | |
| 56 | | | | | | | | |
| 57 | | | | | | | | |
| 58 | | | | | | | | |
| 59 | | | | | | | | |
| 60 | | | | | | SAME AS ABOVE | top of screen | |
| 61 | | | | | | | | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | R-N | | | | | | | |
| 65 | | | | | | | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | | |
| 70 | | | | | | boring terminated @ 69'bgs | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney
DRILLER: Osvaldo BORING NO.: RCRA-3 SHEET 4 OF 4

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: RCRA-4
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: CME-55 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/7/99 | 35.5'bgs | | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

Remarks:

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | A-N | | | | | yellowish brown dry sand, fine o medium | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | S-1 | 2.0/2.0 100% | 10 10 15 18 | | | Clayey Sand, yellowish 4/6 5yr, organic material on top | | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | | | |
| 9 | | | | | | Same as above | | |
| 10 | | | | | | | | |
| | S-2 | | 11 | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Joe Etheridge
DRILLER: Osvaldo BORING NO.: RCRA-4 SHEET 1 OF 3

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: RCRA-4

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | S-2 | 1.8/2.0 90% | 19 18 32 | | | oxide nodules, fine to medium sand ina clayey matrix,brownish-yellow, 10yr5/6 | | |
| 12 | | | | | | | | |
| 13 | A-N | | | | | dull yellowish brown, dry Clayey sand | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | S-3 | 100% | 14 16 17 17 | | | oxide nodules, fine to medium sand ina clayey matrix,brownish-yellow, 10yr5/6 | | |
| 17 | | | | | | | | |
| 18 | A-N | | | | | dry, brown, Clayey Sand, 10yr 4/3 | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | S-4 | 100% | 21 23 31 30 | | | oxide nodules, fractures, fine to medium sand, clayey , clay matrix, reddish yellow 7.5 yr 6/6 | | |
| 22 | | | | | | | | |
| 23 | A-N | | | | | dry Clayey Sand | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | S-5 | 100% | 16 19 19 19 | | | same as above bottom 4"; greenish gray, fine Clayey Sand, 7/5 Gy | | |
| 27 | | | | | | | | |
| 28 | A-N | | | | | 7/2 10yr, light grey cuttings | | |
| 29 | | | | | | | cement/ grout to surface | |
| 30 | | | | | | | | |
| | S-6 | | 33 | | | loose, fractured, clayey | | |

DRILLING CO.: SoilTech BAKER REP.: Joe Etheridge

DRILLER: Osvaldo BORING NO.: RCRA-4 SHEET 2 OF 3

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: RCRA-4

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | S-6 | 75% | 33 50/5" | | | sand, white, no dark minerals | bentonite | |
| 32 | | | | | | (granodiorite look alike) | | |
| 33 | A-N | | | | | weathered, decomposed black minerals and some quartz from 31.5' to 35' | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | S-7 | 50% | 7/8 50/2 | | | decomposed rock, Silty Sand, some silty clay, same as 30-32' moist; light greenish grey silty fine sand, some black material | | |
| 37 | | | | | | | | |
| 38 | A-N | | | | | pale yellow cuttings, fine silt, like powder | gravel to bottom | |
| 39 | | | | | | | | |
| 40 | | | | | | | top of screen | |
| 41 | S-8 | 30% | 50/3 | | | Silty Sand, wet at bottom 2" fragments of decomposed rock like granodiorite, some clay in the matrix, fine to medium sand | | |
| 42 | | | | | | | | |
| 43 | A-N | | | | | some wet cuttings | | |
| 44 | | | | | | | | |
| 45 | | | | | | | | |
| 46 | S-9 | 25% | 50/5 | | | wet, clayey sand, same as above but wet | | |
| 47 | | | | | | | | |
| 48 | A-N | | | | | | | |
| 49 | | | | | | | bottom of screen | |
| 50 | | | | | | | | |
| | | | | | | boring terminated @ 50.0'bgs | | |

DRILLING CO.: SoilTech BAKER REP.: Joe Etheridge

DRILLER: Osvaldo BORING NO.: RCRA-4 SHEET 3 OF 3

**INSUFFICIENT DATA SET FOR NW-1**

DERTEC
AL RESOURCE TECHNOLOGIES

PROJECT: Cerro Gorda JOB NO:
LOCATION: Vieques
CLIENT: CH2M-HILL
CHECKED BY: Joel Morales DATE: 08/19/99
PAGE: 1 OF 1

NW-1

depth Description

50' - moderately weathered and fines of rock fragments, dark bluish gray matrix.

60' - Do, more fines in the cuttings yellowish brown, olive green material

70' - same material without weathering.

80' - Do

90' - Do, not weathered, same bluish gray matrix same yellowish brown fragments

100' - Do

120' - Do

130' - Do, same material, Bluish gray fine grain matrix.

The cuttings where too small to identify clearly the type of rock

P.O. Box 195336, San Juan, P.R. 00919-5336 • Tel (787) 792-8902 • Fax (787) 783-5555

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: _____ BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 111 | | | | | | | | |
| 112 | | | | | | | | |
| 113 | | | | | | | | |
| 114 | | | | | | | | |
| 115 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 116 | | | | | | | | |
| 117 | | | | | | | | |
| 118 | | | | | | | | |
| 119 | | | | | | | | |
| 120 | | | | | | | | |
| 121 | | | | | | | | |
| 122 | | | | | | | | |
| 123 | | | | | | | | |
| 124 | | | | | | | | |
| 125 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 126 | | | | | | | | |
| 127 | | | | | | | | |
| 128 | | | | | | | | |
| 129 | | | | | | | | |
| 130 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: _____ BORING NO.: P-3 SHEET 7 OF 9

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 131 | | | | | | | | |
| 132 | | | | | | | | |
| 133 | | | | | | | | |
| 134 | | | | | | | | |
| 135 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 136 | | | | | | | | |
| 137 | | | | | | | | |
| 138 | | | | | | | | |
| 139 | | | | | | | | |
| 140 | | | | | | | | |
| 141 | | | | | | | | |
| 142 | | | | | | | | |
| 143 | | | | | | | | |
| 144 | | | | | | | | |
| 145 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 146 | | | | | | | | |
| 147 | | | | | | | | |
| 148 | | | | | | | | |
| 149 | | | | | | | | |
| 150 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-3 SHEET 8 OF 9

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 151 | | | | | | | | |
| 152 | | | | | | | | |
| 153 | | | | | | | | |
| 154 | | | | | | | | |
| 155 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 156 | | | | | | | | |
| 157 | | | | | | | | |
| 158 | | | | | | | | |
| 159 | | | | | | | | |
| 160 | | | | | | | | |
| 161 | | | | | | boring terminated @ 160-ft bgs | | |
| 162 | | | | | | | | |
| 163 | | | | | | | | |
| 164 | | | | | | | | |
| 165 | | | | | | | | |
| 166 | | | | | | | | |
| 167 | | | | | | | | |
| 168 | | | | | | | | |
| 169 | | | | | | | | |
| 170 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-3 SHEET 9 OF 9

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: P-5
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: B-90 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | | | | | 8/19/99 | | sunny, humid, 90 | -- |
| Length | | | | | | | | |
| Type | | | | | | | | |
| Hammer Wt. | | | | | | | | |
| Fall | | | | | | | | |

**Remarks:** The piezometer was advanced with an air rotary drill rig. The lithology was descriped from the drill cuttings.

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | R-N | | | | | Yellow brown, coarse to fine SAND, some silt and clay **SM** | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | Yellow brown, adequetly weathered GRANODIORITE, with mica **GD** | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales
DRILLER: BORING NO.: P-5 SHEET 1 OF 8

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-5

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | R-N | | | | | Yellow brown, adequetly weathered GRANODIORITE, with mica **GD** | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica **GD** | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-5 SHEET 2 OF 8

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-5

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | | |
| 35 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | | | |
| 46 | | | | | | | | |
| 47 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-5 SHEET 3 OF 8

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 56 | | | | | | | | |
| 57 | | | | | | | | |
| 58 | | | | | | | | |
| 59 | | | | | | | | |
| 60 | | | | | | | | |
| 61 | | | | | | | | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | | | | | | | | |
| 65 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | | |
| 70 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-5 SHEET 4 OF 8

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | | | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 76 | | | | | | | | |
| 77 | | | | | | | | |
| 78 | | | | | | | | |
| 79 | | | | | | | | |
| 80 | | | | | | | | |
| 81 | | | | | | | | |
| 82 | | | | | | | | |
| 83 | | | | | | | | |
| 84 | | | | | | | | |
| 85 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | | | | | | | | |
| 90 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-5 SHEET 5 OF 8

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: P-5

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 91 | | | | | | Continued from Sheet 2 | | |
| 92 | | | | | | | | |
| 93 | | | | | | | | |
| 94 | | | | | | | | |
| 95 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 96 | | | | | | | | |
| 97 | | | | | | | | |
| 98 | | | | | | | | |
| 99 | | | | | | | | |
| 100 | | | | | | | | |
| 101 | | | | | | | | |
| 102 | | | | | | | | |
| 103 | | | | | | | | |
| 104 | | | | | | | | |
| 105 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 106 | | | | | | | | |
| 107 | | | | | | | | |
| 108 | | | | | | | | |
| 109 | | | | | | | | |
| 110 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales
DRILLER: BORING NO.: P-5 SHEET 6 OF 8

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 111 | | | | | | | | |
| 112 | | | | | | | | |
| 113 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 114 | | | | | | | | |
| 115 | | | | | | | | |
| 116 | | | | | | | | |
| 117 | | | | | | | | |
| 118 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 119 | | | | | | | | |
| 120 | | | | | | | | |
| 121 | | | | | | | | |
| 122 | | | | | | | | |
| 123 | | | | | | | | |
| 124 | | | | | | | | |
| 125 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 126 | | | | | | | | |
| 127 | | | | | | | | |
| 128 | | | | | | | | |
| 129 | | | | | | | | |
| 130 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-5 SHEET 7 OF 8

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-5

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 131 | | | | | | | | |
| 132 | | | | | | | | |
| 133 | | | | | | | | |
| 134 | | | | | | | | |
| 135 | R-N | | | | | Yellow brown, slightly weathered GRANITE/ GRANODIORITE, with mica, and olivine | | |
| 136 | | | | | | | | |
| 137 | | | | | | | | |
| 138 | | | | | | | | |
| 139 | | | | | | | | |
| 140 | | | | | | | | |
| 141 | | | | | | Boring terminated @ 140-ft bgs | | |
| 142 | | | | | | | | |
| 143 | | | | | | | | |
| 144 | | | | | | | | |
| 145 | | | | | | | | |
| 146 | | | | | | | | |
| 147 | | | | | | | | |
| 148 | | | | | | | | |
| 149 | | | | | | | | |
| 150 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-5 SHEET 8 OF 8

**INSUFFICIENT DATA SET FOR P-6**

ERTEC
L RESOURCE TECHNOLOGIES

PROJECT: Carp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2MHILL
CHECKED BY: Joel Morales DATE: 08/18/99
PAGE: 1 OF 1

P-6

60' - Granodiorite look alike Basalt fragment, Quartz, hornblend, [redacted]. some mica, The cutting look a bluish gray color

70' - Do,

The Driller only take this two samples, he said that the material was almost the same since the begining. The mayor changes in the hardness of the material, he did not feel it in the machine.
hardness

INSUFFICIENT DATA SET FOR P-7

ERTEC
...TAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Marks DATE: 08/14/99
PAGE: 1 OF 1

P-7 8-14-99

| depth | Description |
|---|---|
| 58' | greenstone material, cutting as 5/, 2.5Y gray color. same ~~[illegible]~~ or similar (driller version) |
| 68' | Do, but with more olive or green material |
| 80' | Do |

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Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-8

COORDINATES: EAST: NORTH:

ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: Mobile B-56 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/4/99 | 32 | sunny, breezy, 90 | -- |
| Length | 2 | | 5 | | | | | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

Remarks:

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | 2 | 10 | 30 |
| Sch 40 PVC riser | 2 | -2.5 | 10 |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | A-N | | | | | Gravel - numerous obstructions near the surface | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | S-1 | 2.0/2.0 100% | 5 5 6 9 | | | Brown to redbrown, dry to moist stiff, sandy **CLAY**, some roots no odor | | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | **SAND** | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| | S-2 | | 10 | | | Match to Sheet 2 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: P-8 SHEET 1 OF 3

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-8

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | S-2 | 2.0/2.0 100% | 14 32 38 | | | Brown, moist, very stiff, sandy **CLAY** | | |
| 12 | | | | | | Dry, very dense **SAND** and and gravel, iron staining | | |
| 13 | A-N | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | S-3 | 2.0/2.0 100% | 13 15 15 18 | | | Dry, medium dense **SAND** and gravel | | |
| 17 | | | | | | Brown, hard, sandy clay | | |
| 18 | A-N | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | S-4 | 2.0/2.0 100% | 8 10 10 12 | | | Moist, reddish brown clayey **SAND** at 21 to 21.5 ft solution fracture w/iron staining and black gravel | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | A-N | | | | | | | |
| 25 | | | | | | | | |
| 26 | S-5 | 1.5/2.0 75% | 10 13 14 14 | | | Wet, **SAND** and gravel to 25.75' Moist. clayey sand and gravel to 27-ft | | |
| 27 | | | | | | | | |
| 28 | A-N | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| | S-6 | | 9 | | | Match to Sheet 3 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: P-8 SHEET 2 OF 3

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT:

CTO NO.: 138 BORING NO.: P-8

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | S-6 | 2.0/2.0 100% | 11 17 20 | | | Red brown, wet, clayey SAND | | |
| 32 | | | | | | | | |
| 33 | | | | | | boring terminated @ 32-ft. bgs | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: P-8 SHEET 3 OF 3

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P 9

COORDINATES: EAST: NORTH:

ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: CME 45 & 55 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | 1 5/8 | | 4 1/4 | | 8/5/99 | 25 | sunny, brief showers, | -- |
| Length | 2 | | 5 | | | | 90 | |
| Type | | | STD | | | | | |
| Hammer Wt. | | | 130 | | | | | |
| Fall | | | 30 | | | | | |

Remarks:

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | A-N | | | | | sandy **LOAM,** auger cuttings | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | S-1 | 0.5/2.0 25% | 3 4 5 9 | | | **Clayey Sand** | | |
| 7 | | | | | | | | |
| 8 | A-N | | | | | | | |
| 9 | | | | | | No sample | | |
| 10 | | | | | | Match to Sheet 2 | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: P-9 SHEET 1 OF 2

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-9

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | A-N | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | S-2 | 1.5/2.0 | 7 | | | **Sand & Gravel**, brown to yellow, dry, dense, no odor | | |
| | | | 16 | | | | | |
| | | 75% | 23 | | | | | |
| 17 | | | 22 | | | | | |
| 18 | A-N | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | S-3 | 1.7/2.0 | 7 | | | **Sand & gravel**, dry, dense:20-21.5', 21.5-22', clear brown sand; **wet** | | |
| | | | 7 | | | | | |
| | | 85% | 7 | | | | | |
| 22 | | | 7 | | | | | |
| 23 | A-N | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | boring terminated @ 25-ft. bgs | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |

DRILLING CO.: SoilTech BAKER REP.: Matt Maloney

DRILLER: Osvaldo BORING NO.: P-9 SHEET 2 OF 2

# APPENDIX F

# WELL AND PIEZOMETER CONSTRUCTION DIAGRAMS

# MONITORING WELL

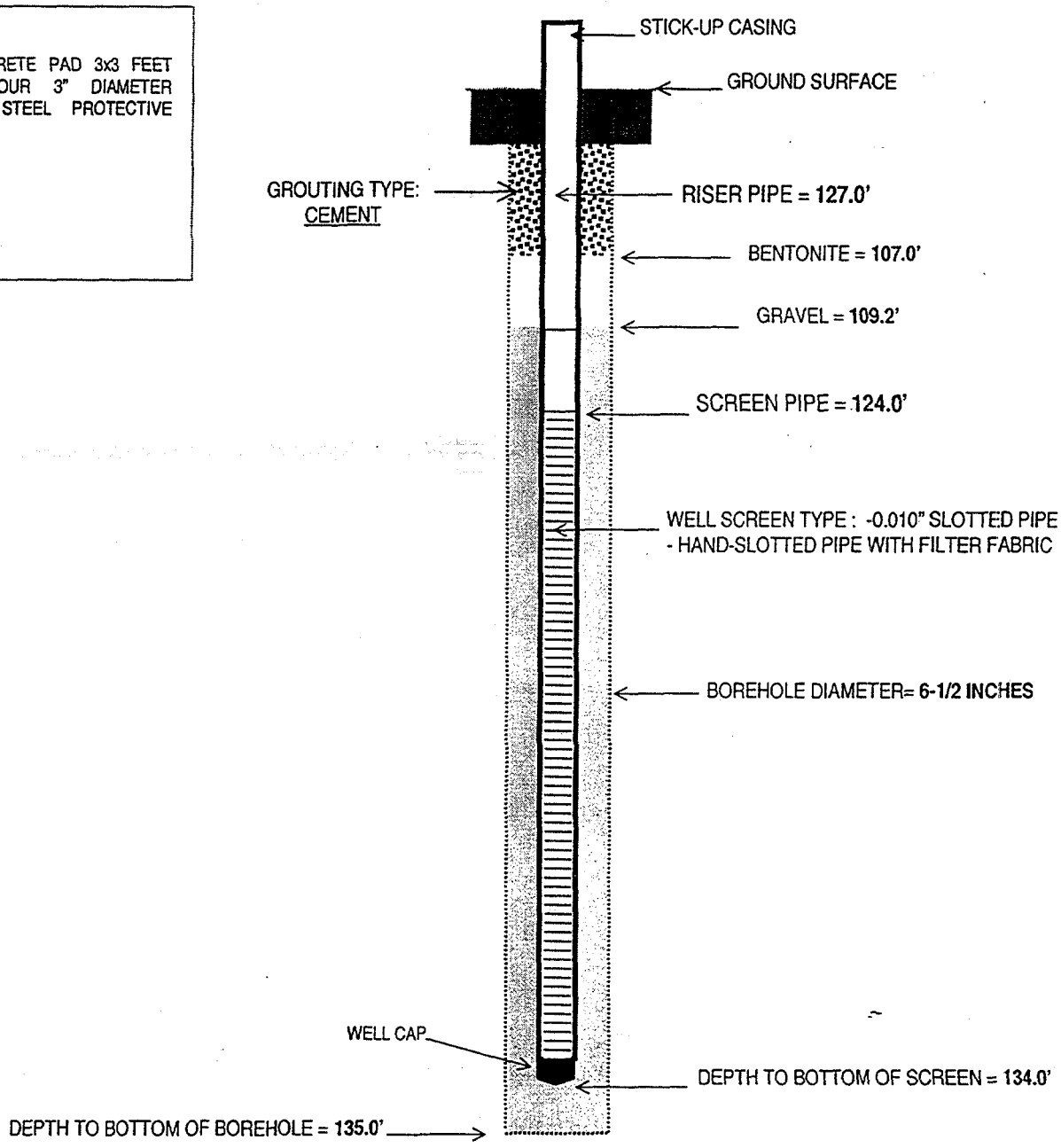
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| PROJECT NAME: | CAMP GARCIA | WELL ID: | NW-1 |
| LOCATION | VIEQUES, PUERTO RICO | BEGIN DATE: | 08/13/99 |
| CLIENT: | CH2M-HILL | FINISH DATE: | 08/14/99 |
| JOB NO.: | E-990716 | WELL PURPOSE: | MONITORING WELL |
| FIELD PERSON: | JOEL MORALES | DRILLER: | AQUA SYSTEM |
| MANHOLE TYPE: | __ FLUSH GROUND | MEASURE BASE AT: | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| UNIT: | _X_ FEET __ METER | WELL DIAMETER: | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



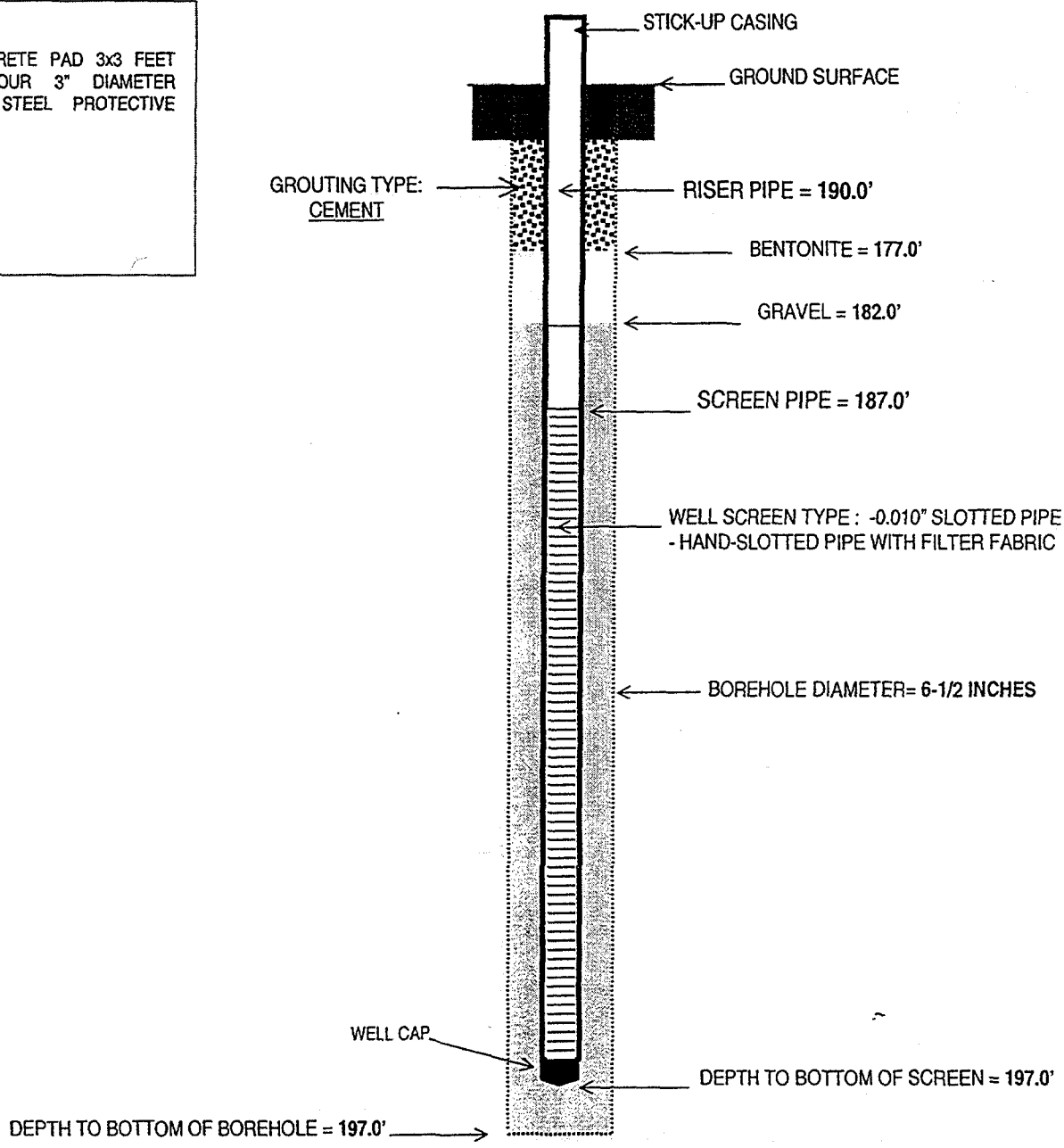
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | NW-3 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/06/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/06/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



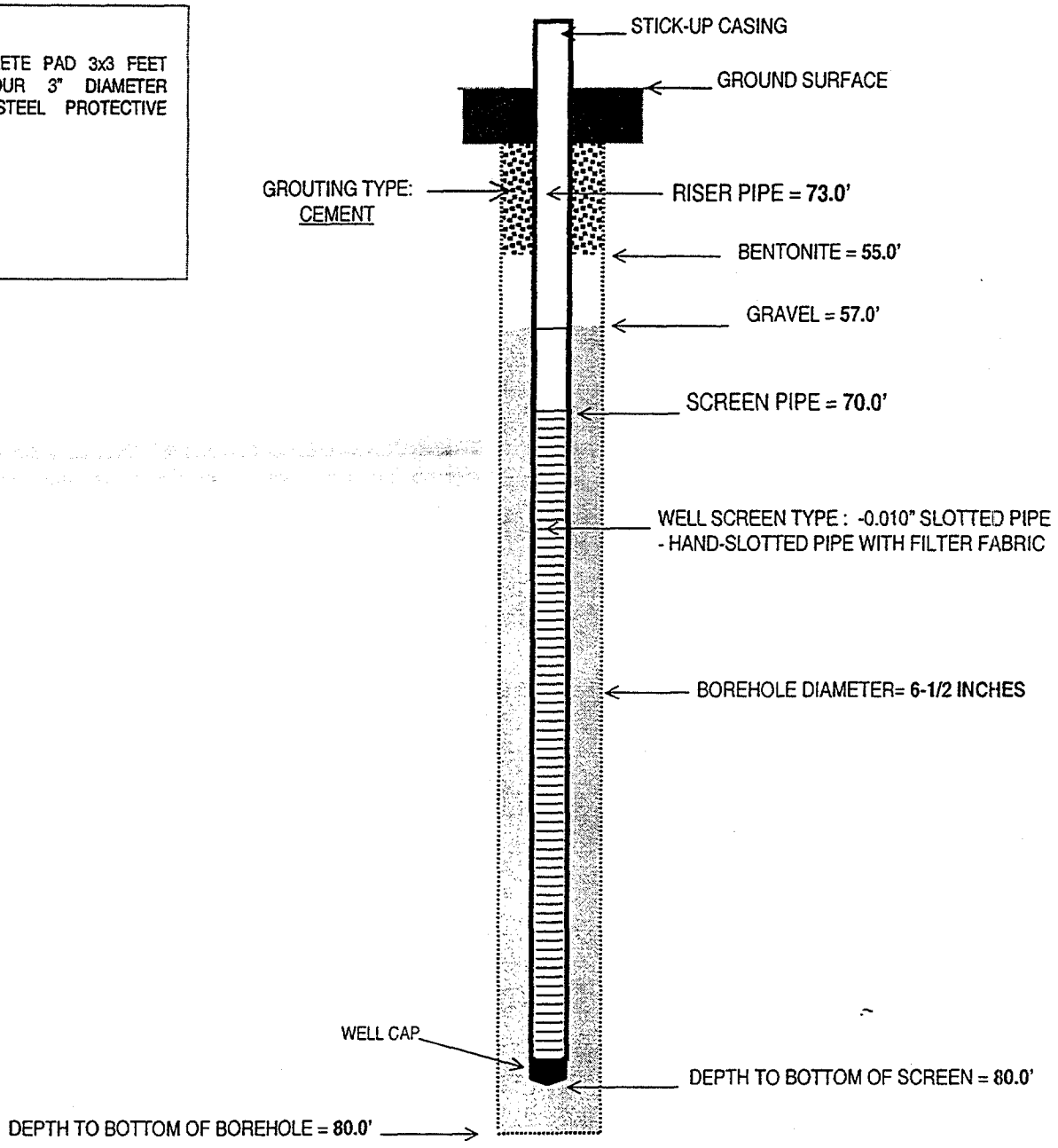
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | NW-4 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/16/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/17/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | AQUA SYSTEM |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



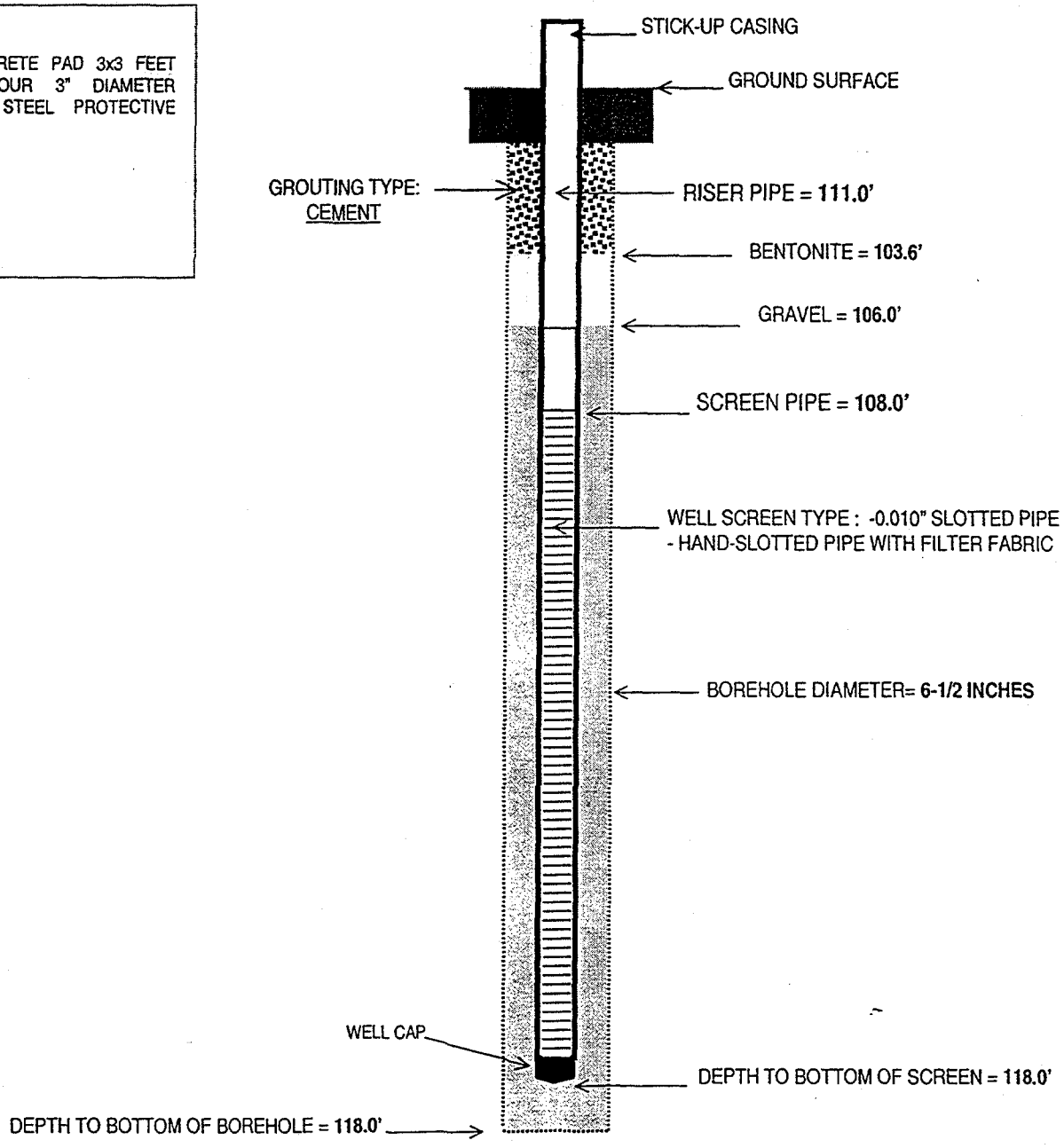
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | NW-5 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/10/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/10/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | _____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



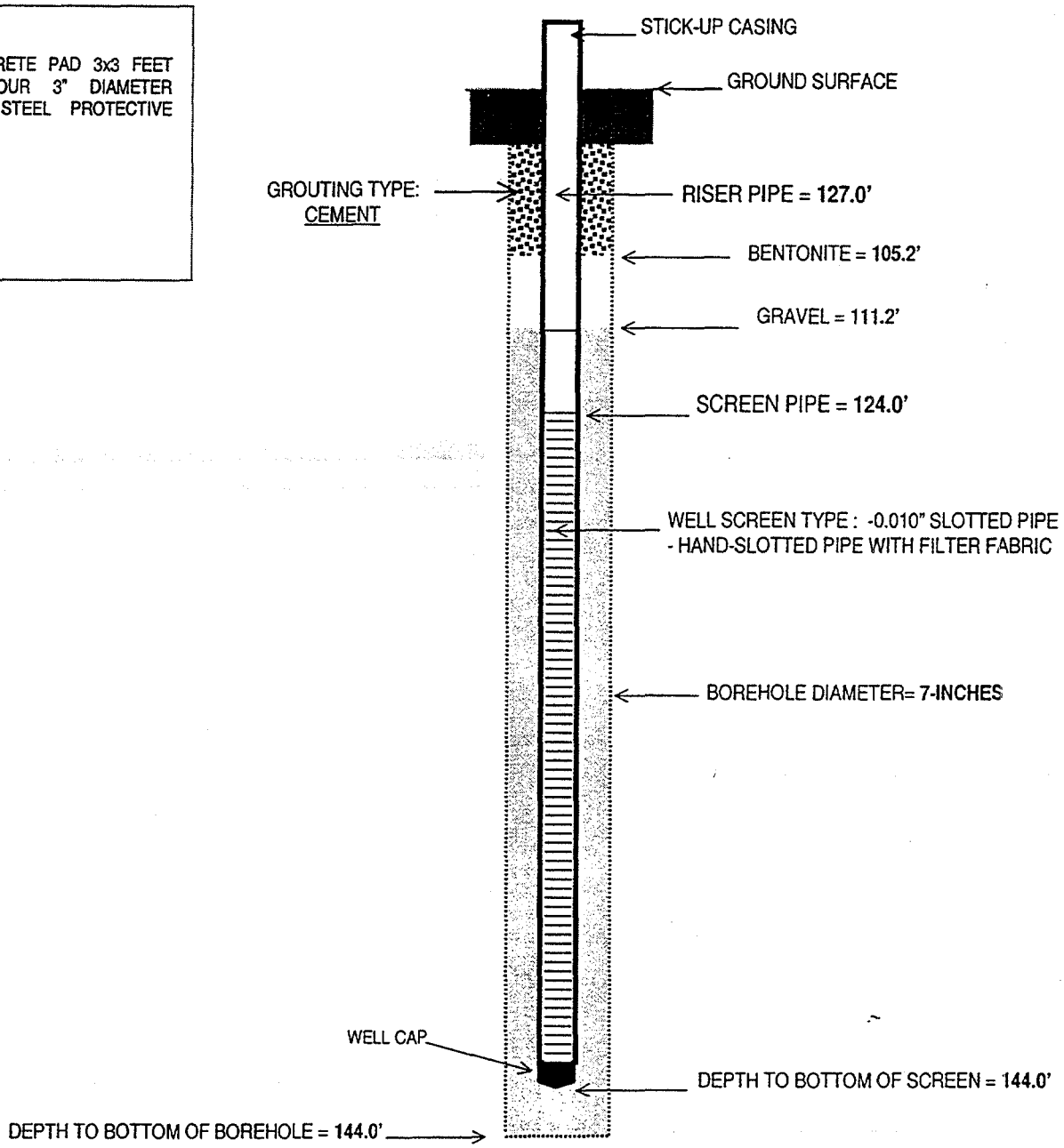
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | **NW-6** |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/11/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/12/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | _____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



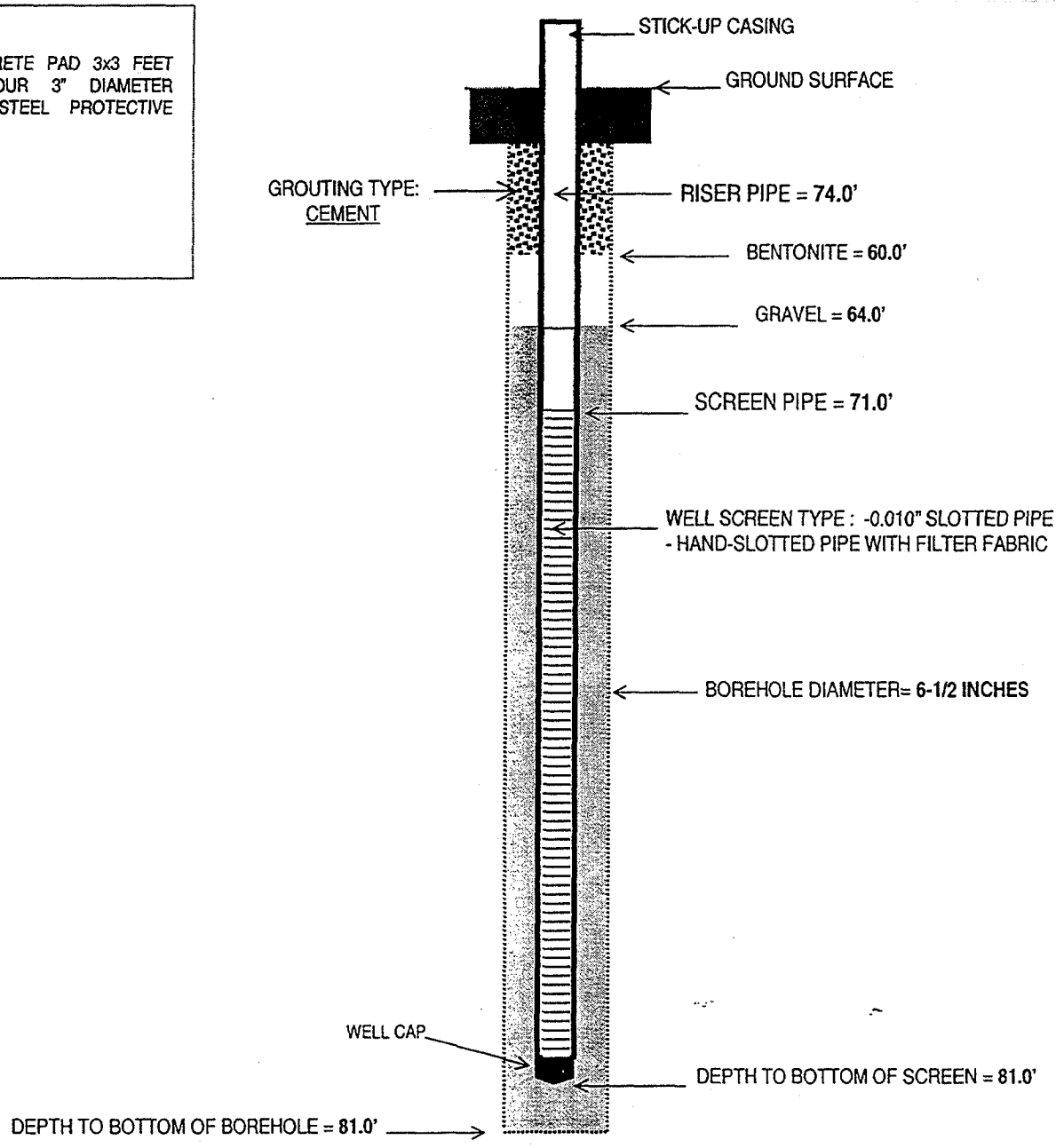
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | NW-7 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/16/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/17/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | AQUA SYSTEM |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



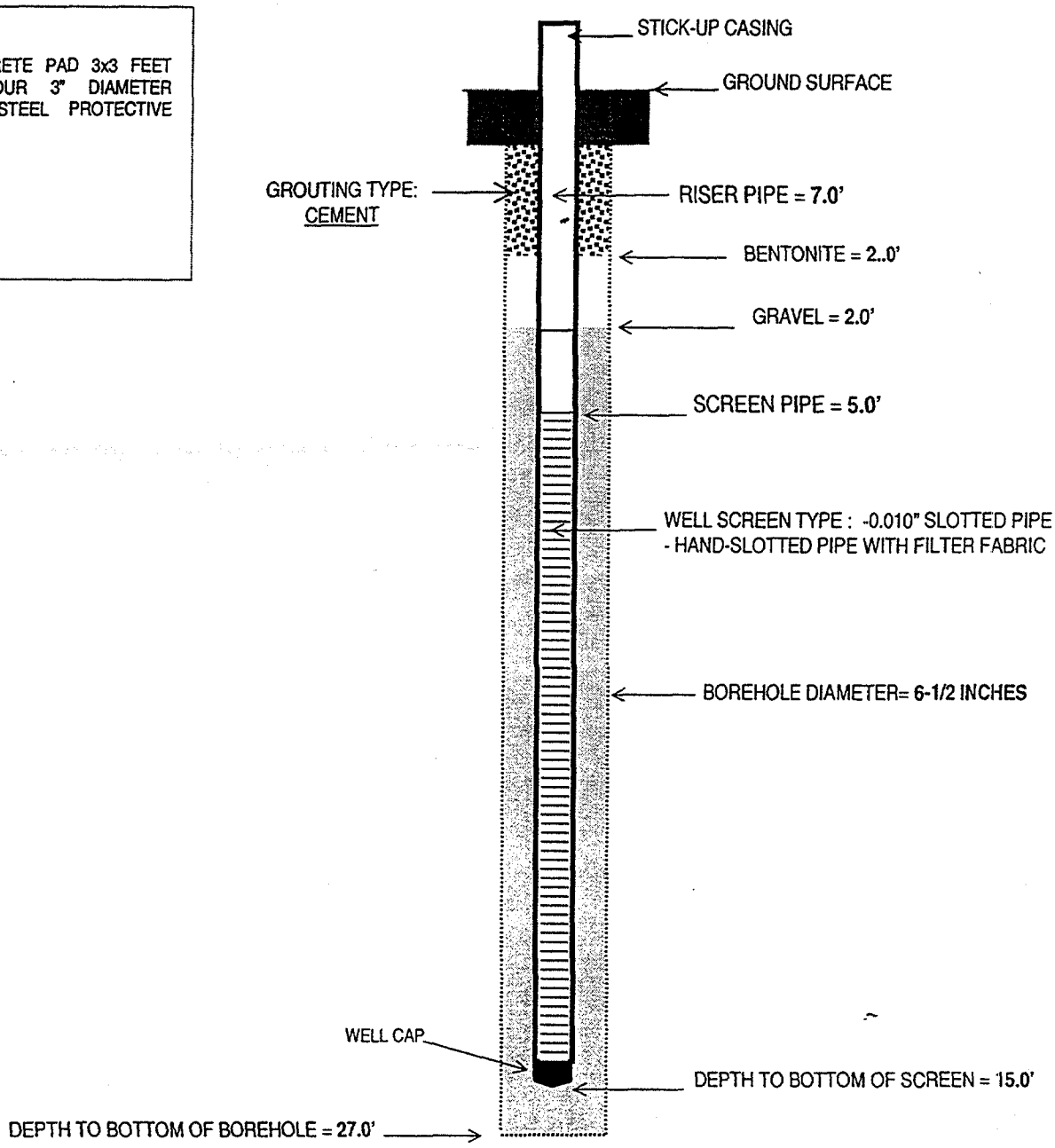
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | **NW-8** |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/03/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/03/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | MATT | **DRILLER:** | SOIL TECH DRILLING |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



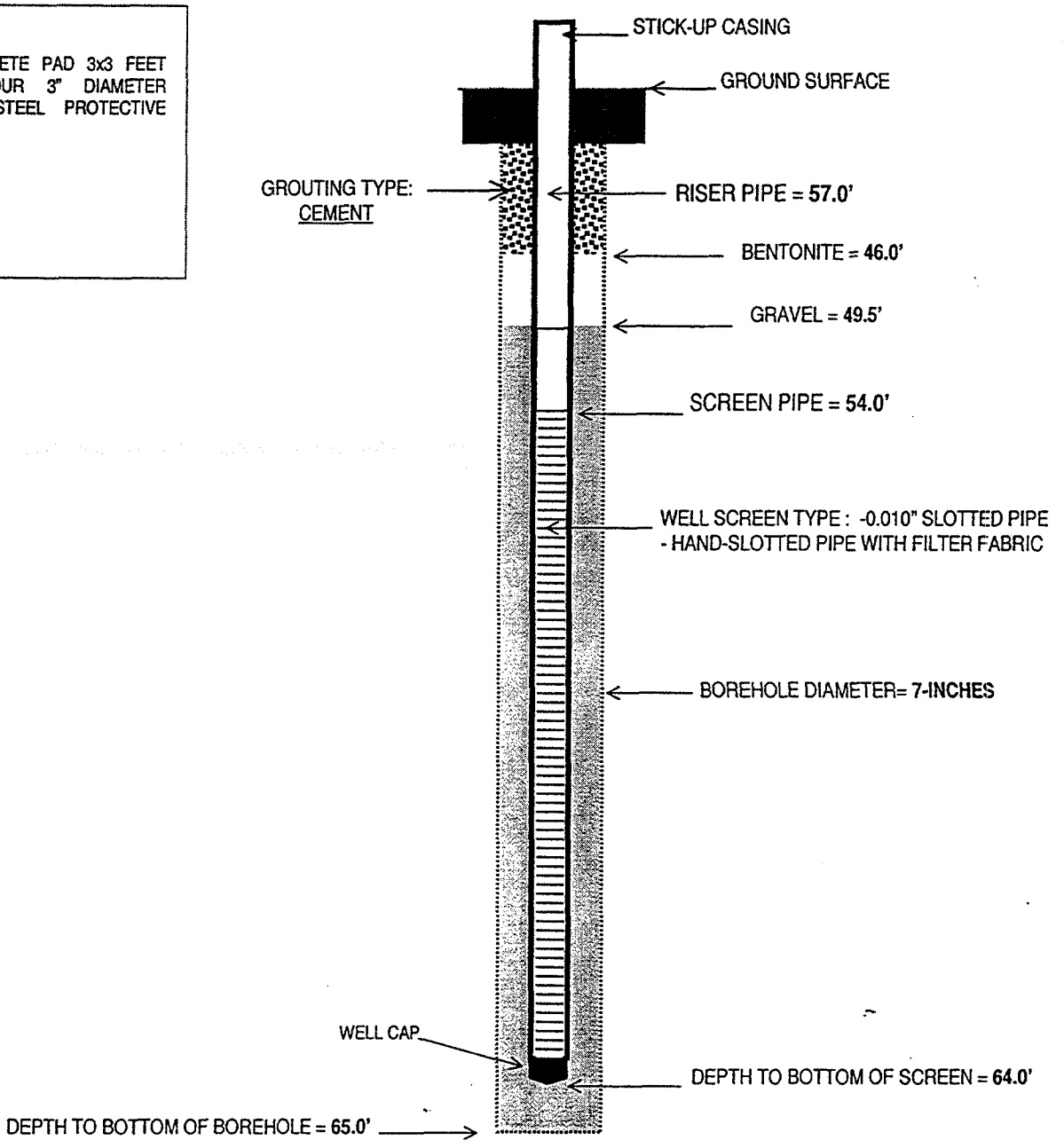
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | RCRA-1 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/18/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/18/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | _____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



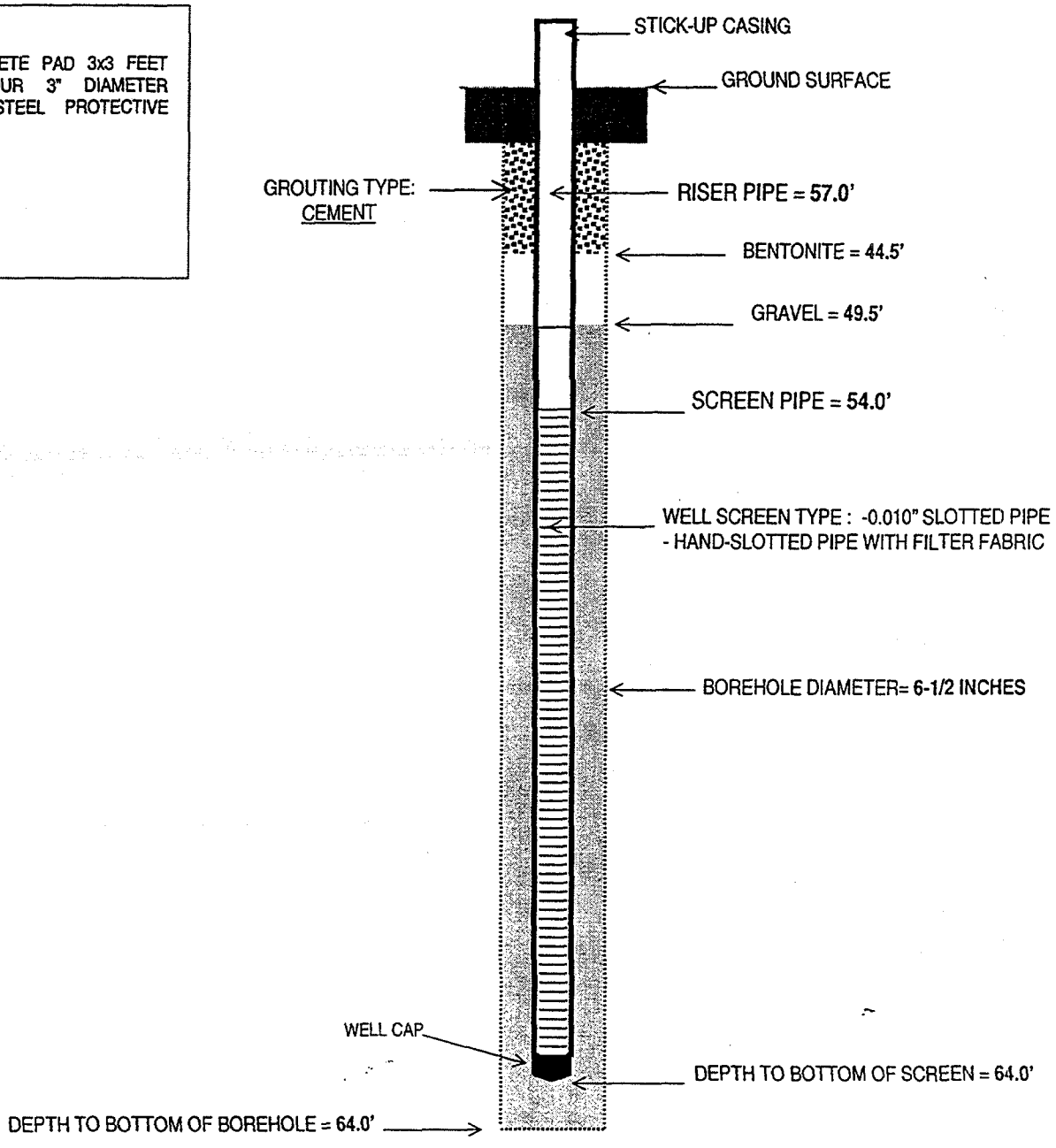
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | RCRA-2 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/08/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/08/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | MATT | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



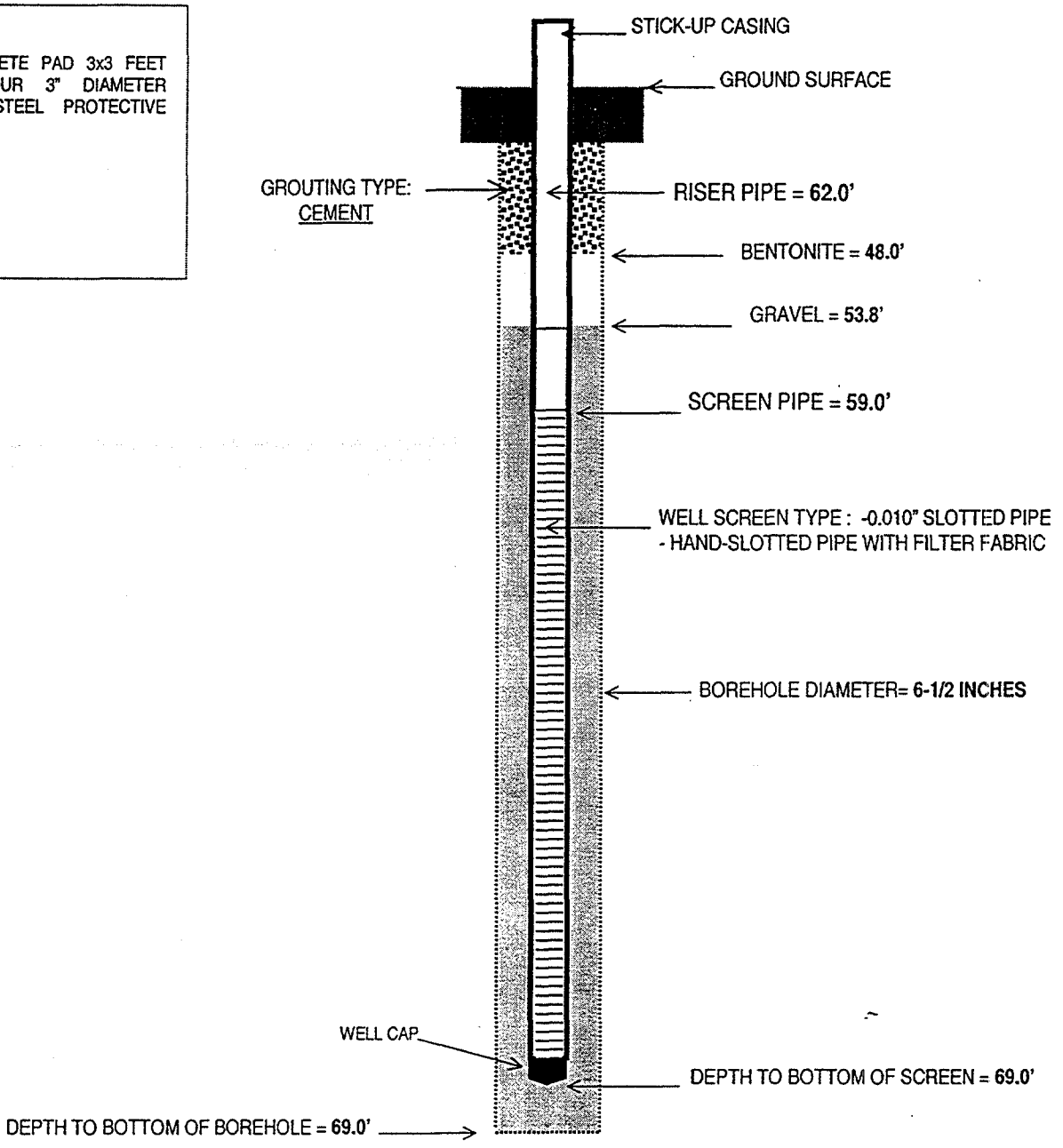
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | RCRA-3 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/14/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/14/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | X GROUND LEVEL |
| | X ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | X FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



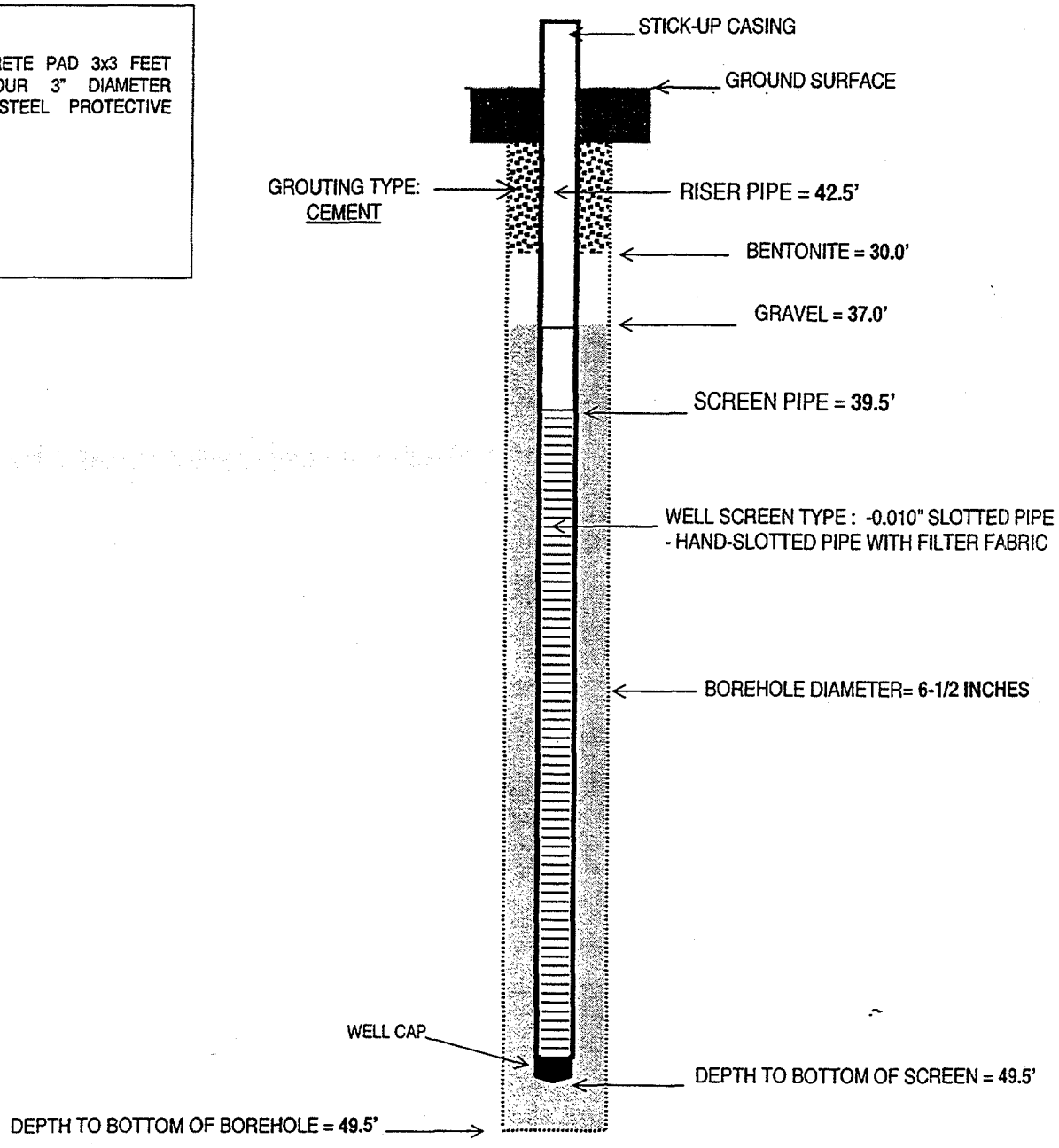
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | RCRA-4 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/11/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/11/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | SOILTECH DRILLING |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



# PIEZOMETER

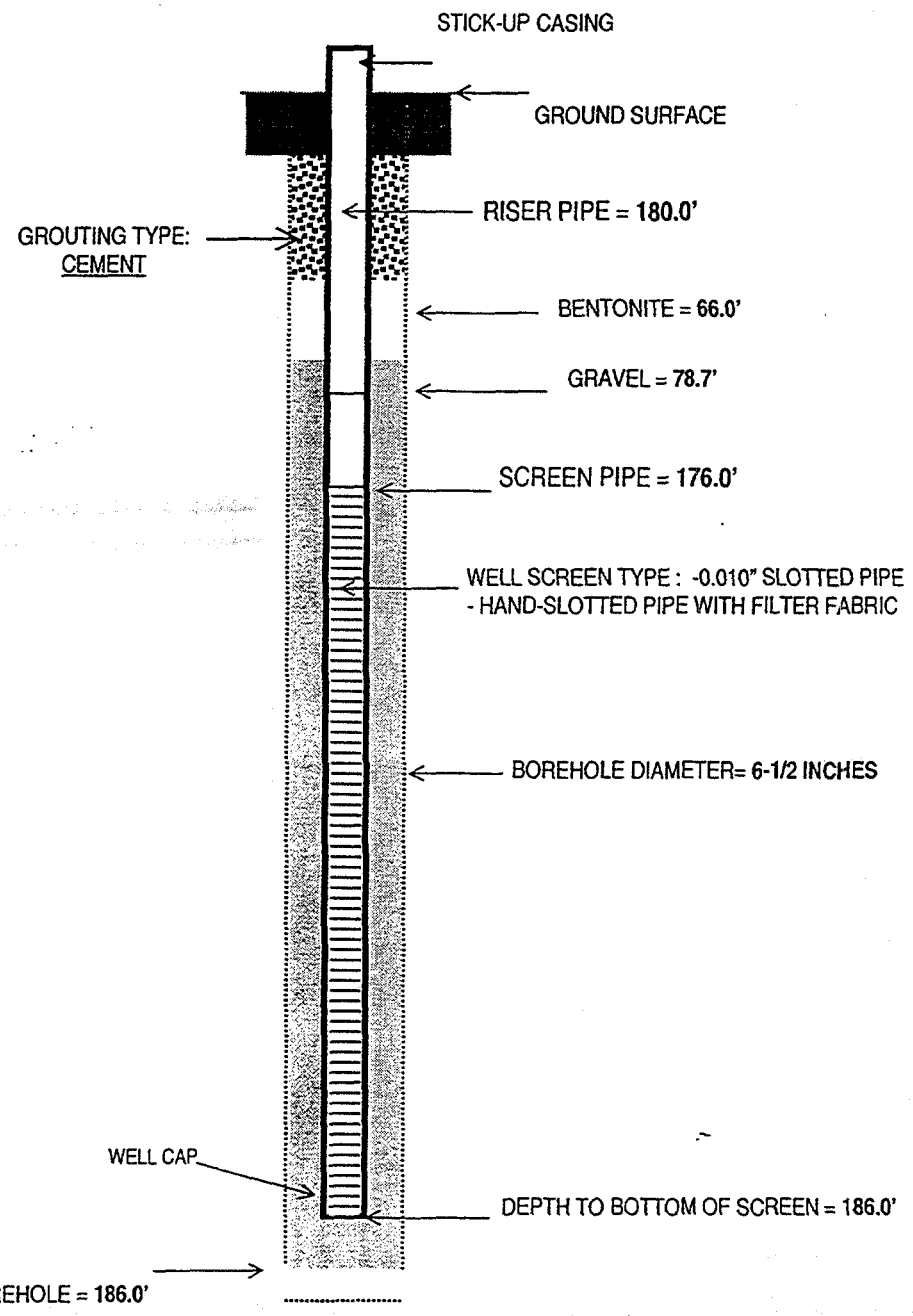
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | P-1 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/25/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/25/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORACIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



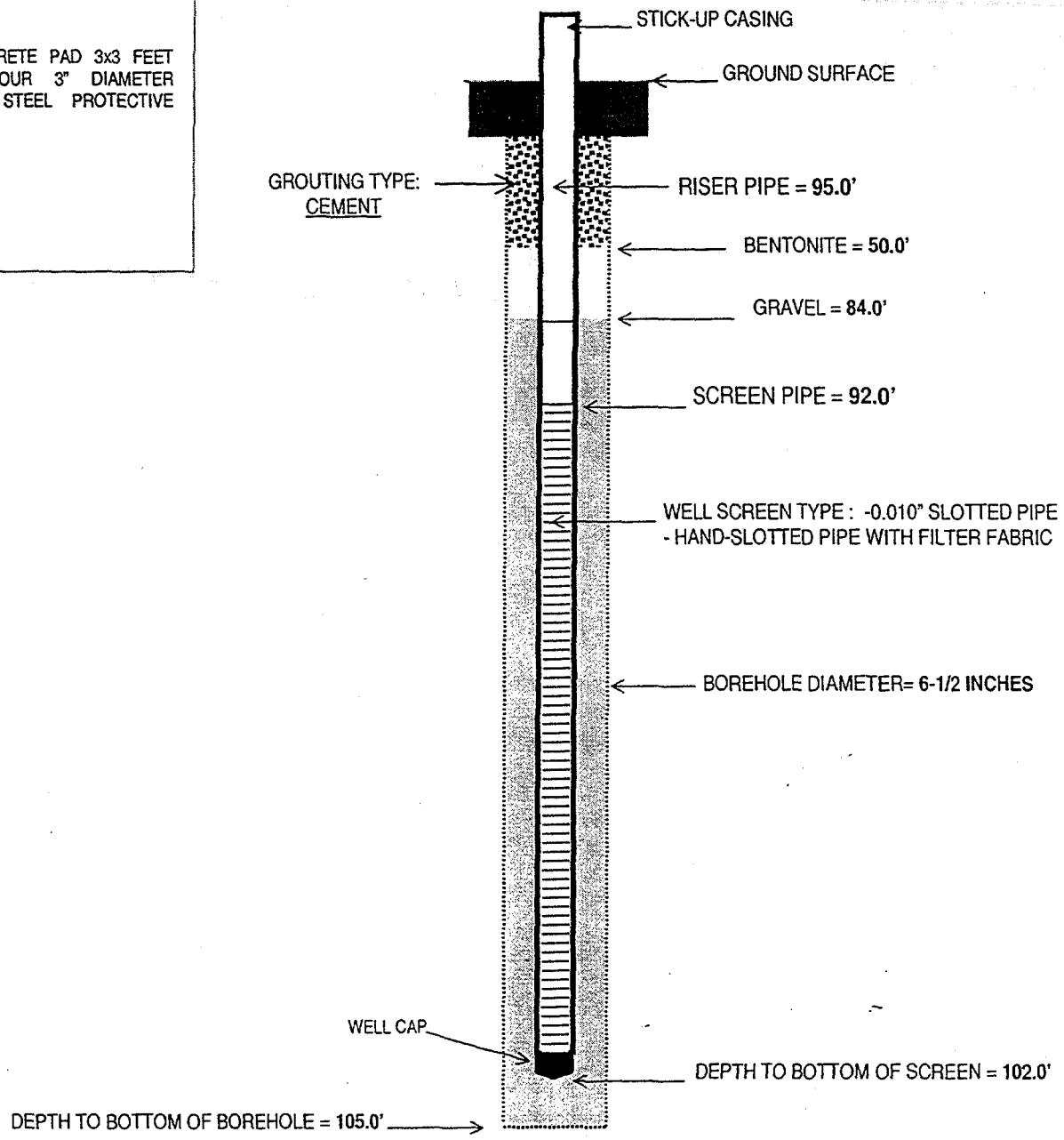
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | P-2 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/18/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/18/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | AQUA SYSTEM |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



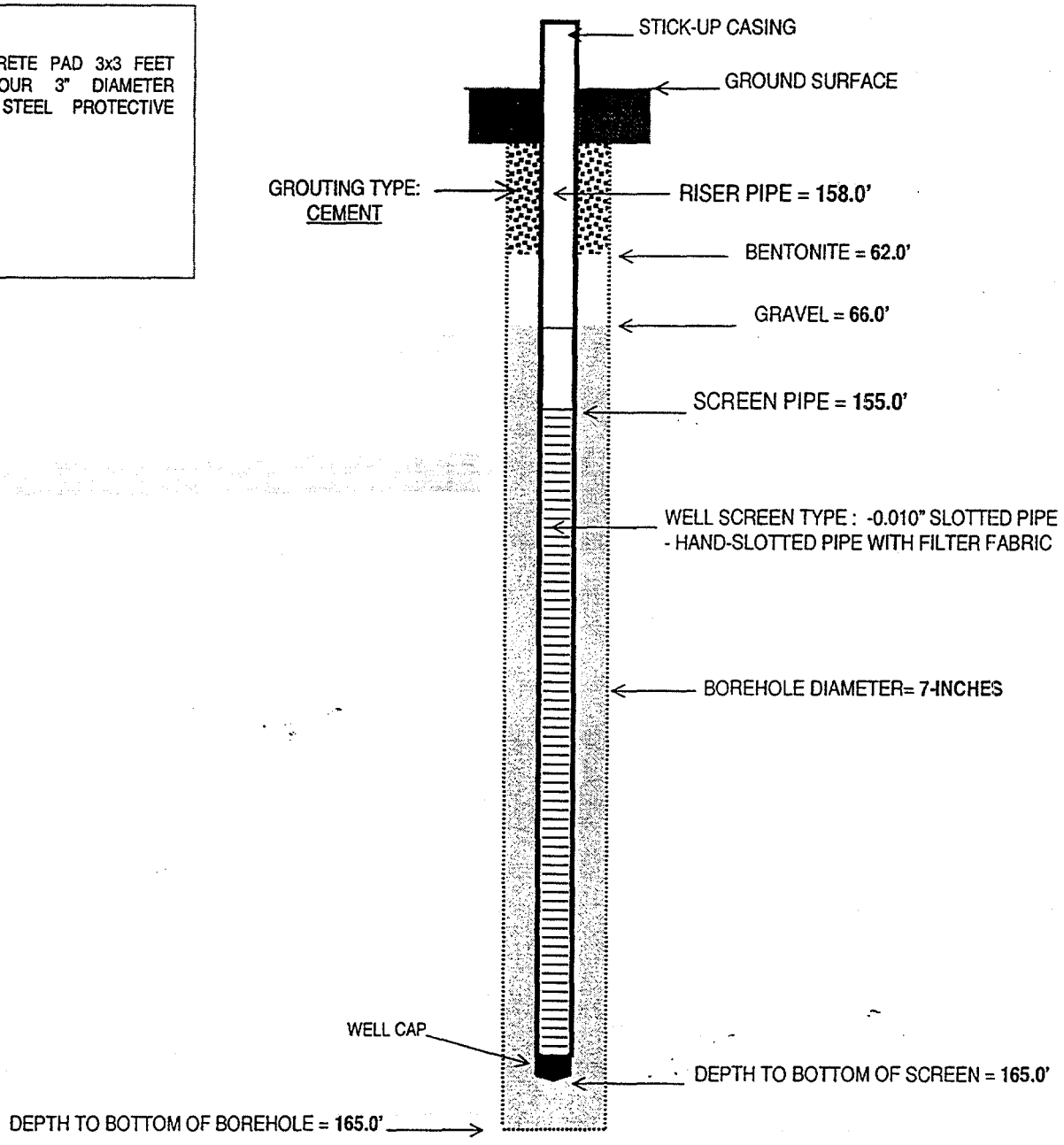
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | P-3 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/17/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/19/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | PERFORCIONES E.CAMPOS |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



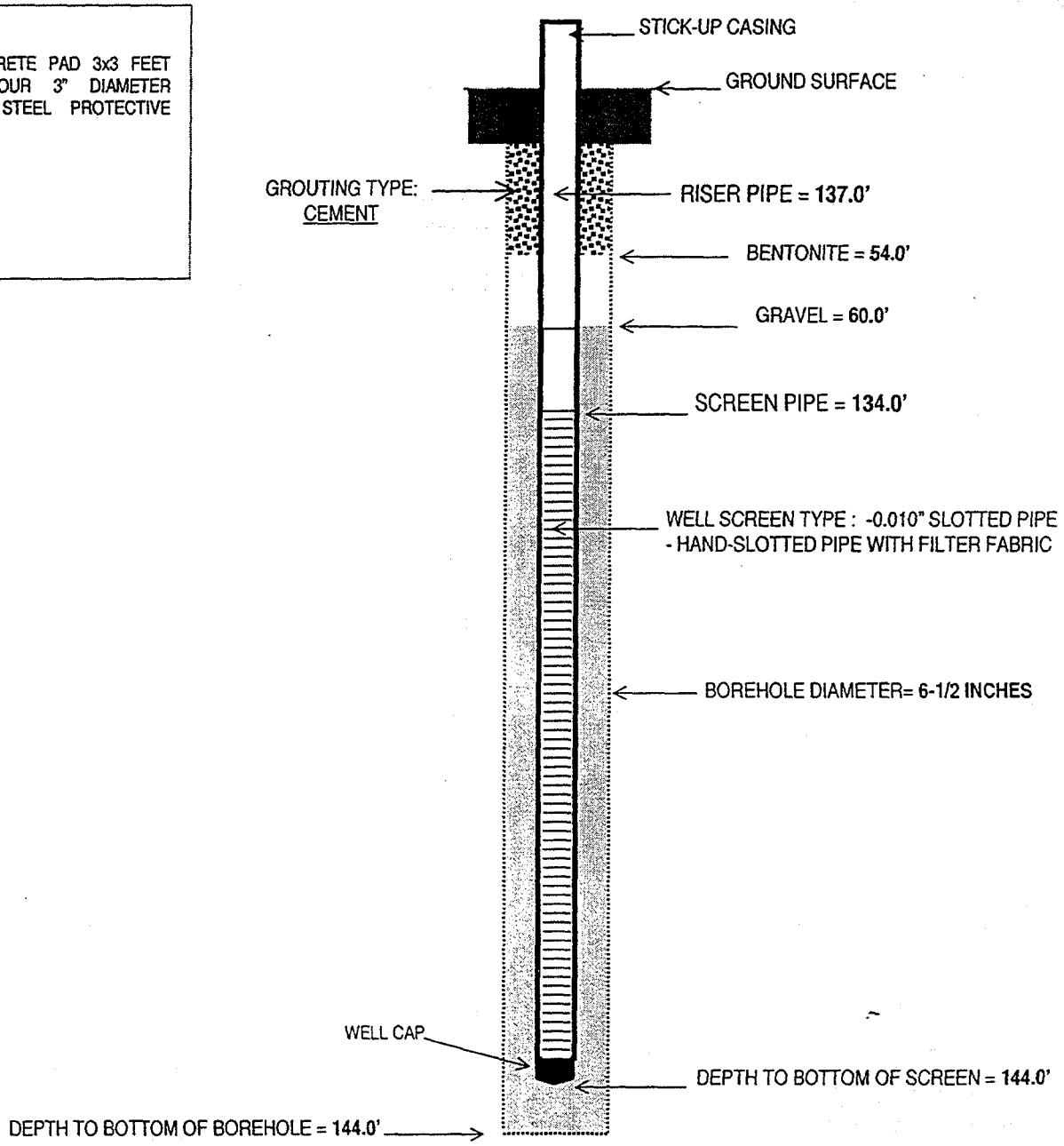
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| PROJECT NAME: | CAMP GARCIA | WELL ID: | P-5 |
| LOCATION | VIEQUES, PUERTO RICO | BEGIN DATE: | 08/18/99 |
| CLIENT: | CH2M-HILL | FINISH DATE: | 08/19/99 |
| JOB NO.: | E-990716 | WELL PURPOSE: | MONITORING WELL |
| FIELD PERSON: | JOEL MORALES | DRILLER: | PERFORACIONES E.CAMPOS |
| MANHOLE TYPE: | __ FLUSH GROUND | MEASURE BASE AT: | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| UNIT: | _X_ FEET __ METER | WELL DIAMETER: | 2 INCHES |

NOTES:

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



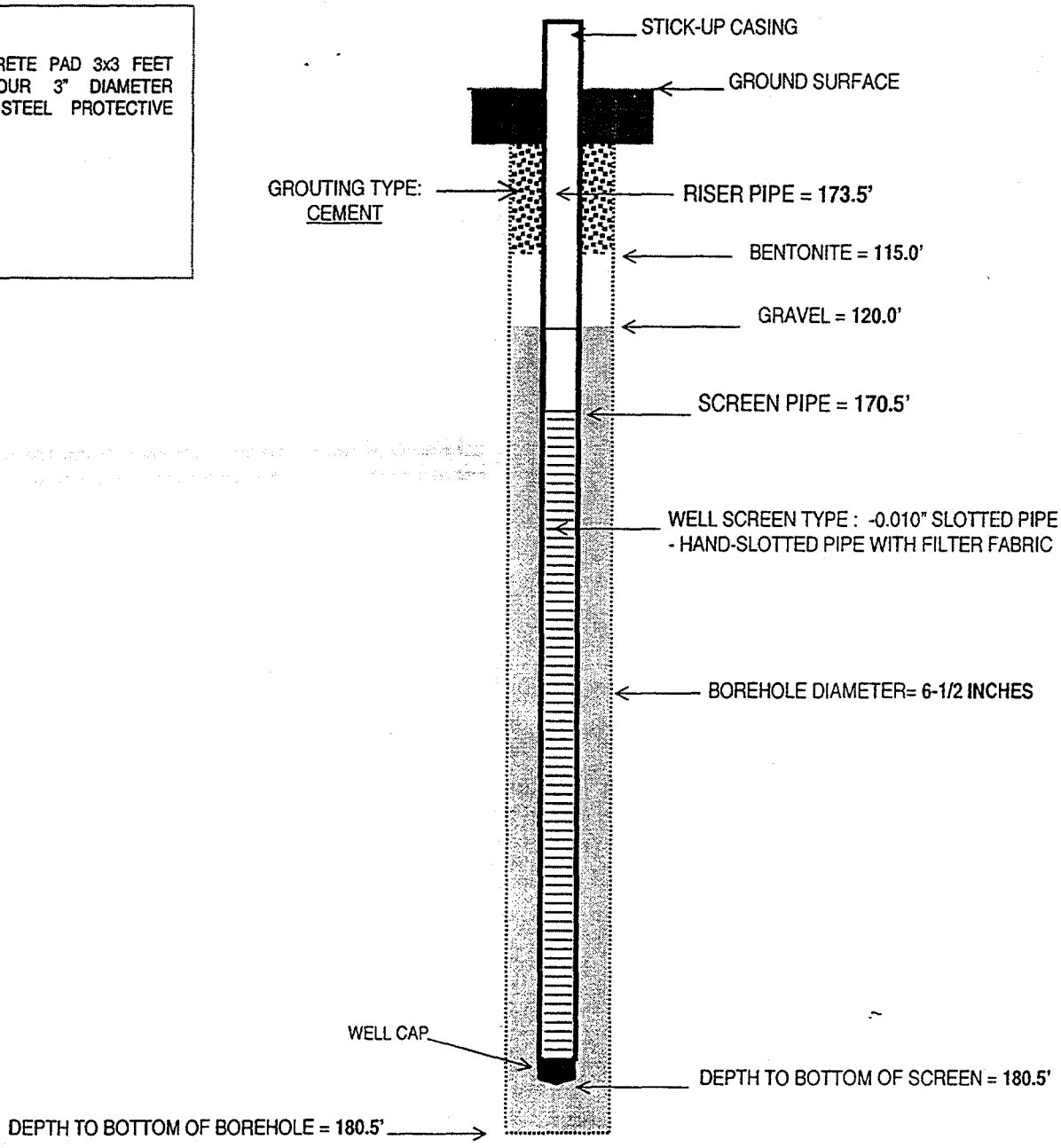
# ERTEC

## WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | P-6 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/18/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/19/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | SOIL TECH DRILLING |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



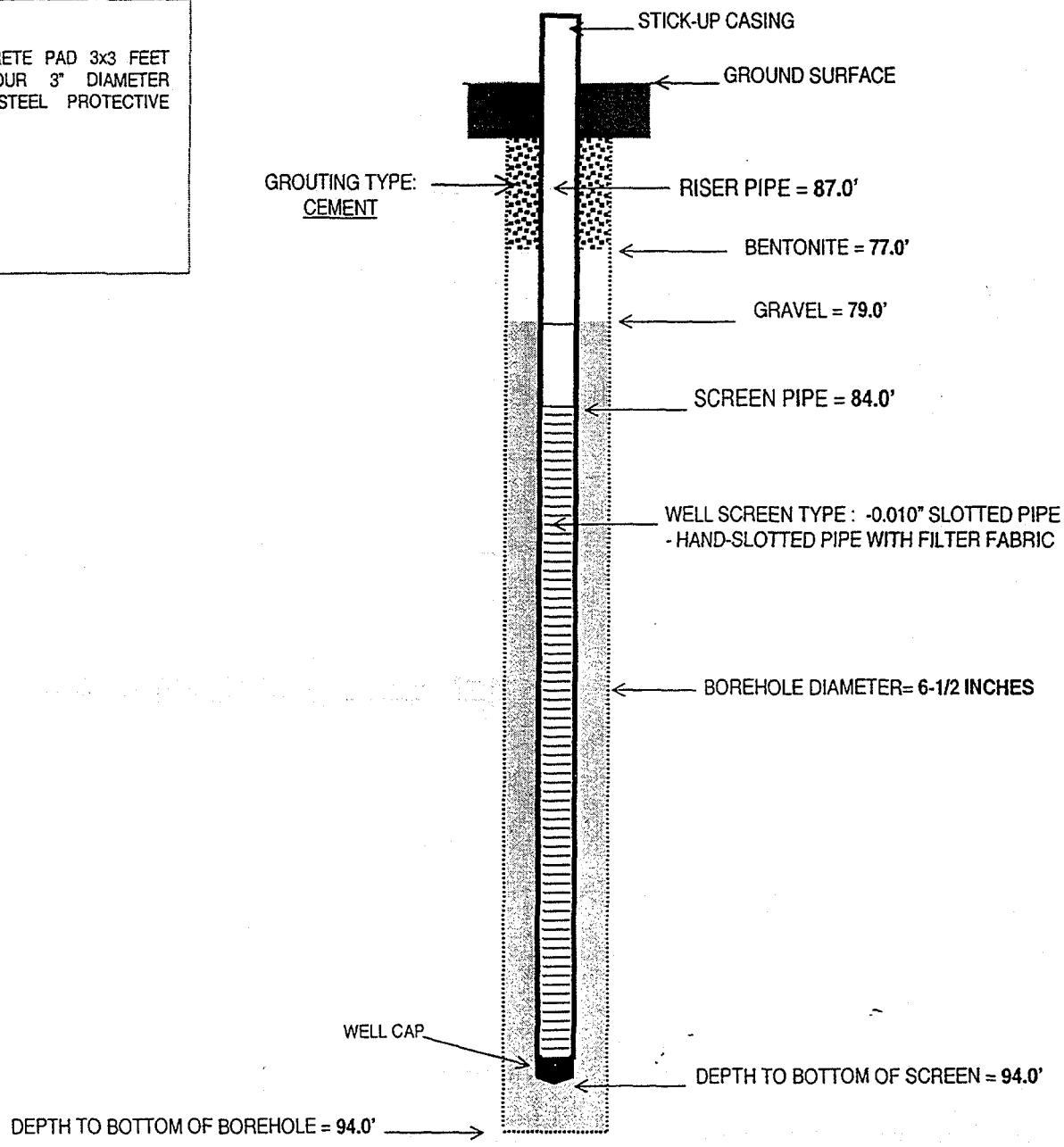
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | P-7 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/14/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/14/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | SOIL TECH DRILLING |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



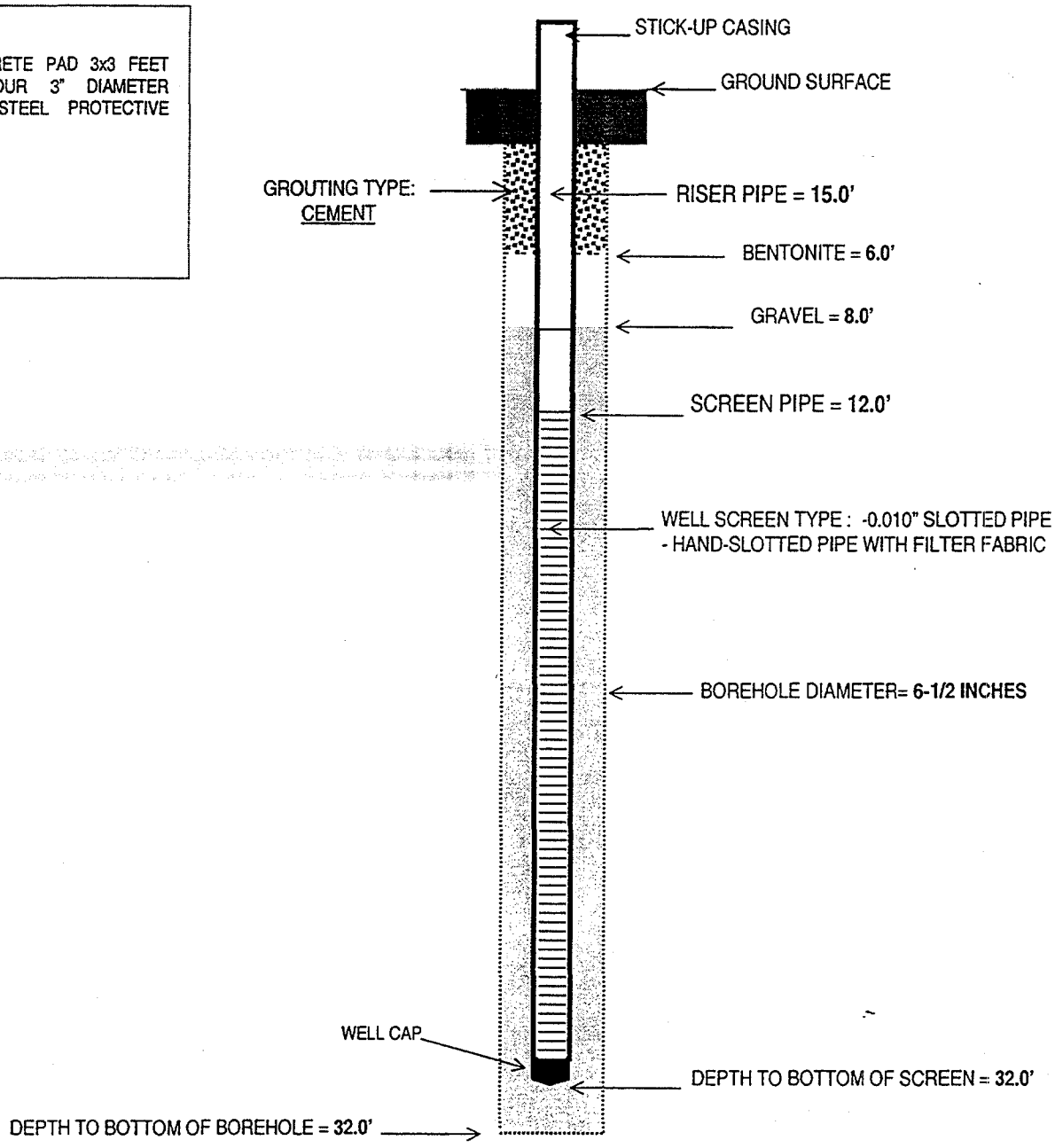
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | **P-8** |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/04/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/04/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | MATT | **DRILLER:** | SOIL TECH DRILLING |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | _X_ GROUND LEVEL |
| | _X_ ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | _X_ FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



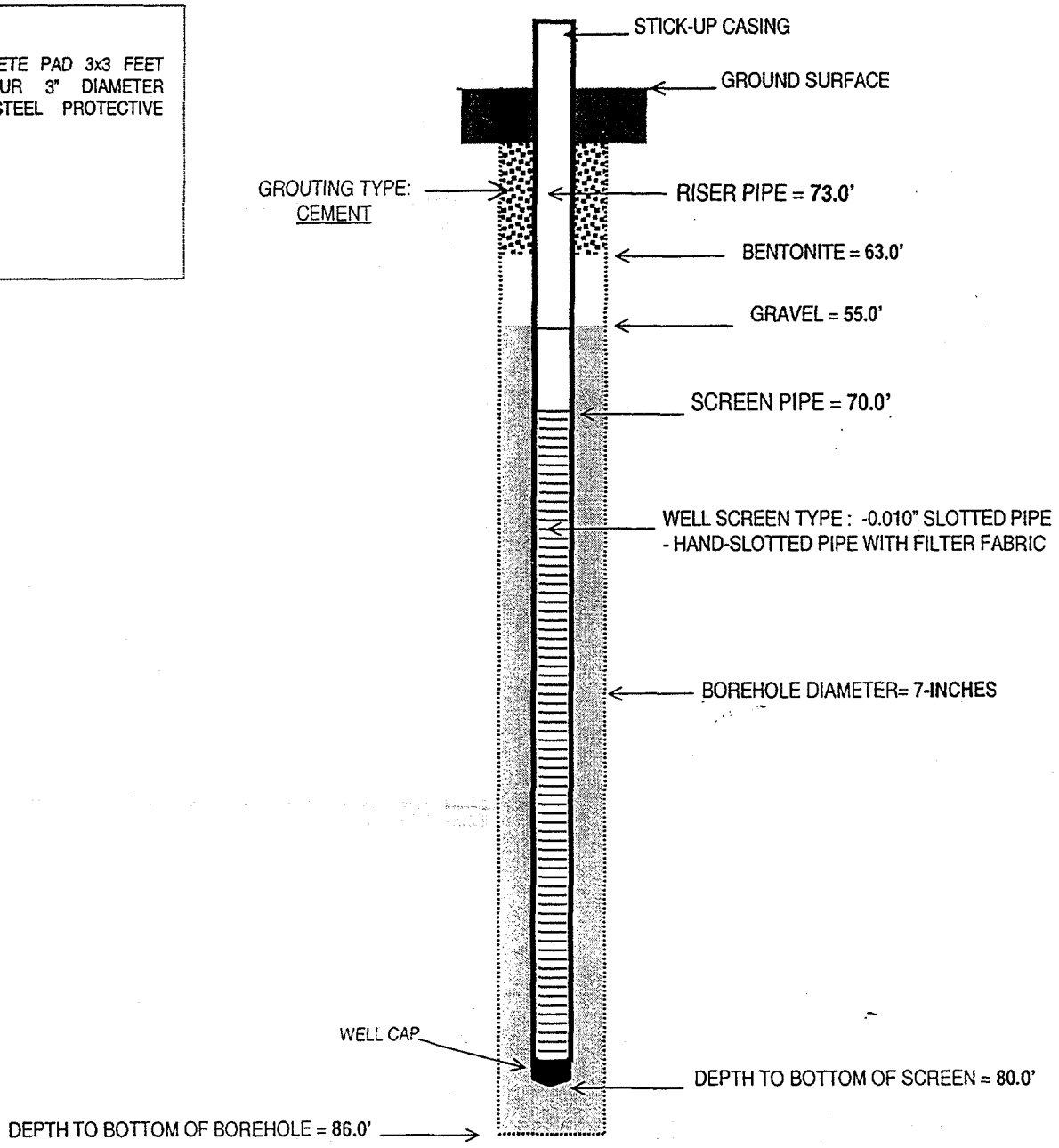
# ERTEC

# WELL CONSTRUCTION DETAIL

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | CAMP GARCIA | **WELL ID:** | P-9 |
| **LOCATION** | VIEQUES, PUERTO RICO | **BEGIN DATE:** | 08/18/99 |
| **CLIENT:** | CH2M-HILL | **FINISH DATE:** | 08/18/99 |
| **JOB NO.:** | E-990716 | **WELL PURPOSE:** | MONITORING WELL |
| **FIELD PERSON:** | JOEL MORALES | **DRILLER:** | SOIL TECH DRILLING |
| **MANHOLE TYPE:** | __ FLUSH GROUND | **MEASURE BASE AT:** | X GROUND LEVEL |
| | X ABOVE GROUND | | ____ MEAN SEA LEVEL |
| **UNIT:** | X FEET __ METER | **WELL DIAMETER:** | 2 INCHES |

**NOTES:**

- CONCRETE PAD 3x3 FEET AND FOUR 3" DIAMETER BLANK STEEL PROTECTIVE PIPE.



# PIEZOMETER

INSUFFICIENT DATA SET FOR P-1

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: P-2
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: B-90 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | | | | | 8/19/99 | | sunny, humid, 90 | -- |
| Length | | | | | | | | |
| Type | | | | | | | | |
| Hammer Wt. | | | | | | | | |
| Fall | | | | | | | | |

**Remarks:** The piezometer was advanced with an air rotary drill rig. The lithology was descriped from the drill cuttings.

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | R-N | | | | | Brown silty CLAY, some fine to sand, organics | | |
| 4 | | | | | | CL | | |
| 5 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 6 | | | | | | | | |
| 7 | | | | | | | cement grout | |
| 8 | R-N | | | | | Brown silty CLAY, some fine to sand | | |
| 9 | | | | | | CL | | |
| 10 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales
DRILLER: BORING NO.: P-2 SHEET 1 OF 6

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-2

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | R-N | | | | | GRANITE **GR** | | |
| 14 | | | | | | | 2-2-inch diameter sch. 40 PVC riser | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | R-N | | | | | GRANITE **GR** | cement grout | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | R-N | | | | | GRANITE **GR** | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | R-N | | | | | DIORITE, with high percentage of mafic minerals **DR** | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| | | | | | | Match to Sheet 3 | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-2 SHEET 2 OF 6

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: BORING NO.:

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | |
| 32 | R-N | | | | | DIORITE, with high percentage of mafic minerals **DR** | | |
| 33 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | R-N | | | | | DIORITE, with high percentage of mafic minerals **DR** | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | cement grout | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | R-N | | | | | DIORITE, with high percentage of mafic minerals **DR** | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-2 SHEET 3 OF 6

Baker
Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: BORING NO.: P-2

**SAMPLE TYPE**
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | R-N | | | | | Yellow brown, slightly weathered GRANODIORITE, with mica, and olivine | | |
| 56 | | | | | | | | |
| 57 | | | | | | | | |
| 58 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 59 | | | | | | | | |
| 60 | | | | | | | cement grout | |
| 61 | | | | | | | | |
| 62 | R-N | | | | | | | |
| 63 | | | | | | | | |
| 64 | | | | | | | | |
| 65 | | | | | | | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | R-N | | | | | DIORITE, with high percentage of mafic minerals | | |
| 69 | | | | | | **DR** | | |
| 70 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales
DRILLER: BORING NO.: P-2 SHEET 4 OF 6

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-2

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | | | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 76 | | | | | | | | |
| 77 | | | | | | | | |
| 78 | R-N | | | | | DIORITE, with high percentage of mafic minerals **DR** | | |
| 79 | | | | | | | cement grout | |
| 80 | | | | | | | top of bentonite | |
| 81 | | | | | | | seal | |
| 82 | | | | | | | | |
| 83 | | | | | | | | |
| 84 | | | | | | | top of # 1 qtz sand | |
| 85 | | | | | | | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | | | | | | | | |
| 90 | R_N | | | | | DIORITE, with high percentage of mafic minerals **DR** | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-2 SHEET 5 OF 6

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: _____ BORING NO.: P-2

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 91 | R-N | | | | | DIORITE, with high percentage of mafic minerals, some pyrite DR | | |
| 92 | | | | | | | | |
| 93 | | | | | | | top of screen | |
| 94 | | | | | | | | |
| 95 | | | | | | | 10 slot sch. 40 PVC screen - 2-inch dia. | |
| 96 | | | | | | | | |
| 97 | | | | | | | | |
| 98 | | | | | | | | |
| 99 | | | | | | | | |
| 100 | R-N | | | | | DIORITE, with high percentage of mafic minerals DR | | |
| 101 | | | | | | | | |
| 102 | | | | | | | | |
| 103 | | | | | | | | |
| 104 | | | | | | | | |
| 105 | | | | | | | | |
| 106 | | | | | | boring terminated @ 105-ft bgs | | |
| 107 | | | | | | | | |
| 108 | | | | | | | | |
| 109 | | | | | | | | |
| 110 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-2

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico
CTO NO.: 138 BORING NO.: P-3
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

| Rig: B-90 | Split Spoon | Casing | Augers | Core Barrel | Date | Progress (Ft.) | Weather | Depth to Water (Ft.) |
|---|---|---|---|---|---|---|---|---|
| Size (ID) | | | | | 8/19/99 | | sunny, humid, 90 | -- |
| Length | | | | | | | | |
| Type | | | | | | | | |
| Hammer Wt. | | | | | | | | |
| Fall | | | | | | | | |

**Remarks:** The piezometer was advanced with an air rotary drill rig. The lithology was descriped from the drill cuttings.

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

**WELL INFORMATION**

| Type | Diam. | Top Depth (Ft.) | Bottom Depth (Ft.) |
|---|---|---|---|
| Sch 40 PVC screen | | | |
| Sch 40 PVC riser | | | |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 4 | | | | | | | | |
| 5 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 6 | | | | | | | | |
| 7 | | | | | | | cement grout | |
| 8 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales
DRILLER: BORING NO.: P-3 SHEET 1 OF 9

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | R-N | | | | | DIORITE, little quartz, olivine **DR** | 2-sc 2-inch diameter sch. 40 PVC riser | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | cement grout | |
| 17 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| | | | | | | Match to Sheet 3 | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-3 SHEET 2 OF 9

Baker

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 35 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | cement grout | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 46 | | | | | | | | |
| 47 | | | | | | | | |
| 48 | | | | | | | | |
| 49 | | | | | | | | |
| 50 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-3

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.:

BORING NO.: P-3

**SAMPLE TYPE**

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

**DEFINITIONS**

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level
BG/PS = Background/Point Source

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | |
| 52 | | | | | | | | |
| 53 | | | | | | | | |
| 54 | | | | | | | | |
| 55 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 56 | | | | | | | | |
| 57 | | | | | | | 2-inch diameter sch. 40 PVC riser | |
| 58 | | | | | | | | |
| 59 | | | | | | | | |
| 60 | | | | | | | cement grout | |
| 61 | | | | | | | | |
| 62 | | | | | | | | |
| 63 | | | | | | | | |
| 64 | | | | | | | | |
| 65 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 66 | | | | | | | | |
| 67 | | | | | | | | |
| 68 | | | | | | | | |
| 69 | | | | | | | | |
| 70 | | | | | | | | |

DRILLING CO.: ERTEC

DRILLER:

BAKER REP.: Joel Morales

BORING NO.: P-3

Baker

Baker Environmental

# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: 138 BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 71 | | | | | | | | |
| 72 | | | | | | | | |
| 73 | | | | | | | | |
| 74 | | | | | | | | |
| 75 | R-N | | | | | DIORITE, little quartz, olivine **DR** | 2-inch diameter sch. 40 PVC riser | |
| 76 | | | | | | | | |
| 77 | | | | | | | | |
| 78 | | | | | | | | |
| 79 | | | | | | | cement grout | |
| 80 | | | | | | | top of bentonite | |
| 81 | | | | | | | seal | |
| 82 | | | | | | | | |
| 83 | | | | | | | | |
| 84 | | | | | | | top of # 1 qtz sand | |
| 85 | R-N | | | | | DIORITE, little quartz, olivine **DR** | | |
| 86 | | | | | | | | |
| 87 | | | | | | | | |
| 88 | | | | | | | | |
| 89 | R_N | | | | | | | |
| 90 | | | | | | | | |

DRILLING CO.: ERTEC BAKER REP.: Joel Morales

DRILLER: BORING NO.: P-3 SHEET 5 OF 9

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# TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Vieques Phase I, Vieques Island, Puerto Rico

CTO NO.: BORING NO.: P-3

| SAMPLE TYPE | DEFINITIONS |
|---|---|
| S = Split Spoon A = Auger | SPT = Standard Penetration Test (ASTM D1586) |
| T = Shelby Tube W = Wash | PID = Photo Ionization Detector Measurement |
| R = Air Rotary C = Core | MSL = Mean Sea Level |
| D = Denison P = Piston N = No Sample | BG/PS = Background/Point Source |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | SPT | Lab ID | PID (ppm) BG/PS | Visual Description | Well Installation Detail | Elevation (Ft. MSL) |
|---|---|---|---|---|---|---|---|---|
| 91 | | | | | | | | |
| 92 | | | | | | | | |
| 93 | | | | | | | top of screen | |
| 94 | | | | | | | | |
| 95 | | | | | | | 10 slot sch. 40 PVC | |
| | R-N | | | | | DIORITE, little quartz, olivine | screen - 2-inch dia. | |
| 96 | | | | | | **DR** | | |
| 97 | | | | | | | | |
| 98 | | | | | | | | |
| 99 | | | | | | | | |
| 100 | | | | | | | | |
| 101 | | | | | | | | |
| 102 | | | | | | | | |
| 103 | | | | | | | | |
| 104 | | | | | | | | |
| 105 | R-N | | | | | DIORITE, little quartz, olivine | | |
| 106 | | | | | | **DR** | | |
| 107 | | | | | | | | |
| 108 | | | | | | | | |
| 109 | | | | | | | | |
| 110 | | | | | | | | |

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DRILLER: BORING NO.: P-3 SHEET 6 OF 9

# APPENDIX G
# WELL AND PIEZOMETER NOTES

ERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Cerro Gorda JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/19/99
PAGE: 1 OF 1

NW-1

depth Description

50' - moderately weathered and fines of rock fragments, dark bluish gray matrix.

60' - Do, more fines in the cuttings yellowish brown, olive green material

70' - same material without weathering.

80' - Do

90' - Do, not weathered, some bluish gray matrix some yellowish brown fragments

100' - Do

120' - Do

130' - Do, same material, Bluish gray fine grain matrix.

The cuttings where too small to Identify clearly the type of rock

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Cap Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Meeks DATE: 08/15/99
PAGE: 1 OF 1

RCRA-3 - 08/14/99 - from cutting.

| depth | Time | Description |
|---|---|---|
| 5' | 10:00 AM | → 4/6 10YR dark yellowish brown matrix is a silty clay with a minimum to coarse sand. |
| 10' | 10:11 | → Do. |
| 15' | 10:15 | → Do. but more fines, less coarse sand. (quartz. |
| 20' | 10:23 | → Do. |
| 25' | 10:31 | → dark yellowish brown fine from cutting, coarse material sand, granodiorite look alike material, Quartz, feldspar, orthoclase (mafic) |
| 30' | 10:38 | → Do. |
| 35' | 10:46 | → medium to coarse chips from cutting, is a look alike granodiorite composition, lahutes and dark minerals some yellowish brown but less than before. |
| 40' | 10:04 | → Do |
| 45' | 11:09 | → Do, pyrite, more lahutes, less fines |
| 50' | 11:19 | - Do, darker because oxide material on cutting, more brown in rock fragments |
| 55' | 11:25 | - Do |
| 60' | 11:40 | - Do. |
| 65' | 11:49 | - Do |

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/14/91
PAGE: 1 OF 2

6:30 - At site.
Fernando Campos crew start to decon, STC crew start to work in RCRA-3

6:45 - Alex Campos crew went to the base to get water.

7:30 - Alex Campos crew still at the base getting water, Ernesto Campos continue at Decon, and STC in RCRA-3.

8:40 - STC crew leave RCRA-3 and start decon to machine, STC crew out to get cement. RCRA-3 will be finish by Ernesto Campos Crew.

9:21 - NW-1 was finish (134') and the well was started. 10' of screen and 15' over the screen of gravel.
9:25 - depth of water.

10:14 - 135' of pvc.
10:53 - Gravel to 109.2.

12:26 - After 5 galon bucket of bentonite. final measurement, 107.01'
12:45 - Keep grouting 3/4 of a 55 galon. of water and 6 -(47 lbs) cement bag.

2:12 - Start to measure water levels.

NW-6 → 52.15 - WD
→ 148' = TD
RCRA-4 → 37.28 - WD
52.71 - TD
3 - casing
NW-8 → 8.13 - WD
17.1 - TD
2.23 - casing
NW-5 → 39.13 - WD
122 - TD
2' - casing
RCRA-3 → 69.2 - TD
54 - WD } Not completed

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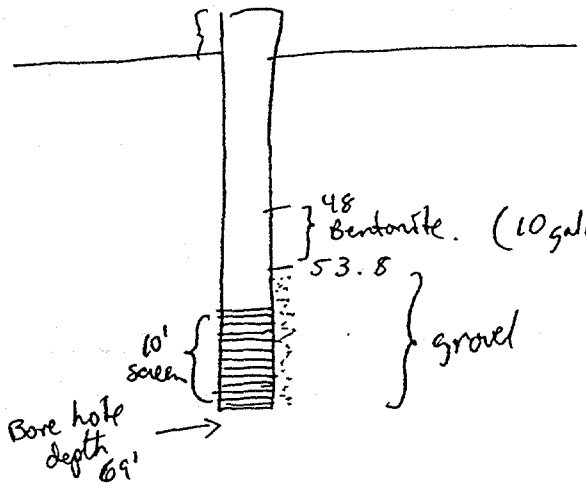
PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/14/99
PAGE: 2 OF 2

NW-3 → 118.40 WD
3.59 casing
TD not found

RCRA-1 → 49.12 WD
67 → TD
1.91 - casing

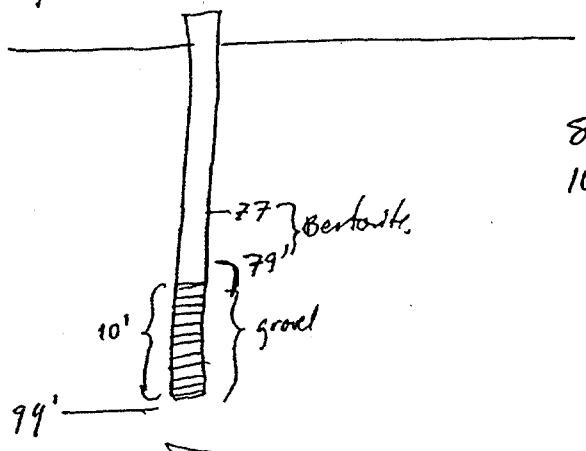
RCRA-2 → 66.41 TD
40.34 WL
2.2 casing

RCRA-3




water depth - 54' (before tubing)
Ernesto crew said that he felt a fracture at about 63'.

P-7




85' solid
10' screen

Joel Morales

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DERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M HILL
CHECKED BY: Del Morales DATE: 08/18/99
PAGE: 1 OF 1

P-5 - 08/18/99 from Cuttings

| depth | Time | Description |
|---|---|---|
| 5' | 12:12 | medium to coarse sand in a fine grai yellowish brown soil matrix. |
| 10' | 12:17 | ~~well weathered~~ moderately weathered granodiorite rock fragments, rare micas and yellowish brown appearance. |
| 15' | 12:22 | Do |
| 20' | 12:31 | Do but less weathering |
| 25' | 12:31 | Do |
| 30' | 1:22 | Do, some olive or green material. |
| 40' | 1:35 | Do |
| 45' | 1:43 | Do |
| 50' | 2:05 | Do |
| 60 | 2:20 | Do |
| 70 | 2:45 | Do |
| 80 | 3:00 | Do |
| 100 | 3:30 | Do, The granodiorite is very tending to the granite side |
| 115 | 4:10 | Do |
| 120 | 4:20 | Do |
| 130 | 4:40 | Do |
| 140 | 4:45 | Do |

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/12/99
PAGE: 1 OF

P-2 - from cutting

| Depth | description |
|---|---|
| 5' | 4/3 10YR brown silty clay, fine to medium sand, pale olive, organics. |
| 10' | Do without organics, |
| 15' | Do, The cutting is more pale olive than brown, some sand (one rock fragments. |
| 20' | Same kind of material, the sand is from Granitic material |
| 25' | Do |
| 30' | the cutting present less quantity of fines and more rock fragments, the rock is a ~~granite~~ Diorite or but with higher percentage of mafic minerals (orthoclase). |
| 35' | Do |
| 40' | Do |
| 50' | Do |
| 60' | Do |
| 65' | Do |
| 85' - | Do |
| 95' - | Do, Pyrite |
| 105' - | Do |

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M Hill
CHECKED BY: Joel Morales DATE: 08/18/99
PAGE: 1 OF 1

08/16/99 NW-7

depth hour.

5' - 2:45 → fine sand, silty clay, 5/10Y - greenish gray, look like organic from the color and site. (near swamp)

10' - 4:35 → light yellowish brown matrix, fine sand, 6/3 2.5YR

15' - → Do, some darker (brown material fragments) some sand.

20' - → Do, coarser sand.

40' - 4:46 - Do

45' - 4:55 - Do

55 - 5:05 - Do

60 - 5:10 - Do.

---

08/17/99

70 - 7:00 - coarse sand, light yellowish brown, some fines in the matrix.

80 - 7:20 - Do, the material seem to be groundout, but in the cuttings look like coarse sands.

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/15/98
PAGE: 1 OF

6:00 - At site
7:00 - Ernesto Campos Crew start on the monitoring well, and Alex Campos to finish pads.
STC - to finish P-5
10:00 Finish P-8 - Pad and start, to move to P-5
11:02 - start putting P-5 monitoring well
11:45 - Continue to grout P-5
12:00 - Lunch
1:00 - Back to work
~~[illegible]~~ -
1:52 - continue on P-5

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PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M HILL
CHECKED BY: Joel Morales DATE: 08/19/99
PAGE: 1 OF 1

P-6

60' - Granodiorite look alike Basalt fragment, Quartz, hornblend, some mica, The cutting look a bluish gray color

70' - Do,

The Driller only take this two samples, he said that the material was almost the same since the begining. No mayor changes in the hardness of the material, he did not feel it in the machine.

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167'
120' gravel

ERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/18/99
PAGE: 1 OF

P-3 from Cutting

Depth - hour - Description dark brown
5' → 7:33 → ~~[illegible]~~ ~~dark black~~ coarse cutting, mafic ~~[illegible]~~ material
4/2 7.5YR. look like diorite, some (quartz), (olivine)

10' → 7:48 → Do

15' → 8:07 → Do, finer cutting some material.

20' → 8:20 → Do

25 - 9:03 → Do.

30' - 9:25 - Do

40' - 9:43 → Do

50' - 10:55 - Do

60' - 11:20 - Do
~~[illegible]~~ - dark
→ 70' - 1:00 → Brick gray fine material, 4/1 10B, (look like diorite.) (~~Andesite~~)

80' - 2:17 → Do some light green mineral in the matrix (olivine)?

100 - 3:45 → Do, some ~~[illegible]~~

x 110 - 3:54 → Do

120 - 4:00 → Do

130 - 4:15 → Do
140 - 4:25 → Do
150 - 4:40 - Do
160' - 4:55 - Do no more samples

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: José Morales DATE: 08/19/99
PAGE: 1 OF 1

RCRA-1 → 08/13/99

depth Description

10'- Moderately weathered 5/6 10YR yellowish brown, gravel (gray material looks like weathered, ~~white spots (quartz)~~) on the matrix olive green (olive material), oxide material on faces of the small fragments.

20'- Do

30'- Do

40'- Do

50'- Do, more fines in the cutting yellowish brown color (5/4 10YR)

60'- Do, without the fines.

70'- Do

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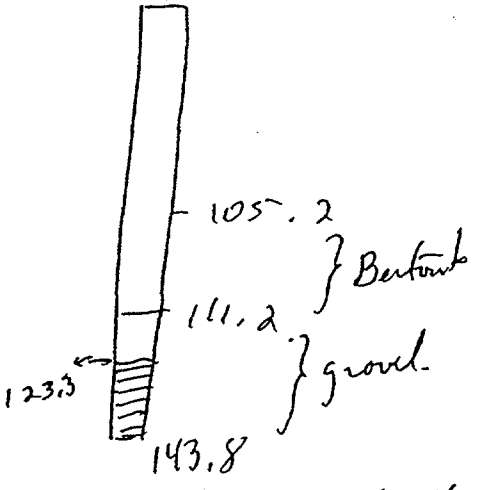
ENVIRONMENTAL RESOURCE TECHNOLOGIES

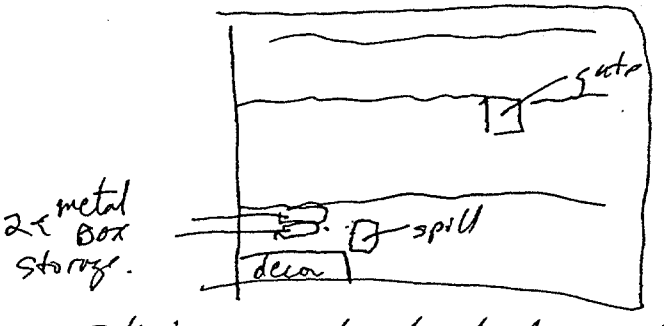
PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: José Morales DATE: 08/12/99
PAGE: 1 OF

6:00 - Arrive at site,
7:00 - ~~start~~ continue to drill on NW-6, STC at decon
8:30 - Take Gordon to airport,
9:30 - Pick. Odwid Cayes and Rick Morales, went to get diesel can and Rick car.
13:00 - start to build the monitoring well NW-6, final depth 143'
13:54 - ~~the~~ gravel for 143.8 to 111.2. Bentonite 111.2 to 105.2

14:45 - start to put the cement.
5 gravel bags
1 bentonite 5 gallon bucket.




20" of screen




5:00 - Diesel spill, the steam cleaner fall by the truck duster and about 2 galons of of diesel went in the soil. The crew start to get the soil with shovels ("palas") and 4 drums of cutting was recovered.

6:00 Finish the recovery of diesel. start to prepare the workers for next day (Diesel to the compressor, steam clean, Truck B-90)

6:40 - Pedro from compos drilling was cleaning the rocker in the decon area and he had his back injured. went to the hospital (Municipal). It was helped in the emergency room. The doctor said the leg was fine and that he will need some rest.
7:10 - finish at the hospital and went to the hotel

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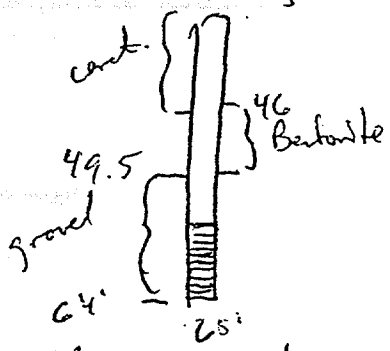
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: JMV DATE: 08/13/99
PAGE: 1 OF 1

6:00 - At site.
7:00 - STC at decon and waiting for Campos Drilling the get the equipment out of the truck
7:30 - start to change Decon Area. Went out to get cement
10:45 - John arrive and decide where to drill, STC start on NW-4 the STC machine start to overheat.
12:00 - Lunch
1:00 - start drilling on NW-4.
2:00 - Finish drilling at 60'
3:00 - The casing, The installation of the casing do not work properly, The drill rod are 6 1/4" and the casing is 6".
- Also campos crew still working on the NW-1 and. Enviro crew on RCRA-1
5:00 - Decide to abandon the NW-4 and send crew to decon.
- Enviro crew Finish the ~~drill~~ Boring at 64'. start to put casing
6:30 - STC crew out of site
- Enviro crew installing the well RCRA-1




- water L → 47.3'

7:00 - After one week 135' and found water start to pull the rod out and collapse
8:30 - Take the equipment to decon Area and out of the area.

Jose Manuel Valle

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/14/99
PAGE: 1 OF 1

P-7 8-14-99

| depth | Description |
|---|---|
| 58' | greenstone material, cutting is 5/, 2.5Y gray color. same ~~[illegible]~~ or similar (driller version) |
| 68' | Do, but with more olive or green material |
| 80' | Do |

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/15/99
PAGE: 1 OF 1

Sunday
6:00 - At site. Prepare machines to start drilling. (STC mechanic at site)
No cement.

7:10 - Trying to decide what to do, not enough materials and continue to prepare equipment.

9:00 - Continue to work with Edwin on the equipment.

12:00 - Lunch.

| Well ID | Time (pm) | Water Depth | True depth |
|---|---|---|---|
| NW-1 | 1:40 | 101.48 - .41 = | 101.07 |
| RCRA-1 | 2:00 | 49.59 - .41 = | 49.18 |
| RCRA-2. | 2:15 | 30.4 - .41 = | 29.99 |
| NW-3 | 2:35 | 118.83 - .41 = | 118.42 |
| NW-6 | 3:24 | 63.07 - .41 = | 62.66 |
| RCRA-3 | 2:50 pm | Developing | |
| NW-5 | 3:10 | 37.74 - .41 = | 37.33 |
| ~~NW~~ RCRA-4 | 3:30 pm | 38.55 - .41 = | 38.13 |
| NW-8 | 3:55 | 7.56 - .41 = | 7.15 |
| P-8 | 4:28 | 25.33 - .41 = | 24.92 |
| P-7 | | 52.81 - .41 = | 52.40 |

Joel Morales

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ERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp. Garcia JOB NO:
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6:30 - start to work on Decon area. STC crew change decon plastic. Campos crew start to prepare pads for the well that need them. Odriel and STC crew ~~when~~ move to the town to get cement (7:30)

9:00 - Alex Campos crew start to work on NW-4, the objective of the drill was to locate the casing at 60' to drill on tuesday.

10:30 - ~~Ernesto~~ Alex Campos crew continue to drill on NW-4. Ernesto Campos continue to work on the pads. RCRA-1, RCRA-3, NW-1.

12:00 - Lunch. STC went out of Area to get the food. 30 min

1:00 - Continue to work on Pads (Ernesto Crew). Alex Crew start decon. STC crew preparing pad for P-7.

2:00 - STC crew went to get the shipment of materials at the airport. 2 people from the crew stay to clean site

3:00 - Alex and Ernesto Crew star to work on NW-7 put casing.

4:30 - STC crew went to the landfill.

6:30 - Out of site.

Joel Morales Vistal

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ERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
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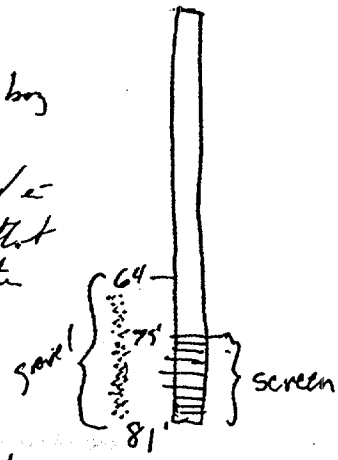
NW-7
~~PCBA~~

6:00 Campos Crew (Alex) start on ~~NW~~-7, 80' of external casing.
6:30 - STC and Campos (Ernesto) start on P-6 and P-8.
8:20 - Alex crew hit well inside the boring. ground water 64'
8:15 - start to put the bentonite, powder bentonite
9:30 - stop putting the bentonite 2 x 55 gallons of drums 1/2 bag of Bentonite

7
89
-67
14

10:30 - lunch, After measuring the bentonite the level is the same, Decide to leave the well like that for a couple of hours to the use the other bentonite




1:00 STC Rig broke a hose

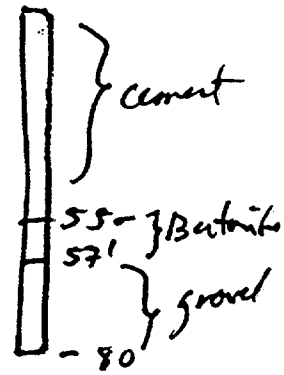
15:00 After checking the Rig start in NW-4

15:45 - 80' deep and start to get the Rod out

16:00 All the rods out start to install the well.

17:37 - Finish NW-4
18:30 - Finish NW-7. Complete with cement. Ernesto Campos Crew left the boring P-6 at 170, An STC at 180.

NW-4




The Bentonite real was made with Bentonite pellet and gravel at the same time

JV.

ERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
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08/16/99 NW-4 → from cutting

Pies Hora

5' → 8:30 → fine to medium sand, silty clay, occasional gravel. yellowish brown

10' → 8:45 → fine sand, yellowish brown matrix 5Y 10YR →, quartz, some mafic minerals very fine,

15' → 8:58 → Do

20' → 9:10 → Do

25' → 9:45 → olive matrix, ~~medium sand to coarse~~ coarse sand, quartz, some mafic minerals, material apparently from granodiorite.

30' → 9:56 – Do

35' → 10:02 → Do.

40' → 10:04 – Do

45' – 10:15 → Do

50' – 10:25 – Do

55' – 10:30 – Do, some green material, olive

60' – Do

70' 80' } 08/17/99 → dark greenish gray matrix, harder, same material and minerals as above like diorite.

ERTEC
ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: JMC DATE: 08/18/97
PAGE: 1 OF

6:00 – At site.
7:18 – Alex Campos Crew finish decon, STC start to pull the rods out and Ernesto campos crew the zone.

~~10:30~~
8:30 - Went to airport to get the equipment,
10:30 - The engineer arrival.
11:33 - download the equipment, went to repair store.
12:00 - Lunch
12:30 - Back to drill (STC)
16:35 - Continue to drill - Tricon, start ~~so~~ had to pull all the rods and clean
18:46 - Out to decon Area

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ENVIRONMENTAL RESOURCE TECHNOLOGIES

PROJECT: Camp Garcia JOB NO:
LOCATION: Vieques
CLIENT: CH2M-Hill
CHECKED BY: Joel Morales DATE: 08/25/99
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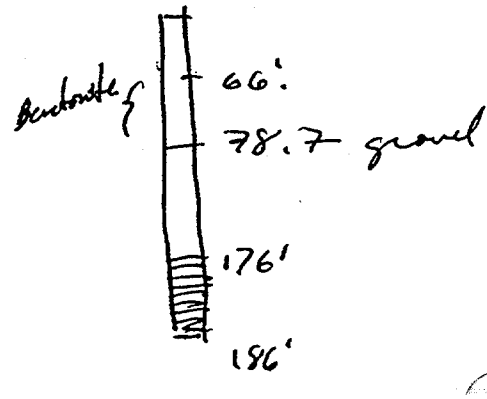
6:30 Arrive to site and prepare to move to P-1
STC crew start to set drums at Decon Area

7:15 - The digger from Sun Rental Arrive, STC start to move to the well to get the drums.

7:50 - Capos drilling continue to pull the rods out of the P-1

8:18 - Final depth of P-1 -186'
Water depth -134'
gravel up to -124'
Water table after gravel -130'
Water depth 128' = 11:04 Am
final gravel depth -78.7' gravel.
5 gallon - Bentonite → 66'
Well diameter → 6"




12:00 - Continue grouting
1:00 - STC crew continue to move drums, and Capos drilling to finish P-1

3:00 - STC crew continue on drums and Capos working on P-1 pad.

5:00 - Everybody at site and working out for the day, working on the materials and putting drums and decon to the right place.
5:30 - Continue on finishing in the site.

6:30 - out of site.

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106 Location

Project / Client

* Tufton Barlow

Main Gate Camp Garcia 741-2090
Dispatcher Security 741-0615
LT Cruz, OIC Cell 376-6513
Watchstander NASD 865-5360/61

Cheif of Public Works
Vieques Romine

Guillermo Perez General Superior
GS

OP1 { 865-5266
865-8263

Project / Client Truly (Vieques)

Note: mobilized to Puerto Rico
on Wednesday night &
arrived on Thursday night
Began work Thursday Morning
Thursday Morning met John Tomik/Truly
Chris Penny/Work Party &
walked Vieques site @ Camp Garcia
Asked Rick Gorsia to join me
@ Vieques site, HG arrive
Friday @ 2:30 A.M & Work Began
Friday @ 4:00 A.M.
Dozer onsite on Friday 3rd
of August. Security onsite
on Friday Also.

0500 Met L Gorina @ lobby of
Westin Rio Mar Resort to
Richard Hardy

Project / Client Navy (Vieques)

Pack gear w/ equipment needed for Vieques well development & sampling

0530 John Bimik & Chris Penny pick up Pete @ lobby of Westin to depart for the Fajardo Airport

0600 Arrive @ Fajardo Airport w/ Pete Gorsira, Chris Penny, & John Bimik

0730 Arrive @ Vieques Enroute to Camp Garcia.

0815 Arrive @ Camp Garcia & visit bunkers to check on drilling program.

0900 Pete Gorsira & Rich Morales depart Camp Garcia to rent another vehicle & purchase sampling supplies.

Richard Morales

Project / Client Navy (Vieques)

1115 Back outside @ Camp Garcia. Chris Penny has left to Roosevelt Roads & John Bimik is finalizing the locations for the piezometers.

1130 Break for lunch

1200 Started setting up for development of monitoring wells

1400 Set up on NW6, begin development

1410 DTW = 52.56' @ NW6
TD = -.41
52.15'
DW 9/4/99

TD = 48'

1440 Set ground fault pump @ NW6.
Hazco Serial No. 3542
DW 9/4/99

1450 Began Development Calibration of pH & conductivity meter.

Richard Morales

 Location _____ Date 8/4/99

Project / Client Navy (Vieques)

Meter Calibration

pH meter Model 230A ORION
S/N 002159
property of HAZCO #1447

Autocalibration 2 Buffer

pH 7 reads 6.98 @ 31.6°C
pH 4 reads 4.02 @ 31.6°C

slope 97.4 %

YSI Meter Model 30/50
S/N 95D 32633
Calibration check with
1000 µS/cm YSI 3167
LOT # 9J F0528 EXP 12/00

Meter reads 1102 @ 30.9°C
Calibration to 1000 µS/cm
Meter reads 1111 µS/cm @ 30.9°C

Richard Morales

 Location MW-65-52 Date 8/4/99 CRUZ

Project / Client

NW-6 Development (pumping @ ≤ 0.5 gpm)

| Time | V(gal) | pH | Cond(µs) | comments | SAL |
|---|---|---|---|---|---|
| 1618 | 18 | 7.57 | 1100 | turbid. | 0.5 |
| | temp = 29.0°C | | | | |
| 1732 | 25 | 7.56 | 1102 | turbid | 0.5 |
| | temp = 29°C | | | having to wait for recharge | |
| 1750 | 32 | 7.56 | 1104 | same as above | 0.5 |
| | temp = 29°C | | | | |

1800 Stopped developing this well will let well recharge & purge again tomorrow.
Mob. to RCRA 4 for development
DTW = 37.28'
TD = 52.71'

1815 Set groundfos pump
Hazco serial #
Start pump.

Richard Morales

 Location _____ Date 8/4/99

Project / Client _____

RCRA Development

| Time | V | pH | cond. | Sal | temp. Comments |
|---|---|---|---|---|---|
| 1830 | 6 | 7.36 | 1459 | 0.7 | 29.2 |
| 1845 | 12 | 7.35 | 1480 | 0.7 | 29.3 |
| 1900 | 18 | 7.34 | 1487 | 0.7 | 29.3 |
| 1930 | 24 | 7.35 | 1485 | 0.7 | 29.4 |

1935 Began packing Equipment & cleaning site

1950 offsite will eat & lodge @ observation Point 1 (OP 1)

 Location _____ Date 8/4/99

Project / Client _____

Comments

turbid. no odor

Same as above

Same as above

Same as above.

Location _____ Date 8/15/99

Project Navy (Camp Garcia, Vieques)

0600 Rick Morales & Rick Corsino of MCMHU on site to continue development & installation of piezometers & monitoring wells
temp ≈ 85°F
Sunny possibly rain in the afternoon.

0700 Rick² depart to obtain a second generator.

0930 Sun Rental in Vieques is trying to provide us w/ a small portable generator. We picked up generator from them last night after leaving site.

0945 Rick² back on site to continue development of RCRA 4 & NW 6
See development log.
Richard Morales



Location _____ Date 8/15/99

Project Navy (Camp Garcia, Vieques)

0930 Rick Morales departs from site to pickup Chris Penny.

note: Spoke w/ John Tomik earlier this morning & gave him an update of ~~last night~~ on 8/15/99 yesterday's events
I also called Marty Chasen yesterday & asked him to come down & help w/ the drilling.

0945 Rick Morales @ Vieques airport making reservations for tomorrow morning's return.

1015 ~~Rick~~ Chris Penny & depart to site.

1030 Arrive @ Camp Garcia to have well locations w/ Chris & to update him on
Richard Morales

Location _____ Date 8/15/99

Project / Client Navy (Camp Garcia, Vieques)

Use drilling.

1115 Back to Airport to drop off drill

1330 Back onsite w/ Rich Gossman @ RCRA4 pu drill

Note, tomorrow Party chaser, Allyie Chaing & Kathy Swanson will be coming to help Monday Morning.

1300 Monitoring well RCRA4 is now pumping clear.

Calibration of pH meter 2120N 230A S/N 003159 HACO # 1447 was performed by R. Gorsira, see his log book. Same w/ conductivity meter

Richard Morales



Location _____ Date 8/15/99

Project / Client Navy (Camp Garcia, Vieques

1230 Development complete @ RCRA4 will break for lunch to discuss days events w/ Earth Tech Geologist.

1300 Began mobilizing to develop RCRA3 Monitoring well & continue NW6 development.

1400 Development starts @ RCRA3 & continues @ NW6 see development logs

Note: drillers were not working today they were sent back to their hotels @ 1200

1530 finished developing RCRA3 & almost done w/ NW6. Begin cleaning site in order to catch flight. Back to Fajardo @ 5:00

Richard Morales

Project / Client Navy (Camp Garcia)

1600 Depart for airport after decontaminating pump used for development the inserts were disposed per Bakers SOP

1630 Arrive @ Vieques to depart for Fajardo

1700 Arrive in Fajardo airport to Westin to shower & depart for San Juan to pickup Marty, Allyn, & Katie.

1830 Arrive @ airport & picked up Marty, Allyn & Katie will arrive back for dinner then conduct a meeting to set schedule for tomorrow

Richard Morally

Project / Client Navy (Camp Garcia, Vieques)

0615 Met Rick G., Marty Carson, Allyn & Katie in lobby of the Westin

1000 Katie & I left van @ Roosevelt Roads Naval Station & ~~met~~ arrived in Vieques to join w/ rest of team.

1100 Rented van & left Katie & Allyn @ Rio to sort bottles for the sampling event. Rick & Marty are staking sediment sampling locations and developing MW5

1130 Left for airport to pickup Chris Penny

1315 Went ~~back to Camp Garcia~~ for supplies to get some things for field team

We developed wells (Rick Borsma & Rick Morally) for the rest of the day

Richard Morally

Project / Client Camp Garcia Vieques Puerto Rico

Allyie & Katie conducted a bottle inventory & arranged our storage space located @ Public Works.

Allyie & Katie started to collect soil samples (surface soil) See log book containing soil sampling collection information.

Note: We will continue to develop wells tomorrow 8/17/99 see Rick Gorsma's log book for 8/17/99 field activities

Richard Morales

Project / Client CAMP GARCIA

WEATHER: BRIGHT, SUNNY 95°C

CREW: RICK MORALES / ALLYIE CHANG

08:00 - ARRIVE @ BLDG 4042 TO PREPARE SAMPLE KITS AND EQUIPMENT

10:30 - ARRIVE @ CAMPO GARCIA @ STATION RCRA-2 AND DECON PUMP.

10:45 - TAKE EB-4 (EQUIPMENT BLANK). NOTE: COLLECTED EB-4 W/ HPLC WATER.

10:55 - TRIP BLANK.

11:15 - COLLECT H2O SAMPLE @ RCRA 2 Run Amt, Sulfate, 2nd Trunk, TOC SU Perchlorate

1122 Calibrated horiba meter Serial No. 810016 w/ Horiba U-10 Auto Calibration Solution pH 4.01 ONTU, 4.49 mS/cm Lot # D70 Exp. 10/30/2000 meter reads pH 4.00

Richard Morales

Project / Client Navy Vieques, PR

cond = 1.50 ms/cm, 0 NTU

1040 RM 8/9/99

~~1130~~ Begin Purging RCRA2 monitoring well

DTW = 39.96'

TD = 65.05

$H_2O$ column = 25.09'

1 well ∀ = 25.09' * 0.1632 = 4.2 gal

3 ∀ = 12.7 gal

we will be ~~doing~~ RM 8/9/99 purging this well with a grundfos pump pumping at ~ 10 gpm.

| ∀ | pH | cond (ms/cm) | NTU turb | Sal | DO (mg/L) | °C temp |
|---|---|---|---|---|---|---|
| 3.5 | 6.38 | 1.81 | 7 | 0.08 | 7.49 | 29 |
| 6.0 | 6.44 | 1.79 | 1 | 0.08 | 9.58 | 28.5 |
| 9.0 | 6.43 | 1.74 | 1.2 | 0.08 | 9.21 | 28.4 |
| 12.0 | 6.48 | 1.79 | 0 | 0.08 | 9.12 | 28.1 |

RCRA2 monitoring well was sampled for Appendix 9, 2nd $H_2O$ Stds, Fahrney, perchlorates

Richard Morales

Project / Client NAVY, Vieques, PR

Picric Acid, explosives, metals,

1300 Arrive @ RCRA1 monitoring to purge for sampling

DTW = 49.13'

TD = 66.62'

$H_2O$ column = 17.49

1 well ∀ = 17.49' * 0.1632 = 2.9 gal

3 ∀ = 8.6 gal.

| ∀ (gal) | pH | cond (ms/cm) | turb | Sal (%) | DO | temp °C |
|---|---|---|---|---|---|---|
| 3.0 | 6.46 | 2.08 | 65 | 0.1 | 8.81 | 29.0 |
| 6.0 | 6.45 | 2.09 | 25 | 0.1 | 8.78 | 28.8 |
| 9.0 | 6.43 | 2.09 | 25 | 0.1 | 8.65 | 28.9 |

We purged this well @ less than or close to 1 gal/min.

Richard Morales

Project / Client Navy, Vieques, Puerto Rico

1400 Collected G.W. Samples from RCRA1. Will Required Append. 9, Perchlorates, picric Acid, Salinity, explosives & 2nd $H_2O$ Stds.

RM/ 8/18/96

1405 ~~Began Purging NW6~~ Mob to NW6 DTW = 52.47'
TD = 147.85

1410 Note: this well was purged dry yesterday ~~Are~~ below is a summary of Readings.

| # | pH | turb | DO | cond | temp | Salinity |
|---|---|---|---|---|---|---|
| 5 | 6.60 | 363 | 16.15 | 1.16 | 30.0 | 0.05 |
| 10 | 6.95 | 148 | 8.19 | 1.13 | 33.6 | 0.05 |
| 15 | 6.96 | 210 | 8.87 | 1.11 | 28.9 | 0.04 |

Dry

1445 Sampled NW6 for Append 9 perchlorates, picric Acid, Salinity, explosives & 2nd $H_2O$ Stds

Richard Morales

Project / Client Navy, Vieques Puerto Rico

1450 Mob. to NW5
Note: this well was purged dry yesterday below is a summary of the reading collected yesterday

| # | pH | turb (NTUs) | DO (mg/l) | cond (mmhos/cm) | temp | Salinity |
|---|---|---|---|---|---|---|
| 5 | 7.03 | 55 | 8.90 | 1.53 | 29.2 | 0.07 |
| 9 | 7.04 | 50 | 9.00 | 1.50 | 29.2 | 0.07 |

1530 Collected NW5 G.W. samples for Append. 9, perchlorates, picric Acid Salinity, explosives & 2nd $H_2O$ Stds.

1535 Mob. to RCRA3 monitoring well
DTW = 55.08'
TD = 70.80'
$H_2O$ column = 15.72'
1 well # = 15.72 * 0.1632 = 2.6 gal
3 # = 7.7 gal

Richard Morales

Project / Client Navy, Vieques, Puerto Rico

1545 Pump on Rate ≈ 100 ml/min

| # | pH | turb | cond | DO | temp | salinity |
|---|---|---|---|---|---|---|
| 4 | 6.32 | 100 | 1.50 | 8.75 | 29.6 | 0.06 |
| 6 | 6.33 | 107 | 1.49 | 8.66 | 29.3 | 0.06 |
| 10 | 6.29 | 6 | 1.48 | 8.57 | 29.0 | 0.06 |

1555 Collected GW Sample from [illegible] Analysis - Approved [illegible] Explosives & 2nd H2O sets

~~Approved~~

| ~~#~~ | ~~pH~~ | ~~TURB~~ | ~~DO~~ | ~~COND~~ | ~~TMP~~ | ~~SAL~~ |
|---|---|---|---|---|---|---|

1600 Run to guard shack to begin packing coolers.

1745 finished packing coolers for FEDEx, depart for airport to catch charter plane.

1830 Depart Fajardo airport for San Juan International airport

Richard Moroley

Location [illegible] Date 4/19/97 129

Project / Client Navy, Vieques, Puerto Rico

1915 Arrive @ FEDEx & begin to prepare All Bills for coolers we shipped all soil & water having 48 hr hold times

1945 Depart San Juan International on VAL (787) 741-8211 or 1-888-901-9247 Returning to Vieques to pickup Rest of field team.

2030 Pickup Rest of Field team in Vieques, depart for Fajardo

2100 Arrive @ Fajardo will have dinner & then go to warehouse to pickup HPLC water that we will need tomorrow

Richard Moroley

150 Location Camp Garcia Date [illegible]

Project / Client Navy, Vieques, Puerto Rico

0615 Depart the Westin Resort Marty Clausen, Rick Corsiria, Rick Morales, Katie Swanson & Allie Chang.

0630 Arrive @ Fajardo airport & chartered plane to Vieques

0715 Arrive @ Vieques. Field team goes to PW to drop off Katie & Allie. They will be preparing coolers for FED EX shipping. Marty will develop NW1 & NW3 Rick Corsiria will develop NW4 & I will sample RCRA 4 & NW8 monitoring wells.

0845 I arrived @ Camp Garcia & met Rick Corsiria @ Guard gate. He will decon pumps in order to develop MWs

Richard Morales

Project / Client Navy, Vieques, Puerto Rico

0900 I (Rick M) arrive @ RCRA4 Monitoring well. Begin to set up to purge well

TD = 53.10'
DTW = 37.32'
$H_2O$ column = 15.78'
1 well ∀ = 15.78 * 0.1632 = 2.6 gal
3 well ∀ = 3 * 2.6 = 7.7 gal

| ∀ | pH units | cond ms/cm | turb NTUs | D.O mg/l | temp °C | Salinity % |
|---|---|---|---|---|---|---|
| 3.0 | 6.66 | 1.53 | 179 | 8.32 | 30.2 | 0.07 |
| 6.0 | 6.67 | 1.53 | 180 | 8.32 | 29.8 | 0.07 |
| 9.0 | 6.67 | 1.53 | 180 | 8.35 | 29.5 | 0.07 |

Note: water is clear not turbidity & meter Reads 180 (I don't think meter is working correctly in turbidity mode).

Calibrated Horiba meter Serial No. B100K6 w/ Horiba U-10 Auto calibration solution pH 4.01, 0 NTU, 4.49 ms/cm lot# 1778 Exp. 10/30/2000

meter Reads pH = 4.00 cond 4.50 ms/cm & 0 NTUs.

Richard Morales

Project / Client Navy, Vieques, Puerto Rico

I will be using a Grundfos pump to ~~develop~~ purge well pumping @ ~1.0 gpm or less. RM 8/19/99

0950 Collected G.W. samples from RCRA4. Analysis Requested; Append. 9, Explosives, perchlorates, picric acid, 2nd $H_2O$ Stds, & salinity.

1015 collected EB-5 for Append. 9, explosives, perchlorates, picric Acid, 2nd $H_2O$ Stds, & salinity. water used to dilut EQ.BLK was Allied Signal High Purity solvent B&J Brand Lot BT999 & Lot 3U040 cat. 365-4

1150 Mob. to NW8
DTW = 7.26'
TD = 15.32'
$H_2O$ Column = 8.06'

Richard Morales

Project / Client Navy, Vieques, Puerto Rico

1 Well V = 8.06' * 0.1632 = 1.31 gal
3 well V = 1.31 * 3 = 3.9 gal

| V | pH (units) | Cond (ms/cm) | Turb (NTU) | D.O. (mg/L) | temp (°C) | Salinity (%) |
|---|---|---|---|---|---|---|
| 2 | 6.06 | 64.0 | 999 | 6.84 | 29.7 | 4.00 |
| 4 | 6.10 | 64.1 | 999 | 6.84 | 29.7 | 4.00 |
| 6 | 6.11 | 64.1 | 999 | 6.84 | 29.7 | 4.00 |
| 18 | 6.11 | 64.1 | 999 | 6.84 | 29.7 | 4.00 |

1215 Begin setting up on NW8 in order to Purge well.
I will be using a Grundfos pump to purge well. Pumping rate will be less than or equal to 1 gpm.

Note: Rick Corsira took coolers containing samples that I have collected today to PW for packing. He will also purchase tape & ice for the coolers

Richard Morales

 Location Camp Garcia Date 8/19/99

Project / Client Navy, Vieques, Puerto Rico

John Tomik/WSC called & I updated him on the day's activities

1255 Collected NWB G.W. samples for Append. 9, explosives, perchlorates, & picric acid
RM 8/19/99

I was unable to purge well & got a non-turbid sample a orange colored water was what was pumped from this well RM/8/19/99.

Note: Rest of day I will be helping pack & ship samples via FED EX to the laboratories

Raymond Morales

Location Date 

Project / Client

BLANK PAGE

DB 20-49

Project / Client NAVY, VIEQUES PUERTO RICO

07:10 - ARRIVE @ PW BLDG TO PREPARE SAMPLE KITS AND BEGIN TO MOBILIZE.

CREW: MARTY CLASEN
KATIE SWANSON
ANNIE CHANG

08:45: COLLECTED EQUIPMENT BLANK (EQB-6). NOTE: COLLECTED EQB-6 ON BAILER USED FOR SAMPLE.

AZ 08.20.09 USED ~~BAILER RINSE~~ ALLIED SIGNAL BOTTLED WATER. (LOT NO. BL040) & SAVANNAH WATER FOR FILT METS, PERCHLORATE, SULFIDE, CYANIDE ANALYSIS AZ 08.20.09). EB6 COLLECTED FOR: A9 (METALS, VOC, EXTRACTABLES, EXPLOSIVES)

0900 - TRIP BLANK (LAB) 2°DW STDS, SALINITY.

09:15 - DECON EQUIPMENT (GRUNDFOS PUMP ~~G9~~ AZ 08.20.09 13254 HAZCO NO.). USED TAP WATER RINSE / ALCANOX DIP / DI RINSE TO DECON PUMP ~~NOTE: USE PLASTIC~~ AZ 08.20.09

Project / Client NAVY, VIEQUES PUERTO RICO.

09:50: ARRIVE NAVY-1 AND TOOK SAMPLE W/ BAILER.

NOTE: GROUNDWATER WAS A LITTLE MURKY WHEN FIRST BAILED, BUT CLEARED UP AFTER FIRST BAIL.

1:30: ARRIVE @ NAVY-7 (NW-7) AND BEGIN TO SET UP TO PURGE WELL AND SAMPLE. CALIBRATE HORIBA (EQUIP. NO. 810016) W/ ~~STD~~ CALIBRATION SOLN. LOT# 1778 EXP. 10.30.2000

DTW: 5.62'
TD 8.9'

~~SLF~~ AZ 08.20.09

PURGE VOLUME (1) = 12.48 gal
PURGE VOLUME (3) = 37.44 gal

| # | pH (units) | COND (mS/cm) | TURB (NTUs) | DO (mg/L) | TEMP (°C) | % SALINITY |
|---|---|---|---|---|---|---|
| INITIAL | 6.55 | 10.9 | 30 | ~~7.43~~ | 31.0 | .62 |
| 5 | 6.77 | 11.1 | 9.3 | 1.6 | 32 | .62 |
| 10 | 6.68 | 11.1 | 2 | 1.0 | 31.8 | .63 |
| 15 | 6.70 | 11.5 | 3 | 1.86 | 31.5 | .65 |

NOTE: PUMP LOWERED AN ADDITIONAL 3'.

AZ 08.20.09

Project / Client NAVY- VIEQUES PUERTO RICO

| | units | mS/cm | NTUs | mg/L | C° | % |
|---|---|---|---|---|---|---|
| | pH | COND | TURB | DO | TEMP | SALINITY |
| ) | 6.65 | 11.6 | 5 | 1.23 | 31.3 | .65 |
| ) | 6.65 | 11.4 | 50 | 0.87 | 31.2 | 0.64 |
| ) | 6.65 | 11.4 | 10 | 0.98 | 31.1 | 0.64 |
| ) | 6.51 | 10.7 | 10 | 1.05 | 31.5 | 0.60 |
| ) | 6.51 | 11.2 | not func. water is clear | 0.82 | 31.2 | 0.63 |

3 - Generator out of gas, M. Cleaver gets gas
) - restart pump

45 COLLECT SAMPLE @ NAVY-7.

55 LEAVE SITE AND GO TO GUARD SHACK TO DECON.

25 FINISH DECON ON GRUNDFOS PUMP. (SAME PROCEDURE AS BEFORE → ① TAP H2O RINSE
② ALCANOX RINSE
③ DI RINSE

30 LEAVE GUARD SHACK TO GO TO SITE.

08.20.99

Date

139

Project / Client NAVY-VIEQUES PUERTO RICO

1436: ARRIVE @ NAVY-4 AND COLLECT DTW & TD.

DTW: 37.52
TD: 82.55

1450 - STARTED PUMPING. 0.5 gpm
1 PURGE VOLUME : 7.33 gal
3 PURGE VOLUMES : 22.01 gal

| | units | mS/cm | NTUs | mg/L | C° | % |
|---|---|---|---|---|---|---|
| | pH | COND | TURB | DO | TEMP | SALINITY |
| 1450 | INIT | 7.76 | 1.60 | 4 | 1.98 | 30.8 | 0.07 |
| 1500 | 5 | 7.20 | 1.51 | clear | — | 30.0 | 0.07 |
| 1510 | 10 | 7.91 | 1.38 | clear | — | 30.0 | 0.06 |
| 1520 | 15 | 7.47 | ~~1.49~~ 1.44 08-20-99 | clear | — | 29.1 | 0.06 |
| 1530 | 20 | 7.62 | 1.45 | clear | — | 29.3 | 0.06 |
| 1540 | 25 | 7.65 | 1.47 | clear | — | 29.2 | 0.06 |

1550: TOOK WATER SAMPLE. ☆NOTE: READING FOR TURBIDITY NOT FUNCTIONING EVEN AFTER RECALIBRATION.

08.20.99

Project / Client NAVY - VIEQUES PUERTO RICO

0 : FINISH SAMPLING @ NAVY-4.

05 : M-CLASEN WENT TO GO GET ICE TO PACK SAMPLES.

23 FINISH PACKING SAMPLES AND GO TO AIRPORT TO FEDEX.

0 ARRIVE @ FAJARDO AIRPORT TO GO HOME. 08.20.99

08.23.99

SUMMARY OF SERIAL NO's FOR EQUIPMENT FOR FIELD EFFORT

| PMENT | SERIAL NO | |
|---|---|---|
| WDFOS PUMP | S/N 13439 | (HAZCO NO.) |
| | S/N 21207 | (HAZCO NO.) |
| | S/N 13254 | " |
| | S/N 21905 | " |
| COOLER BOXES | S/N 14174 | " |
| | S/N 14181 | |
| | S/N 3542 | |
| | S/N 7284 | |

Project / Client NAVY - VIEQUES PUERTO RICO.

CONT'D

| EQUIPMENT | SERIAL NO |
|---|---|
| HORIBA | 810016 |
| PH METER | ~~SN 230~~ 14407 AZ 08.23.99 |

IDW SAMPLING

~~1440~~ AZ 08.23.99

CREW: RICK MORALES
KATIE SWANSON
ALYLE CHANG

1420: DEFION EQUIPMENT.

1440: ARRIVE @ NW-1 (NAVY-1) AND TAKE SAMPLE (COMPOSITE) FROM SOIL CUTTINGS.

8 SOIL DRUM.
1-$H_2O$ DRUM.

1500 - DEFION EQUIPMENT.

1504 : ARRIVE @ RCRA-1 AND BEGIN TO TAKE LIDS OFF OF

Project / Client [illegible] VIEQUES PUERTO RICO.

1504 SOIL CUTTINGS FOR COMPOSITE SAMPLE.

4 SOIL DRUMS
2 $H_2O$ DRUMS

1520 - TOOK SOIL SAMPLE (COMPOSITE) @ RCRA-1.

1535 - DECON EQUIPMENT AND PREPARE TO DEMOBILIZE.

NOTE: BECAUSE OF BAD WEATHER, WE COULD NOT CHARTER A FLIGHT AFTER 4:30 PM. HAD TO LEAVE THE ISLAND EARLY.

1600 - CHARTER FLIGHT BACK TO FAJARDO AT THE AIRPORT.

1610 - LEAVE AIRPORT TO UNLOAD EQUIPMENT THAT HAS TO BE SHIPPED.

08-23-99

Project / Client NAVY - VIEQUES, PUERTO RICO

IDW SAMPLING

CREW: Rick Morales
Allyic Chand
Katie Swanson

0800 - arrive at Camp Garcia, FedEx is to deliver bottles

0820 - arrive at RCRA-2 location. Soil and purge water drums have been stolen, will sample cuttings that were left on ground

0820 - Sample RCRA-2, soils

0830 - arrive at P-3, drillers left cuttings on plastic sheeting next to piezometer to be drummed when drums arrive on island, will sample soil pile

0835 - collect sample at P-3, soils

0850 - walk back to P-2, no barrels or soil piles at this location. Drums may have been taken by natives, no soil samples collected

0905 - arrive at NW-3, purge water drums have been stolen, will sample soil

0910 - collect sample at NW-3, soil

0915 - RETURN TO GUARD SHACK TO PREPARE SAMPLE KITS FOR REST OF DAY.

08-24-99

Project / Client NAVY - VIEQUES, PUERTO RICO.
IDW SAMPLING.

~~Time | Temp | Cond | SAL | pH | H2O (gal)~~

10:45 - SAMPLED NAVY-1 PURGE H2O

~~1732 | 29.7 | 1102 | 0.5 | 7.58 | 4 | KD~~

1115 - SAMPLED RCRA-1 ~~PURGED~~ PURGE H2O.

~~1752 | 29.3 | 1.04 | 0.5 | 7.56 | 1/2 | KD~~

1150 - collect soil sample at NW-6 from cuttings drums

1210 - collect water sample at NW-6 from purge H2O drums

1245 - TOOK LUNCH

1400 - VAN FOR SAMPLES HAS FLAT. KATIE S. WILL GO REPAIR TIRE.

1420 - ARRIVE @ ~~NAVY-7~~ NAVY-8. SAMPLE @ NAVY-8 FOR TCLP PARAMETERS FROM SOIL CUTTINGS AND PURGE H2O DRUMS.

1430 - SAMPLE NAVY-7 FOR TCLP PARAMETERS FROM PURGE H2O DRUMS.

*NOTE*: SOIL SAMPLE FOR TCLP WAS TAKEN AS A COMPOSITE FROM DRILL ~~CUTTI~~ CUTTINGS FOR NAVY-7 & NAVY-8.

[illegible] 08-24-99

Location [illegible] Date 08-24-99 145

Project / Client NAVY - VIEQUES, PUERTO RICO
IDW SAMPLING

1450 - TAKE COMPOSITE SAMPLE FROM SOIL CUTTINGS FOR NAVY-4 & RCRA-4.

1455 - TAKE SAMPLE OF PURGED H2O FROM DRUMS FOR RCRA-4.

1510 - TAKE SAMPLE OF PURGED H2O FROM DRUMS FOR NAVY-4.

1630 - ARRIVE @ P-5 (PIEZOMETER) AND SAMPLED DRILL CUTTINGS FROM DRUMS. TOOK COMPOSITE SAMPLE.

1640 - ARRIVE @ RCRA-3 AND SAMPLE DRILL CUTTINGS FROM DRUM. ALSO SAMPLED PURGE H2O ~~FROM WELL~~ DRUMS.

1700 - RETURN TO GUARDSHACK TO PACK COOLERS.

1805 - ARRIVE @ NAVY-5 AND SAMPLE PURGE H2O AND SOIL CUTTINGS FROM DRUMS.

Project / Client NAVY - VIEQUES, PUERTO RICO
IDW SAMPLING

ODINIEL Gonzalez
Cond Sal pH

1745 5 gal
1832 4 gal
AL 08/24/99

1825 DECON SAMPLING EQUIPMENT AND RETURN TO GUARD SHACK.

1845 ARRIVE @ VIEQUES AIRPORT AND PREPARE FOR 19:30 FLIGHT BACK TO FAJARDO.



The manufacturers of "Rite in the Rain" all-weather writing products are grateful to the numerous environmental experts who have contributed to the development of this book. Should you have any additions, improvements or corrections for future publications of this field book or have suggestions for other environmental field book formats, we welcome your input.

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## Common Field Data Error Codes

Error Codes Are Used to Explain Common Mistakes and Are Written Above or Close to the Mistake
Commonly Used Error Codes Include:

- RE Recording Error
- CE Calculation Error
- TE Transcription Error
- SE Spelling Error
- CL Changed for Clarity
- DC Original Sample Description Changed After Further Evalutaion
- WO Write Over
- NI Not Initialled and Dated at Time of Entry
- OB Not Recorded at the Time of Initial Observation

Note: Error Code Should Be Circled When Recorded

## Hazard Classifications

Class 1 Explosives
Class 2 Gas
Class 3 Flammable Liquid
Class 4 Flammable Solids (Potential spontaneous combustion, or emission of flammable gases when in contact with water)
Class 5 Oxidizing Substances and Organic Peroxides
Class 6 Toxic (poisonous) and Infectious substances
Class 7 Radioactive material
Class 8 Corrosives
Class 9 Miscellaneous dangerous goods

## Container type abbreviations (for sampling guidelines):

BR - Boston Round
ABR - Amber Boston Round
AJ - Amber Jug
CWM - Clear Wide Mouth
AWM - Amber Wide Mouth

8/19/99 R. Cropsira

0915 Well NW-4 Development

| Time | Temp (°C) | Cond (µS/cm) | Sal (ppt) | pH (su) | Vol. (gal) | Comments |
|---|---|---|---|---|---|---|
| 0922 | Start pumping @ 3 gal/min | | | | | Water clear, no turbidity noticed |
| 0925 | 29.3 | 1,466 | 0.7 | 7.43 | 6 | Water clear, no odor |
| 0930 | 29.2 | 1,464 | 0.7 | 7.45 | 24 | Same |
| 0933 | 29.2 | 1,467 | 0.7 | 7.46 | 30 | Same |
| | | | | | | Well developed - complete |

8/19/99

1045 Well NW-7 Development

DTW = 5.57 TD = 81.90

| Time | Temp (°C) | Cond (mS/cm) | Sal (ppt) | pH (su) | Vol. (gal) | Comments |
|---|---|---|---|---|---|---|
| 1050 | Start pumping @ 2 gal/min | | | | | Water clear, no odor |
| 1055 | 32.9 | 13.32 | 7.6 | 8.54 | 10 | Water clear |
| 1105 | 31.8 | 11.83 | 6.7 | 7.93 | 20 | Same |
| 1110 | 30.5 | 11.28 | 6.4 | 7.96 | 10 | Same |
| 1115 | 30.1 | 10.08 | 5.6 | 7.29 | 10 | |
| 1120 | 30.1 | 10.07 | 5.6 | 7.24 | 10 | Well development - complete |

8/15 R. Garsira / CH2M Hill

INSTRUMENT CALIBRATION

0930

pH Meter ORION 230A
S/N 002159
HACO # 1447
Autocalibration
pH 7 reads 7.04
pH 4 reads 4.02
slope 98.1 %

1530 check
pH read 6.98
pH reads 3.99

YSI Model 30/50
S/N 95D 32633
HACO # 12713 Exp. 12/00
Lot# of Standard 99F0528
Ambient temp 32.8 °C
1000 µS/cm Std. reads 1005 @ 29.8°C
Calibrated to 1000 µS/cm
check in @ 1530 meter reads 994 @ 32.8°C

0940 Proceeded w/ start of well purging.

- Trash bags
- Baggies Ziplock
- Filing

} done!

For well development using Grundfos pump
S/N
Controller BMI/MP1
HACO # 3542

Deconed pump/tubing/rope with Alconox Sol'n, 2 rinses with tap water, pump flush with DI water.

8/15/99 WELL RCRA-4

| TIME | Temp °C | Cond µS/cm | SAL PPT | pH SU | Vol. (gal) | COMMENTS |
|---|---|---|---|---|---|---|
| 0945 | | | | | START | |
| 0950 | 29.3 | 1,485 | 0.7 | 7.37 | 6 | Turbid when pumped/surged, no odor |
| 1010 | 29.7 | 1,487 | 0.7 | 7.27 | 24 | Less turbid, small quant. of fine sand |
| ~~1040~~ RS | | | | | | |
| 1040 | 29.7 | 1,487 | 0.7 | 7.12 | 30 | same as before |
| 1100 | 29.6 | 1,490 | 0.7 | 7.17 | 20 | somewhat clearer, no odor |
| 1120 | 29.6 | 1,491 | 0.7 | 7.16 | 20 | Intermittent clear and turbid |
| 1150 | 29.7 | 1,489 | 0.7 | 7.15 | 25 | Slightly turbid, no odor |
| 1155 | 29.5 | 1,372 | 0.7 | 7.19 | 5 | Water clear, no turbidity |
| 1200 | 29.6 | 1,491 | 0.7 | 7.29 | 5 | same |
| 1205 | 29.6 | 1,489 | 0.7 | 7.28 | 5 | same |
| 1210 | 29.7 | 1490 | 0.7 | 7.28 | 5 | same - Well development complete |

WELL RCRA-3

8/15/94 R. GORSIRA / CH2M HILL

1345 Set up well w/ tubing & pump TD = 69'

| Time | Temp | Cond | Sal | pH | Vol (gal) | Comments |
|---|---|---|---|---|---|---|
| 1345 | Start | | | | | |
| 1350 | 29.7 | 1,432 | 0.7 | 6.63 | 6 | Water turbid, orange-brown color no odor noticeable |
| 1405 | 29.5 | 1,443 | 0.7 | 6.66 | 18 | |
| 1415 | 28.7 | 701 | ~~0.7~~ 0.3 PS | 6.68 | 12 | Water less turbid, sl. yellow color |
| Increased pumping rate to 5 gal/min | | | | | | |
| 1420 | 28.8 | 1,434 | 0.7 | 6.67 | 20 50 | |
| 1430 | 29.1 | 1,439 | 0.7 | 6.74 | ~~100~~ | Water clearing up; stopped pump to get IDW drum for water |
| stopped pump; start @ ~~4~~ 4 gal/min | | | | | | |
| 1450 | 29.7 | 1,439 | 0.7 | 6.83 | 4 gal | |
| 1500 | 29.3 | 1,440 | 0.7 | 6.88 | 20 | Slight color to water, low turbidity sl. cloudy |
| 1505 | 29.1 | 1,443 | 0.7 | 6.66 | 8 | |
| 1510 | 29.0 | 1,442 | 0.7 | 6.75 | 8 | Bottom of bucket visible, water clear. |
| 1515 | 28.9 | 1,441 | 0.7 | 6.77 | 8 | |
| 1520 | 28.8 | 1,440 | 0.7 | 6.72 | 8 | Drum full. - stopped pumping water clear no odor |

Well MW-5

8/16/99 R. Gorsira / M. Clasen

Well MW-5
1050 Meter Calibration

pH Meter Orion 230A
S/N 002159
HAZCO # 1447
Autocalibration
pH 7 reads 6.98
pH 4 reads 4.02
slope 98.9 %

YSI Model 30/50
S/N 95D 32633
HAZCO # 12713
Ambient temp 32.3

✓ 1000 µS/cm Std reads 995
at 30.4 °C

Weather prty cloudy, hot,
occasional rain showers in
early morning

Started purging well
at 1100 hrs.
pumping @ 2 gpm for 5 min
started clear, then cloudy
while moving pump up
screened interval.
Pumped dry after ~ 10 gallons

8/16/99
Check in @ 1845 of
instruments
pH 7 reads 7.02
pH 4 reads 4.08

YSI 30/50

✓ 1000 µS/cm Std. reads 988
at 30.0 °C

8/16/99

Well MW 5

| Time | Temp °C | Cond µS/cm | Sal ppt | pH SU | Vol (gal) | Comments |
|---|---|---|---|---|---|---|
| 1100 | Start | | | | | |
| 1105 | 28.7 | 1,974 | 1.0 | 7.36 | 10 | Fine clay settling in bucket; Turbid, cloudy water, no odor |
| | Low production - left to allow well to recharge | | | | | |

8/16/99

Well RCRA-1

| Time | Temp (°C) | Cond (µS/cm) | SAL (ppt) | pH (SU) | Vol (gal) | COMMENTS |
|---|---|---|---|---|---|---|
| 1450 | Start - 1 gal/min | | | | | Very muddy, orange color, no odor |
| 1457 | 29.6 | 2020 | 1.0 | 6.82 | 7 | Same as before |
| 1510 | 29.1 | 2037 | 1.0 | 6.92 | 20 | Sample turbid, intermittent clearing |
| | Increased pumping rate to 3 gal/min | | | | | |
| 1525 | 28.3 | 2048 | 1.0 | 6.84 | 45 | Sample ~~that~~ is turbid, silty clay |
| 1545 | 28.6 | 2050 | 1.0 | 7.04 | 110 | Clear, finished development |
| 1555 | left well to decon pump | | | | | pump deconned w/ alconox |
| | soap solution, tap water | | | | | rinse of tubing and pumped |
| | ~~soap~~ tap water through | | | | | tubing to clean out soap |
| 1605 | Finished decon | | | | | |

8/16/99 WELL RCRA-2
R. CORSIRA / M. CLASEN

| TIME | Temp | Cond | Sal | pH | Vol | Comments |
|---|---|---|---|---|---|---|
| 1645 | Start pumping 2 gal/min | | | | | |
| 1647 | 27.8 | 1,735 | 0.9 | 6.91 | 2 | Very slightly cloudy |
| 1655 | 27.7 | 1,765 | 0.9 | 6.94 | 20 | Clear, increased flow rate to 4 gpm |
| | increased pumping to 4 gal/min | | | | | |
| 1705 | 27.6 | 1,761 | 0.9 | 6.98 | 55 | Water very clear, no odor finished well development |

Note: Surged well, no increase in turbidity noted

[illegible]

8/1/99
R. Gorsiga / CH2M Hill

1145 Decomned pump w/ alcorox
Tot'n and tap water rinse
1200 Arrive at well NW-1

1220 Set up of pumping activities

1230 Start calibration of instruments

pH Meter ORION 230A
S/N 002159
HACCO #1447
Autocalibration for Std.

pH 7 Std. reads 6.98
pH 4 Std. reads 4.02
slope 98.0 %

YSI model 30/50
S/N 95D 32633
HACCO #12713
1000 µS/cm Std. Lot # 99F0528 Exp. 12/00
Ambient temp 35.8 C

1000 µS/cm Std. reads 994 @ 30.5°C
Calibrated to 1000 µS/cm

011+199

Well NW-1 Development

| Time | Temp (°C) | Cond (µS/cm) | SAL (ppt) | pH (su) | Vol (gal) |
|---|---|---|---|---|---|
| 1400 | START | | | | |
| 1405 | VERY MUDDY | | | | 2 |
| 1705 | 30.0 | 1,817 | 0.9 | 7.38 | 4 |

COMMENTS

Water w/ muddy silt, viscous, stopped pumping, well slow to recharge.
Well pumped dry, allowing time for recharge.

8/18/99 R. Gorsira / Cazenovia

WATER LEVELS

| WELL | Depth | DTW | TIME | |
|---|---|---|---|---|
| RCRA-2 | 65.85 | 39.96 | 1030 | 8/18/99 |
| RCRA-1 | 66.62 | 49.13 | 1150 | |
| RCRA-3 | 70.80 | 55.08 | 1530 | |
| RCRA-4 | 53.10 | 37.32 | 1610 | |
| NW-8 | 15.32 | 7.26 | 1715 | |
| RCRA-4 | | 37.40 | 0915 | 8/19/99 |
| NW-4 | 83.70 | 37.34 | 0918 | |
| NW-7 | 81.90 | 5.57 | 1045 | |

8/18/99 R. Gorsira
1720

Instrument Calibration

pH meter Orion 230A
S/N 002159
HACH #1447
Autocalibration: 1858

pH 7 std reads 6.98 7.02
pH 4 std reads 4.02 4.03

YSI model 30/50
S/N 95D32633
HACH #12713

1000 µS/cm reads 994 @ 30.7°C
calibrated 1000 µS/cm

Slope 98.4 %

8/18/99
R-GERGIRA / CHIZMADIC

NW 8 well development

| Time | Temp (°C) | Cond (mS/cm) | Sal (ppt) | pH (SU) | VOS (gal) | Comments |
|---|---|---|---|---|---|---|
| 1730 | start pumping 2 gal/min | | | | | |
| 1735 | 29.6 | 56.8 | 37.6 | 6.62 | 10 | - Water very turbid, fine silt/sand orange brown color; No odor. |
| 1800 | 29.6 | 64.7 | 43.7 | 6.58 | 20 | - Pump intermittent; water turbid |
| 1830 | 30.0 | 65.4 | 44.2 | 6.43 | 25 | - Less turbid, intermittent cleaning |
| 1845 | 29.6 | 65.5 | 44.3 | 6.62 | 35 | - Lightly turbid |
| 1855 | 29.6 | 66.8 | 45.3 | 6.67 | 42 | - Lightly turbid, readings stable, well development complete |

NOTE: Conductivity is in mS/cm, not uS/cm.

8/19/99 R. Corsina
900
Instrument Calibration

ORION 230A pH meter

S/N 002159
HACO # 1447
Autocalibration with Std.

pH 7 Std. reads 6.98
pH 4 Std. reads 4.02
slope 98.1 %

SCT meter YSI Model 30/50

S/N 95D 32633
HACO # 12713
1000 uS/cm Std. reads 995 @ 30.4°C
Lot # 99F0528 Exp 12/00
Ambient temp 32.5°C
Calibrated meter to 1000 uS/cm

0830
Decon of Grundfos pump
w/ Alconox sol'n, followed
by tap water rinse.

8/19/99 R. Copsiza

0915 Well NW-4 Development

| Time | Temp (°C) | Cond (µS/cm) | Sal (ppt) | pH (su) | Vol. (gal) | Comments |
|---|---|---|---|---|---|---|
| 0922 | Start pumping @ 3 gal/min | | | | | Water clear, no turbidity noticed |
| 0925 | 29.3 | 1,466 | 0.7 | 7.43 | 6 | Water clear, no odor |
| 0930 | 29.2 | 1,464 | 0.7 | 7.45 | 24 | Same |
| 0933 | 29.2 | 1,467 | 0.7 | 7.46 | 30 | Same |
| | | | | | | Well developed - complete |

8/19/99 (mS/cm

1045 Well NW-7 Development

DTW = 5.57 TD = 81.90

| Time | Temp | Cond | Sal | pH | Vol. | Comments |
|---|---|---|---|---|---|---|
| 1050 | Start pumping @ 2 gal/min | | | | | Water clear, no odor |
| 1055 | 32.9 | 13.32 | 7.6 | 8.54 | 10 | Water clear |
| 1105 | 31.8 | 11.83 | 6.7 | 7.93 | 20 | Same |
| 1110 | 30.5 | 11.28 | 6.4 | 7.96 | 10 | Same |
| 1115 | 30.1 | 10.08 | 5.6 | 7.29 | 10 | |
| 1120 | 30.1 | 10.07 | 5.6 | 7.24 | 10 | Well development - complete |

26 Location Vieques Date 8/17/91

Project / Client Navy [illegible]

Camp Garcia

14:00 Pumping NW-6

Calibrated Horiba w/ 14-10 cal.

| Time | Gal | pH | Turbid | DO | Conductivity |
|---|---|---|---|---|---|
| 14:00 | 5 | 6.60 | 363 | 16.75 | 1.16 |
| 15:00 | 10 | 6.95 | 198 | 8.19 | 1.13 |
| 1600 | 15 | 6.96 | 200 | 8.87 | 1.11 |

pumping complete, well will purge dry — will sample in AM

16:15 Start pumping NW-5

| | | | | | |
|---|---|---|---|---|---|
| 16:30 | 5 | 7.03 | 55 | 8.94 | 1.53 |
| 17:15 | 9 | 7.04 | 50 | 9.00 | 1.50 |

Location Date

Project / Client

NW-6

| Temp | Salinity |
|---|---|
| 30.0 | 0.05 |
| 33.6 | 0.05 |
| 28.5 | 0.04 |

NW-5

| | |
|---|---|
| 29.2 | 0.07 |
| 29.2 | 0.07 |

Location _____ Date _____

Project / Client Camp Garcia

:40 M[illegible] arrive well
NW-2 to check access
DTW 118.50'
TD - 203.70'
Bailed 2 gallons - clear
0.163 x 85.20' = 13.88 gal.

| H | Cond | turb | DO | Temp. | sal. |
|---|---|---|---|---|---|
| .70 | 1.79 | 21 | 9.37 | 29.1 | 0.08 |

1:00 Purged 2 gal - total 4 gal
1:25 Purged 2 gal - total 6 gal
:45 Purged 2 gal - total 8 gal
:10 Purged 2 gal - total 10 gal

| | | | | | |
|---|---|---|---|---|---|
| | 2.55 | 59 | 8.58 | 29.1 | 0.10 |
| .75 | | | | ~~29.1~~ | |

:30 Purged 2 gal total 12 gal

| | | | | | |
|---|---|---|---|---|---|
| .80 | 2.86 | 71 | 8.75 | 29.1 | 0.14 |

2:50 Purged 2 gal total 14 gal

| | | | | | |
|---|---|---|---|---|---|
| .83 | 2.89 | 75 | 8.78 | 29.1 | 0.14 |

Measurements taken with
Horiba Model U-10 Serial No.
& 100% Cal. Solution Lot #
t:00 Sampled well Exp. 10/30/
with teflon bailer 2000
because of constriction

Location _____

Project / Client Camp Garcia

Temp = mS/cm

13:00 Mob to well NW-1
DTW = 101.17
TD = 137.75
Water column = 137.75 - 101.17
" " = 36.58'
Purge vol. = 0.163 x 36.58 = 6 gal
14:50 Calibrated Horiba
- using Horiba U-10
Auto Calibration Solution
Lot # 1778 Exp. 10/30/2005
Calibration - Good
15:20 Bailed 2 gallons

| pH | Cond | Turb | DO | Temp | Salin | Vol. |
|---|---|---|---|---|---|---|
| 6.47 | 1.93 | 2 | 17.56 | 30.9 | 0.09 | 2 gal |
| 6.55 | 2.25 | 9 | 7.95 | 29.2 | 0.10 | 4 gal |
| 6.52 | 2.34 | 5 | 8.16 | 28.0 | 0.11 | 6 gal |

Location [illegible] Date [illegible]

Project / Client NAVY/DOD

IDW SAMPLING

WEATHER [illegible], partly cloudy, warm

CREW KATIE SWANSON
RICK MORALES
ALLIE CHANG

0715 - arrive at Vieques Go to Public Works Bldg, load equipment. K. Swanson shows A. Chang & R. Morales the locations of P-6 P-8 & P-9.

08:55 ARRIVE @ P-6 AND COLLECT COMPOSITE SOIL SAMPLE

DTW: 102.91'
TD : 185.80

09:00 DECON EQUIPMENT.

09:15 ARRIVE @ P-8 & P-9.
09:30 COLLECT SOIL SAMPLE FROM P-1
0935 COLLECT COMPOSITE SOIL SAMPLE FROM P-8 & P-9 SOIL CUTTINGS

Location [illegible] Date [illegible] 31

Project / Client NAVY/DOD

IDW Sampling and Water Levels

0935: FROM DRUMS.

0940: COLLECT $H_2O$ LEVELS FROM P-8 + P-9.

P-8
DTW: 24.87' ~~24.87~~
TD: ~~24.0~~ 32.54'

NOTE: NO LOCK ON CAP. OUTSIDE HAD LOCK

P-9
DTW: 24.79'
TD: 8.40'

1020 COLLECT SOIL SAMPLE FROM SOIL CUTTINGS FOR P-7.

1030 TAKE $H_2O$ LEVEL FOR P-7.

NOTE: USED TWO CREWS TO SAMPLE $H_2O$ LEVELS.
CREW #1 ALLIE & RICK
CREW #2 KATIE

Project / Client NAVY / DOD

1ST ~~ROUND~~

(ALLYIE & PUCK) SUMMARY OF H2O LEVELS

| TIME | STATION | DTW (FT) | TD (FT) |
|---|---|---|---|
| 0855 | P-6 | 102.91' | 185.80' |
| 0940 | P-8 | 24.87' | 32.54' |
| 0940 | P-9 | 24.79' | 84.07' |
| 0030 | P-7 | 53.11' | 98.50' |
| 100 | NAVY-1 | 101.21' | |
| 105 | RCRA-1 | 49.26' | |
| 110 | P-2 | 61.87' | |
| ~~LATIE~~ AZ 1120 | P-3 | OBSERVED SOME PRESSURE AFTER OPENING THE WELL CAP. WILL RETURN TO MEASURE WATER ONCE STABILIZED. | |
| 1145 | P-3 | 82.39' | |

STROUND (KATIE)

| TIME | STATION | DTW (FT) | TD (FT) |
|---|---|---|---|
| 1025 | NAVY-7 | 5.38 | 81.15 |
| | | NOTE: LOCK IS RUSTED. | |
| 1030 | NAVY-8 | 4.93 | 17.03 |
| 1040 | RCRA-4 | 37.27 | 53.20 |
| 1045 | NAVY-4 | 37.28 | 83.10 |
| 1100 | NAVY-5 | 36.03 | 122.30 |
| 1105 | RCRA-3 | 55.41 | 71.48 |
| 1050 | NAVY-6 | 52.70 | 187.60 |

Project / Client NAVY / DOD

(KATIE)

1ST ROUND CONT'D

| TIME | STATION | DTW (FT) | TD (FT) |
|---|---|---|---|
| 1115 | P-5 | 80.15' | 150.30' |
| 1120 | NAVY-3 | 118.47' | 32.10 |
| | | NOTE: BAILER IN WELL. | |
| 1135 | RCRA-2 | 40.03 | 66.40 |

1230 - return to Public Works Bldg. unload equip, get lunch. Return to Camp Garcia

| | | | |
|---|---|---|---|
| 1621 | RCRA-1 | 49.24 | |
| 1625 | P-2 | 61.88 | |

1635 - Not enough time to complete full 2nd round of water levels prior to departure of Charter flight for Ted Ex. Return to Public Works to finish packing equipment and samples. R. Morales & G. Ford will collect water levels tomorrow morning (8/25/99).

1745 - leave Public Works for airport. Will drop off samples & equipment at Ted Ex in San Saran

8/25/99 [signature]

Project / Client DPI

0530 Greg Ford & Rick Morales Depart for airport to catch flight to Urequay. We will collect WLs today.

9:00 Returned Rental Van

| Time | Station | DTW (ft) |
|---|---|---|
| 0950 | Navy 1 | 131.13' |
| 1230 | P9 | 24.76' |
| 1232 | P8 | 24.81' |
| 1240 | P6 | 93.03' |
| 1253 | P7 | 52.98' |
| 1257 | Navy-5 | 35.97' |
| 1300 | RCRA-3 | 55.42' |
| 1305 | P5 | 79.91' |
| 1312 | Navy 3 | 118.21' |
| 1318 | RCRA 2 | 40.03' |
| 1322 | P3 | 82.02' |
| 1333 | P2 | 61.89' |
| 1340 | RCRA 1 | 49.26' |
| 1348 | NAVY 1 | 101.19' |
| 1411 | Navy 6 | 52.56' |
| 1416 | Navy 4 | 37.22' |
| 1415 | RCRA 4 | 37.20' |

Richard Morales

Project / Client NAVY

1000 Met Greg (RLA (Surveyors) & showed him the additional wells that John Tomyk requested be surveyed. One well is located @ Camp Garcia Bldg. 504 the other is located in the PW compound. It is located adjacent to Bldg 2029 & used to serve as the potable $H_2O$ supply for the Navy.

1130 Break for lunch.

1225 Back @ Camp Garcia to complete GL

| Time | Station | DTW (ft) |
|---|---|---|
| 1420 | Navy 7 | 5.47' |
| 1422 | Navy 8 | 5.03' |

# APPENDIX H
# DATA SUMMARY TABLES

## ANALYTICAL SUMMARY OF EXPLOSIVE COMPOUNDS
## SURFACE SOIL
## VIEQUES ISLAND

| SAMPLE ID | NAVY-1-SS | NAVY-3-SS | NAVY-3-SSD | NAVY-4-SS | NAVY-5-SS | NAVY-6-SS | NAVY-7-SS | NAVY-8-SS | RCRA-1-SS | RCRA-2-SS |
|---|---|---|---|---|---|---|---|---|---|---|
| LOG NUMBER | S915556-6 | S915556-9 | S915556-10 | S915556-20 | S915556-15 | S915556-16 | S915556-19 | S915556-18 | S915556-7 | S915556-8 |
| SAMPLE DATE | 08/16/99 | 08/16/99 | 08/16/99 | 08/17/99 | 08/16/99 | 08/16/99 | 08/17/99 | 08/17/99 | 08/16/99 | 08/16/99 |
| **EXPLOSIVES (ug/kg)** | | | | | | | | | | |
| 1,3,5-Trinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 1,3-Dinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4,6-Trinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4-Dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,6-Dinitrotoluene | 250 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 2-Amino-4,6-dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 3-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 4-Amino-2,6-dinitrotoluene | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 4-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | 250 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Methyl-2,4,6-trinitrophenylnitramine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Nitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| **EXPLOSIVES (ug/kg dw)** | | | | | | | | | | |
| Nitroglycerin | 1000 U | 1100 U | 1100 U | 1100 U | 1100 U | 1100 U | 1300 U | 1100 U | 1100 U | 1100 U |
| Pentaerythritol tetranitrate | 1000 U | 1100 U | 1100 U | 1100 U | 1100 U | 1100 U | 1300 U | 1100 U | 1100 U | 1100 U |

NOTES: U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
ug/kg = micrograms per kilogram.
dw = dry weight

**ANALYTICAL SUMMARY OF EXPLOSIVE COMPOUNDS**
**SURFACE SOIL**
**VIEQUES ISLAND**

| SAMPLE ID | RCRA-3-SS | RCRA-4-SS | SS-01 | SS-02 | SS-03 | SS-04 | SS-05 | SS-06 | SS-06D |
|---|---|---|---|---|---|---|---|---|---|
| LOG NUMBER | S915556-14 | S915556-17 | S915556A-41 | S915556A-45 | S915556A-46 | S915556A-47 | S915556-21 | S915556A-29 | S915556A-30 |
| SAMPLE DATE | 08/16/99 | 08/16/99 | 08/17/99 | 08/17/99 | 08/17/99 | 08/17/99 | 08/18/99 | 08/18/99 | 08/18/99 |
| **EXPLOSIVES (ug/kg)** | | | | | | | | | |
| 1,3,5-Trinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 1,3-Dinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4,6-Trinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4-Dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,6-Dinitrotoluene | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 2-Amino-4,6-dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 3-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 4-Amino-2,6-dinitrotoluene | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 4-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Methyl-2,4,6-trinitrophenylnitramine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Nitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| **EXPLOSIVES (ug/kg dw)** | | | | | | | | | |
| Nitroglycerin | 1100 U | 1100 U | 1000 U | 1100 U | 1000 U | 1100 U | 1100 U | 1000 U | 1100 U |
| Pentaerythritol tetranitrate | 1100 U | 1100 U | 1000 U | 1100 U | 1000 U | 1100 U | 1000 U | 1100 U | 1100 U |

NOTES: U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
ug/kg = micrograms per kilogram.
dw = dry weight

## ANALYTICAL SUMMARY OF EXPLOSIVE COMPOUNDS
## SURFACE SOIL
## VIEQUES ISLAND

| SAMPLE ID | SS-07 | SS-08 | SS-09 | SS-10 | SS-11 | SS-12 | SS-13 | SS-14 | SS-15 |
|---|---|---|---|---|---|---|---|---|---|
| LOG NUMBER | S915556-24 | S915556-25 | S915556-26 | S915556-27 | S915556-28 | S915556-22 | S915556-23 | S915556A-31 | S915556A-32 |
| SAMPLE DATE | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 |
| **EXPLOSIVES (ug/kg)** | | | | | | | | | |
| 1,3,5-Trinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 1,3-Dinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4,6-Trinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4-Dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,6-Dinitrotoluene | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 2-Amino-4,6-dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 3-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 4-Amino-2,6-dinitrotoluene | 500 U | 250 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 4-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Methyl-2,4,6-trinitrophenylnitramine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Nitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| **EXPLOSIVES (ug/kg dw)** | | | | | | | | | |
| Nitroglycerin | 1000 U | 1000 U | 1000 U | 1000 U | 1000 U | 1000 U | 1000 U | 1100 U | 1100 U |
| Pentaerythritol tetranitrate | 1000 U | 1000 U | 1000 U | 1000 U | 1000 U | 1000 U | 1000 U | 1100 U | 1100 U |

NOTES: U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
ug/kg = micrograms per kilogram.
dw = dry weight

**ANALYTICAL SUMMARY OF EXPLOSIVE COMPOUNDS**
**SURFACE SOIL**
**VIEQUES ISLAND**

| SAMPLE ID | SS-16 | SS-16-FD | SS-17 | SS-18 | SS-19 | SS-20 | SS-20-FD | SS-21 |
|---|---|---|---|---|---|---|---|---|
| LOG NUMBER | S915556A-33 | S915556A-34 | S915556A-35 | S915556A-36 | S915556A-37 | S915556A-38 | S915556A-39 | S915556A-40 |
| SAMPLE DATE | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 |
| **EXPLOSIVES (ug/kg)** | | | | | | | | |
| 1,3,5-Trinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 1,3-Dinitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4,6-Trinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,4-Dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2,6-Dinitrotoluene | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 2-Amino-4,6-dinitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 2-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 3-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| 4-Amino-2,6-dinitrotoluene | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| 4-Nitrotoluene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Methyl-2,4,6-trinitrophenylnitramine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| Nitrobenzene | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U | 250 U |
| Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U | 500 U |
| **EXPLOSIVES (ug/kg dw)** | | | | | | | | |
| Nitroglycerin | 1400 U | 1100 U | 1100 U | 1100 U | 1000 U | 1100 U | 1100 U | 1100 U |
| Pentaerythritol tetranitrate | 1400 U | 1100 U | 1100 U | 1100 U | 1000 U | 1100 U | 1100 U | 1100 U |

NOTES: U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
ug/kg = micrograms per kilogram.
dw = dry weight

# APPENDIX I
# DATA SUMMARY TABLES – QA/QC SAMPLES

## ANALYTICAL SUMMARY OF EXPLOSIVE COMPOUNDS
## FIELD BLANKS/EQUIPMENT BLANKS
## VIEQUES ISLAND

| SAMPLE ID | AB-2 | EQB-1 | EQB-2 | EQB-3 | EQB-4 | EQB-5 | EQB-6 |
|---|---|---|---|---|---|---|---|
| LOG NUMBER | S915608-9 | S915556-29 | S915556-30 | S915556-31 | S915608-7 | S915608-10 | S915651-4 |
| SAMPLE DATE | 08/19/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/18/99 | 08/19/99 | 08/20/99 |
| **EXPLOSIVES (ug/l)** | | | | | | | |
| 1,3,5-Trinitrobenzene | 0.46 U | 0.91 U | 0.63 U | 2.1 U | 0.46 U | 0.33 U | 0.3 U |
| 1,3-Dinitrobenzene | 0.46 U | 0.91 U | 0.63 U | 2.1 U | 0.46 U | 0.33 U | 0.3 U |
| 2,4,6-Trinitrotoluene | 0.46 U | 0.91 U | 0.63 U | 2.1 U | 0.46 U | 0.33 U | 0.3 U |
| 2,4-Dinitrotoluene | 0.46 U | 0.91 U | 0.63 U | 2.1 U | 0.46 U | 0.33 U | 0.3 U |
| 2,6-Dinitrotoluene | 0.76 U | 1.5 U | 1.1 U | 3.6 U | 0.77 U | 0.55 U | 0.5 U |
| 2-Amino-4,6-dinitrotoluene | 0.46 U | 0.91 U | 0.63 U | 2.1 U | 0.46 U | 0.33 U | 0.3 U |
| 2-Nitrotoluene | 0.76 U | 1.5 U | 1.1 U | 3.6 U | 0.77 U | 0.55 U | 0.5 UJ |
| 3-Nitrotoluene | 0.76 U | 1.5 U | 1.1 U | 3.6 U | 0.77 U | 0.55 U | 0.5 U |
| 4-Amino-2,6-dinitrotoluene | 0.76 U | 1.5 U | 1.1 U | 3.6 U | 0.77 U | 0.55 U | 0.5 U |
| 4-Nitrotoluene | 0.76 U | 1.5 U | 1.1 U | 3.6 U | 0.77 U | 0.55 U | 0.5 U |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | 1.5 U | 3.0 U | 2.1 U | 7.1 U | 1.5 U | 1.1 U | 1 U |
| Methyl-2,4,6-trinitrophenylnitramine | 0.76 UJ | 1.5 UJ | 1 UJ | 3.6 UJ | 0.77 UJ | 0.55 UJ | 0.5 UJ |
| Nitrobenzene | 0.46 U | 0.91 U | 0.63 U | 2.1 U | 0.46 U | 0.33 U | 0.3 U |
| Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine | 1.5 U | 3.0 U | 2.1 U | 7.1 U | 1.5 U | 1.1 U | 1 U |
| Nitroglycerin | 30 U | ** | ** | ** | 30 U | 30 U | 30 U |
| Pentaerythritol tetranitrate | 20 U | ** | ** | ** | 20 U | 20 U | 20 U |
| Perchlorate (ug/L) | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Picric Acid (ug/L) | 3 U | 2.6 U | 16 U | 2.6 U | 2.8 U | 3.2 U | 4.6 U |

NOTES: U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.
J = Analyte present. Reported value may not be accurate or precise.
** = Insufficient sample volume to perform analysis.

ug/l = micrograms per liter.

# APPENDIX J
# GROUNDWATER FLOW DIRECTION CALCULATIONS

## TABLE A-1 - Three Point (Triangulation) Calculations

| Triangle ID | Figure No. Scale | Groundwater Elevations (feet MSL on 8/26/99) High | Mid | Low | Distance from High to Low* X | Proportional Distance Ratio [Q = (High - Low) / X] | Distance from High to Midpoint [(High - Mid) / Q] | Distance from Low to Midpoint [(Mid - Low) / Q] |
|---|---|---|---|---|---|---|---|---|
| 1A | A-1 1 cm = 400 cm | NW-8 -0.88 | RCRA-4 -1.06 | P-8 -3.48 | 17.3 | 0.15 | 1.20 | 16.10 |
| 1B | A-4 1 cm = 800 cm | NW-4 -1.23 | NW-7 -1.37 | P-9 -3.14 | 5.8 | 0.33 | 0.43 | 5.37 |
| 2 | A-2 1 cm = 800 cm | P-7 15.05 | NW-4 -1.23 | P-9 -3.14 | 3.7 | 4.92 | 3.31 | 0.39 |
| 3 | A-3 1 cm = 800 cm | NW-6 38.17 | P-7 15.05 | NW-4 -1.23 | 3.8 | 10.37 | 2.23 | 1.57 |
| 4 | A-4 1 cm = 800 cm | NW-5 71.84 | NW-6 38.17 | P-7 15.05 | 2.9 | 19.58 | 1.72 | 1.18 |
| 5 | A-2 1 cm = 800 cm | RCRA-3 98.52 | NW-5 71.84 | P-7 15.05 | 3.7 | 22.56 | 1.18 | 2.52 |
| 6 | A-3 1 cm = 800 cm | P-6 99.55 | RCRA-3 98.52 | P-7 15.05 | 4.9 | 17.24 | 0.06 | 4.84 |
| 7 | A-4 1 cm = 800 cm | P-6 99.55 | P-7 15.05 | P-9 -3.14 | 6.8 | 15.10 | 5.60 | 1.20 |
| 8 | A-4 1 cm = 800 cm | P-5 216.91 | P-6 99.55 | RCRA-3 98.52 | 3.9 | 30.36 | 3.87 | 0.03 |
| 9 | A-4 1 cm = 800 cm | NW-3 236.17 | P-5 216.91 | RCRA-3 98.52 | 5.1 | 26.99 | 0.71 | 4.39 |
| 10 | A-2 1 cm = 800 cm | NW-3 236.17 | P-5 216.91 | P-3 150.77 | 7.6 | 11.24 | 1.71 | 5.89 |
| 11 | A-3 1 cm = 800 cm | NW-3 236.17 | RCRA-2 217.44 | P-3 150.77 | 7.6 | 11.24 | 1.67 | 5.93 |
| 12 | A-2 1 cm = 800 cm | RCRA-2 217.44 | P-3 150.77 | P-2 54.37 | 7.1 | 22.97 | 2.90 | 4.20 |
| 13 | A-4 1 cm = 800 cm | RCRA-2 217.44 | P-2 54.37 | RCRA-1 51.98 | 7.3 | 22.67 | 7.19 | 0.11 |
| 14 | A-4 1 cm = 800 cm | P-3 150.77 | P-2 54.37 | P-1 13.95 | 11 | 12.44 | 7.75 | 3.25 |
| 15 | A-3 1 cm = 800 cm | P-2 54.37 | RCRA-1 51.98 | P-1 13.95 | 4.4 | 9.19 | 0.26 | 4.14 |
| 16 | A-2 1 cm = 800 cm | RCRA-1 51.98 | P-1 13.95 | NW-1 12.9 | 3.3 | 11.84 | 3.21 | 0.09 |
| 17 | A-3 1 cm = 800 cm | RCRA-2 217.44 | RCRA-1 51.98 | NW-1 12.9 | 9.5 | 21.53 | 7.68 | 1.82 |

* - NOTE: calculated by Angie Pompa, checked by Daniel S. Fisher using a 1" = 40' measuring scale.

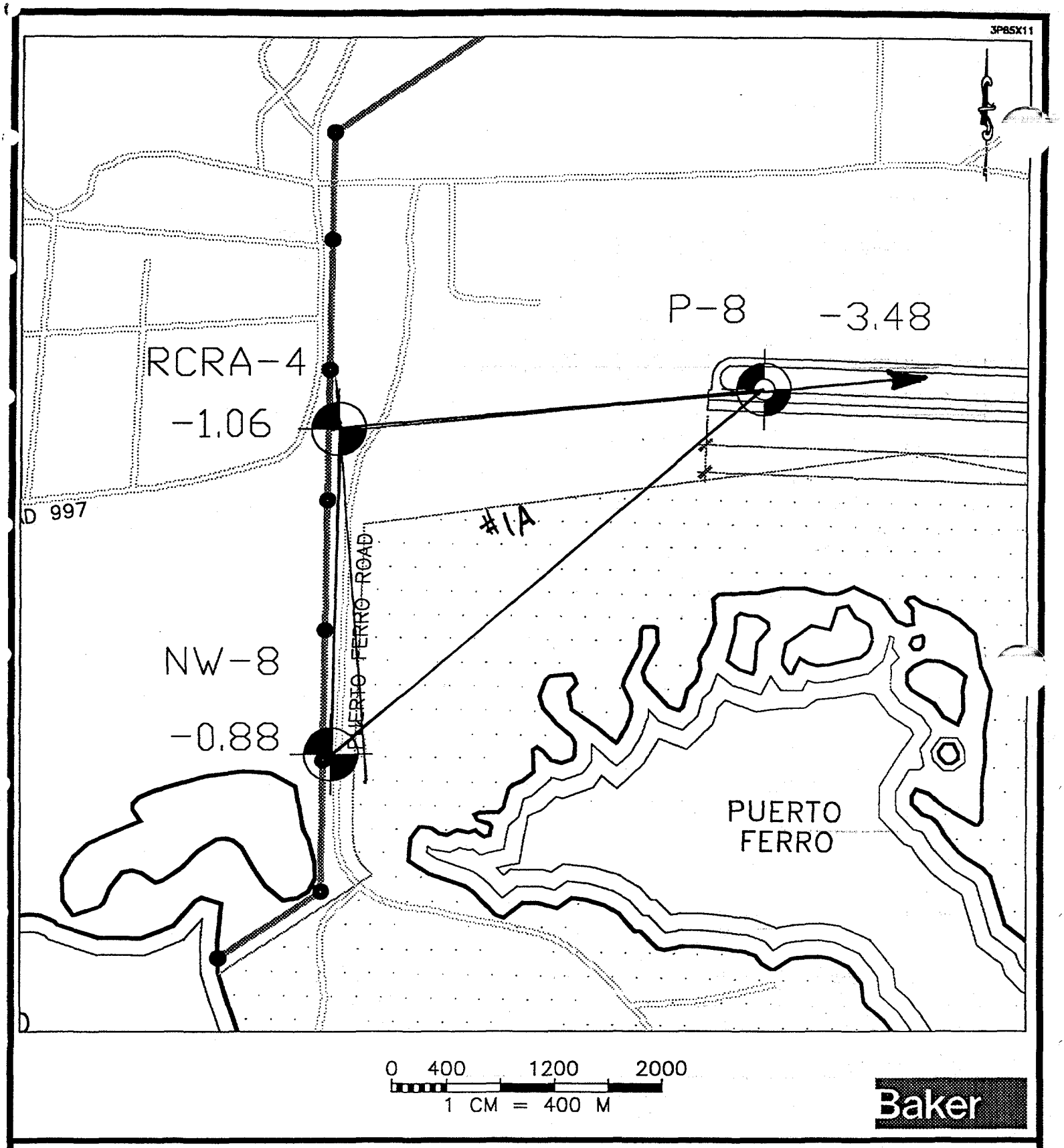
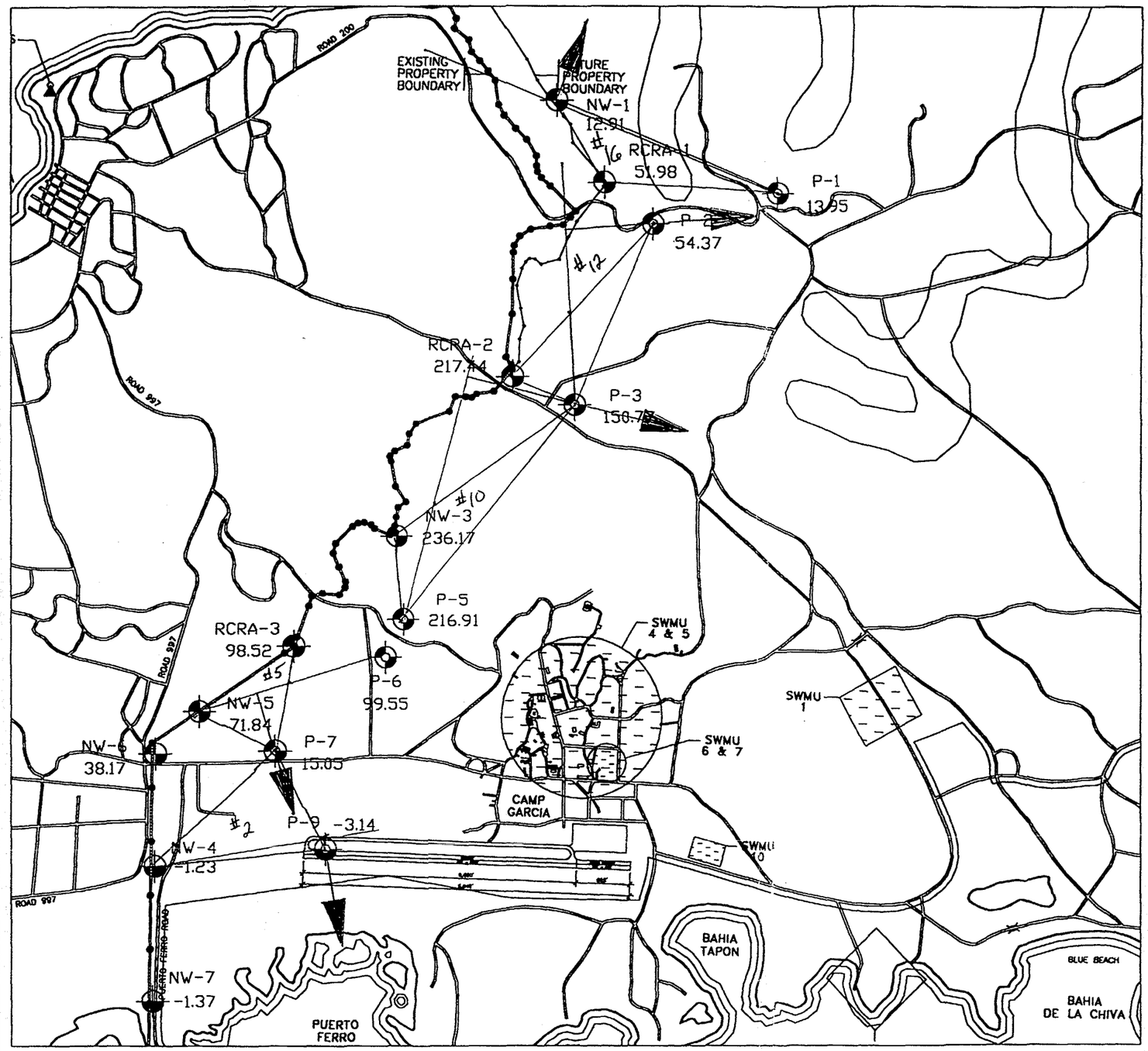



FIGURE A-1
3-POINT PROBLEMS

VIEQUES ISLAND
PUERTO RICO



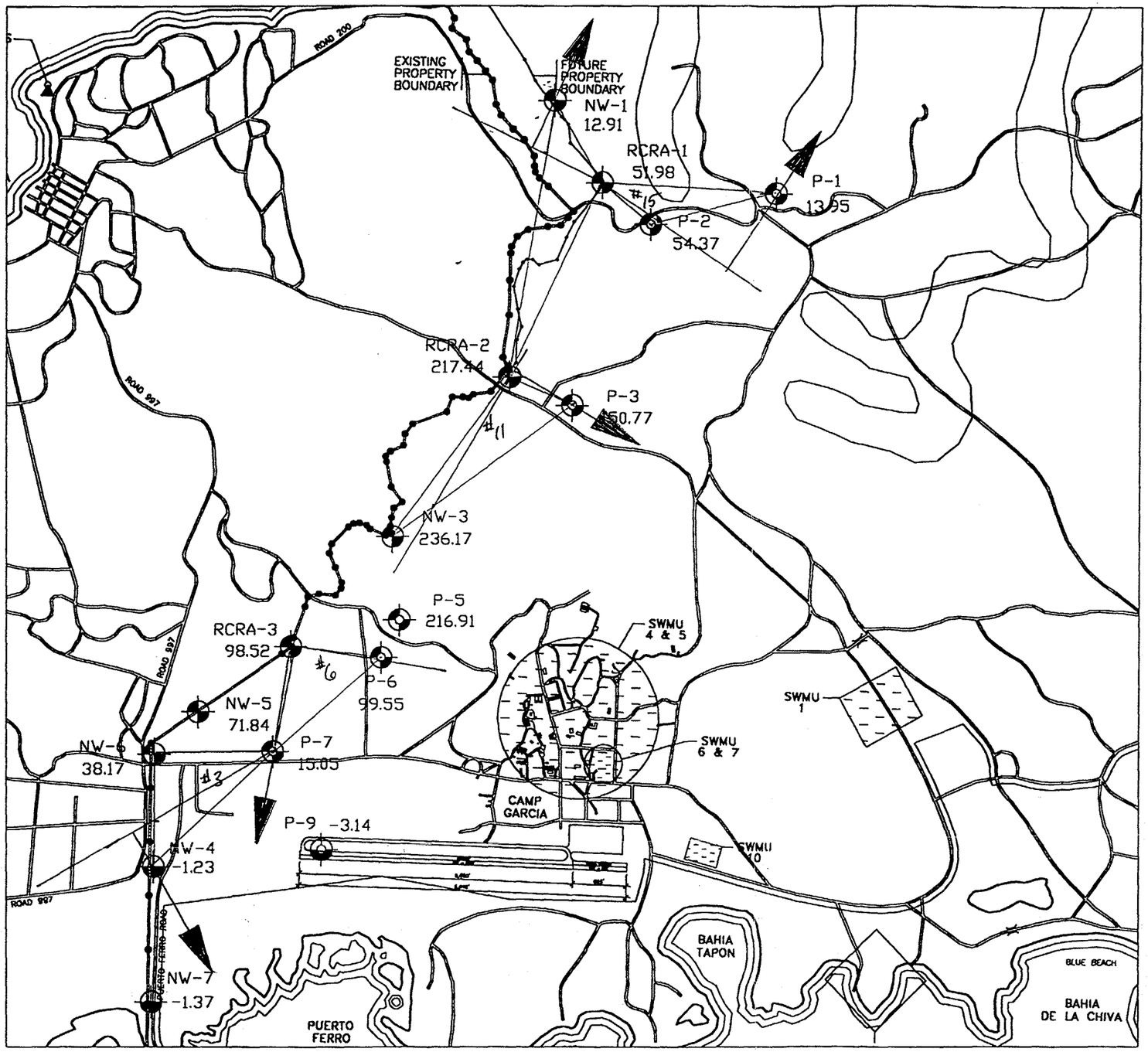

0 800 2400 4000
1 CM = 800 M

Baker

**FIGURE A-2**
**3-POINT CALCULATIONS**

**VIEQUES ISLAND**
**PUERTO RICO**

00179FB5Z

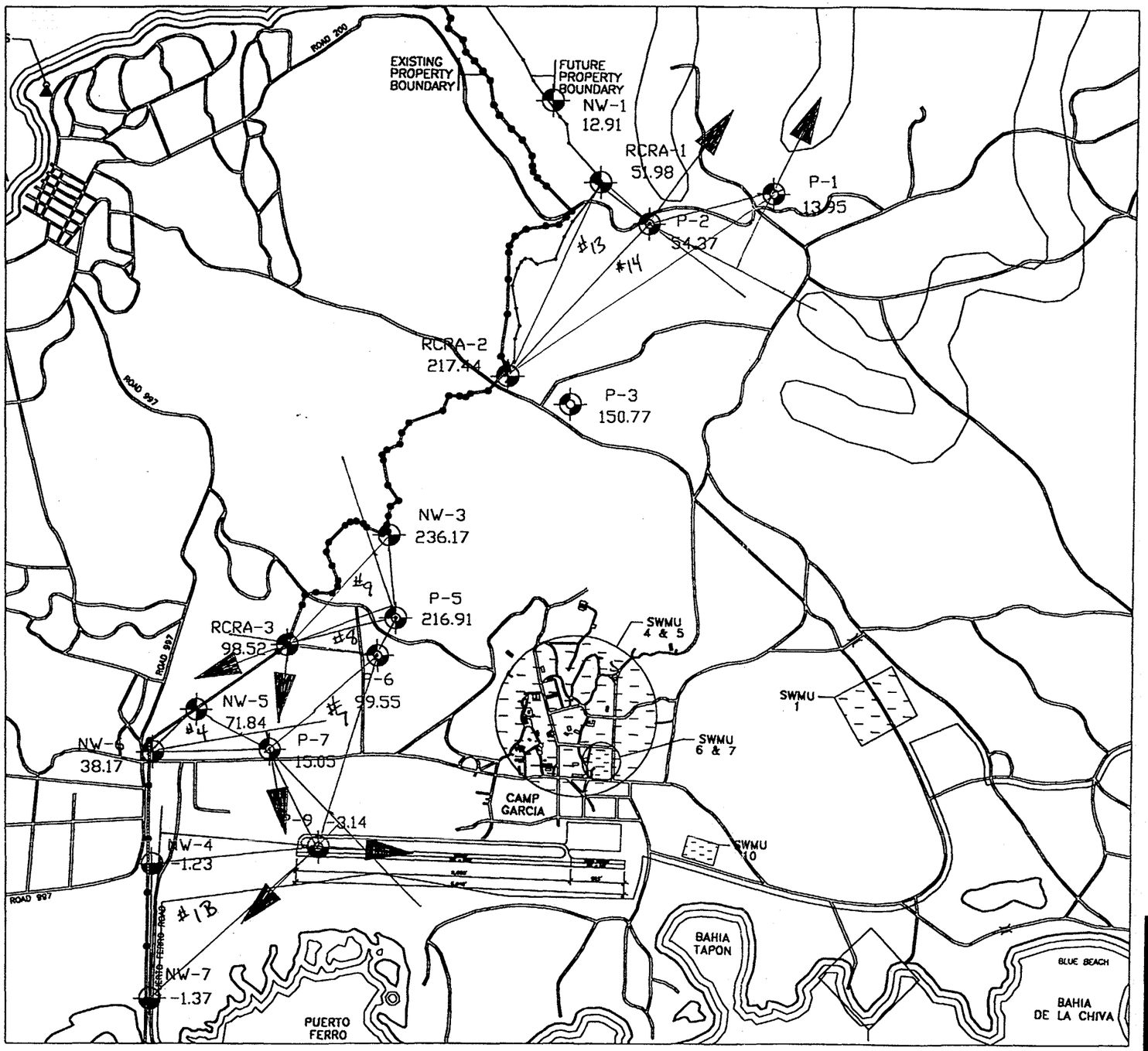



0 800 2400 4000
1 CM = 800 M

Baker

**FIGURE A-3**
**3-POINT CALCULATIONS**

**VIEQUES ISLAND**
**PUERTO RICO**




3P11X17

0 800 2400 4000
1 CM = 800 M

Baker

**FIGURE A-4**
**3-POINT CALCULATIONS**

**VIEQUES ISLAND**
**PUERTO RICO**