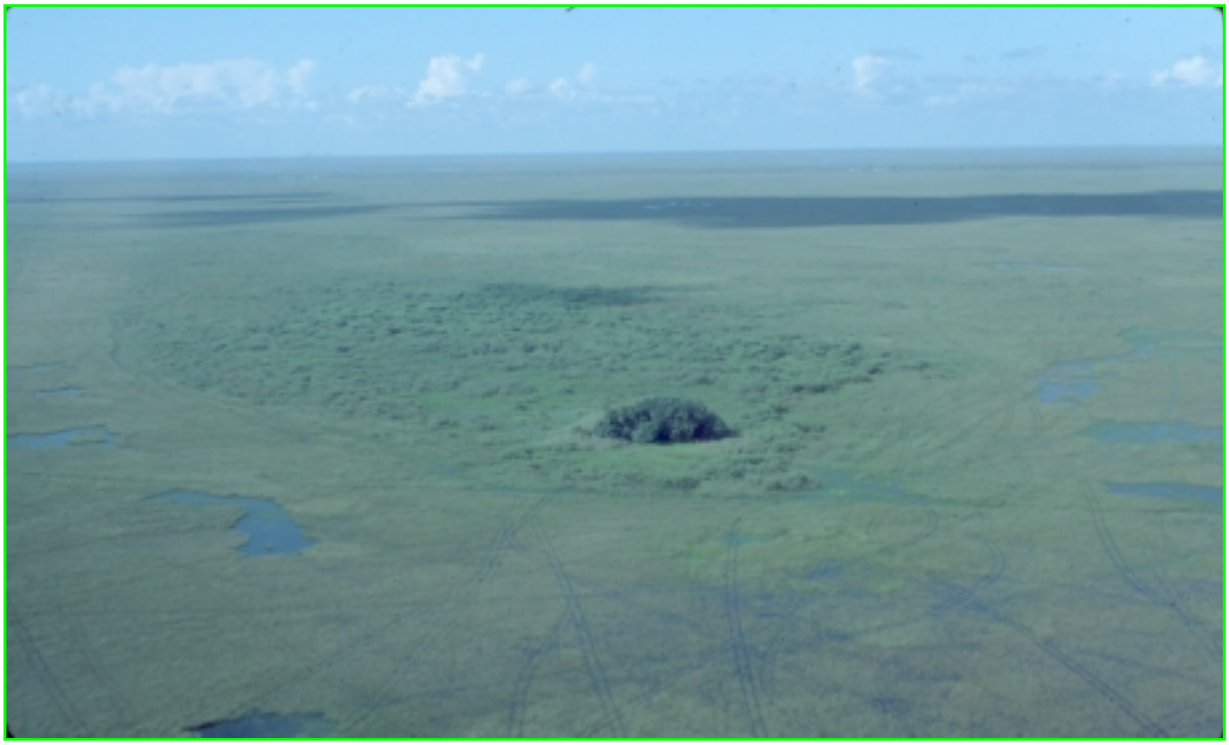
# Groundwater-Surface Water Interaction in Tree Islands: Water Conservation Area 3
## Part 1: Phase 1 Well Installation

### Technical Publication WS-4

Cindy Bevier and Steve Krupa, P.G.

**May 2001**



**South Florida Water Management District**
**3301 Gun Club Road**
**West Palm Beach, FL 33306**
**(561) 686-8800**
**www.sfwmd.gov**

# EXECUTIVE SUMMARY

The South Florida Water Management District (District or SFWMD), along with the Florida Center for Environmental Studies, Florida Fish and Wildlife Conservation Commission[1], U.S. Geological Survey, and several universities are involved in a 5-year, multidisciplinary study of selected tree islands in the Everglades. The establishment of ecological and hydrological criteria to address the needs of the Everglades is an important part of the U.S. Army Corps of Engineers (USACE) and SFWMD Comprehensive Everglades Restoration Plan (CERP). Tree island communities have been found to be very sensitive to altered hydrologic regimes (both extreme flooding and extreme drydowns), and are considered good indicators of the Everglades' overall well being.

The groundwater-surface water interaction investigation portion of the multidisciplinary study is designed to provide long-term information on site-specific geology, depositional environments, spatial and seasonal changes in groundwater levels, horizontal and vertical groundwater gradients, surface water levels, hydroperiods, meteorological conditions, and water chemistry. These objectives will be achieved through the drilling of monitor wells, collection and study of geologic and water samples, and installation of instrumentation for long-term collection of water level and weather data. The data collected from these well stations will provide baseline hydrologic information before the CERP-driven decompartmentalization of Water Conservation Area 3 (WCA-3), and will document subsequent changes to hydrologic conditions after decompartmentalization is achieved. In addition, the data will support research on minimum flows and levels, help establish guidelines for tree island restoration, and will be incorporated into the Florida Ambient Water Quality Network.

This report documents the work conducted on the first phase of well construction at two tree islands in WCA-3. Also described in this report is the work performed in constructing eight dual-zone monitor wells, with general descriptions of the geology found during drilling. Geologic data are provided in the form of boring and geophysical logs. Aquifer slug tests were performed on most of the completed well sites, and the raw data and hydraulic conductivity values derived are included in this report. The instrumentation installed at the wells for long-term water level data collection is described in this report.

This report does not analyze or interpret detailed geologic, water level, or water chemistry data, nor does it present any conclusions or recommendations. Subsequent reports will include the following:

- Description of well construction and geologic samples obtained in an additional tree island located in northern WCA-3A
- Detailed hydrostratigraphic analysis of the geologic samples obtained from tree island wells

1. The Florida Fish and Wildlife Conservation Commission was formerly called the Florida Game and Fresh Water Fish Commission.

- Presentation of hydrographs and discussion of horizontal and vertical water level gradients around the tree islands
- Description and discussion of baseline conditions and the use of hydrologic data as a performance measure for Everglades restoration
- Presentation and discussion of water chemistry data, including stable isotope data.

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# ACKNOWLEDGEMENTS

The successful completion of the Phase 1 Tree Island wells and report was possible because of the contributions of several key individuals. Mike Millican of Precision Drilling spent long hours for many weeks, under extremely trying conditions, dealing with difficult drilling situations, airboat and equipment breakdowns, snakes, and unusual requests from the project hydrogeologists. His persistence, cooperative attitude, and ability to improvise were invaluable.

Ed Rectenwald and Simon Sunderland of the Hydrogeology Unit of the Water Supply Department at South Florida Water Management District (District or SFWMD) contributed their expertise in geophysical logging and field data collection. We thank Mr. Rectenwald and Mr.Sunderland. We appreciate the efforts of David Demonstranti for conducting the slug tests and processing those data files. Walt Betit and Dan Walsh, from the Fort Lauderdale Field Station, and Sharon Niemczyk (former Mercury Toxics unit) provided airboat driving support. Mr. Betit spent many hours transporting equipment and personnel; the authors of this report often relied heavily on his skill in handling airboats in accomplishing many project tasks.

The authors thank Mike Korvela from the Everglades Department for his logistical assistance and for handling the day-to-day communications link between the project hydrogeologists and the other scientists conducting concurrent work on the tree islands. We appreciate Woody Van Voorhees for keeping the Miccosukee Tribe apprised of project activities. Gerald Hyink, Nancy Demonstranti, and Debra Case provided graphical support for this report. Special thanks are extended to Felicia Berger, Kim Jacobs, and Victor Mullen for their expertise in compiling, formatting, editing, and producing this report for publication.

# INTRODUCTION

## Background

The Everglades Forever Act of 1993 (EFA or The Act), together with the U.S. Army Corps of Engineers (USACE) and the South Florida Water Management District (District or SFWMD) Comprehensive Everglades Restoration Plan (CERP), require establishment of ecological and hydrological criteria to address the needs of the Everglades. Tree islands are topographic high points within the Everglades that provide habitat for a wide variety of terrestrial plants and animals. The tree islands in Water Conservation Area 3 (WCA-3) are typically tear-shaped, with the long axis parallel to surface water flow. The tallest trees and shrubs are upstream on the island on the head, which is usually the widest part of the island. Behind the head is an elongated, v-shaped area called the tail, which is dominated by lower elevation vegetation, such as shrubs and sawgrass.

Maximum land surface elevations of the highest tree islands are only slightly above mean annual maximum water levels. Tree island plant and animal communities are very sensitive to extremely wet or extremely dry conditions. The health of tree islands is considered an important aspect of the well being of the Everglades ecosystem. Changes in the physical and biological characters of tree islands are considered important indicators of problems caused by water management practices, beginning with canal construction in the 1910s.

Tree islands may have developed their unique shape as a result of nutrients being deposited in the lee of the head by water currents (van der Valk et al., 1998). The nutrients could be transported by surface water flow and/or by groundwater leaching of decomposing plant material on the head. It is also possible that groundwater plays a role in sustaining tree islands by providing moisture from groundwater flow during low surface water levels.

## Objectives

The groundwater-surface water interaction investigation is part of a 5-year multidisciplinary study involving SFWMD, Florida Fish and Wildlife Conservation Commission[1], Florida Center for Environmental Studies, U.S. Geological Survey (USGS), and various universities. This project will provide information on the site-specific geology, depositional environments, geomorphology, spatial and seasonal changes in the groundwater levels, horizontal and vertical groundwater gradients, surface water levels, detailed hydroperiod data, and groundwater-surface water nutrient contributions for selected tree islands. These objectives will be achieved through the drilling of dual-zone monitor wells, intensive study of geologic samples, and long-term collection of water level and water quality data. Information from this project will be used

1. Florida Fish and Wildlife Conservation Commission was formerly called Florida Game and Fresh Water Fish Commission.

to assess tree island development, and the subsequent changes in ecology in response to changes in hydrology.

These groundwater-surface water stations will provide long-term water level and meteorological monitoring data for daily operational activity at the SFWMD and USACE. The data will ultimately be useful in supporting mandated research on minimum flows and levels (MFLs) and in establishing guidelines for tree island restoration. One of the CERP initiatives, the decompartmentalization of WCA-3, involves the restoration of a more natural sheetflow between the WCAs and Everglades National Park through modifying the existing structures and filling in the canals. These data will establish baseline information on hydrologic conditions around the tree islands in WCA-3 before the planned decompartmentalization, as well as continued monitoring of conditions after decompartmentalization. Additionally, these wells will be incorporated into the State of Florida Ambient Water Quality Network.

## Site Locations

The tree islands selected for this study are located in WCA-3, in western Broward and Miami-Dade Counties. The eight monitor well sites constructed for the first phase of this project were distributed around two different tree islands: 3AS3 in southern WCA-3A and 3BS1 in southern WCA-3B (**Figure 1**). These particular tree islands were selected as drilling sites to coordinate the data collection with the intensive biological studies being conducted at the same sites. Each tree island had four dual-zone monitor well sites: one on the head of the island, one in the tail, and two in the marshes to the east and west of the head. The locations of these sites, relative to their associated tree islands, are shown in **Figures 1** and **3**. Four dual-well sites are planned for an additional tree island, 3AN1 in northern WCA-3A, in Summer 2001.

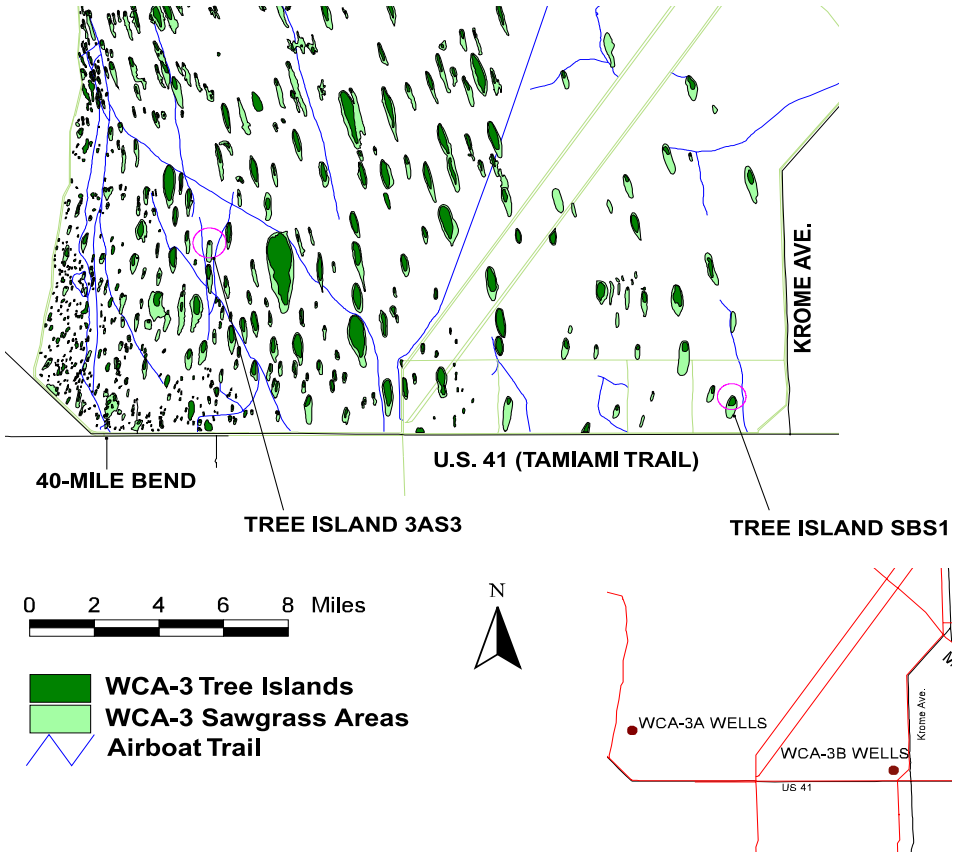



**Figure 1.** Tree Island Drilling Sites

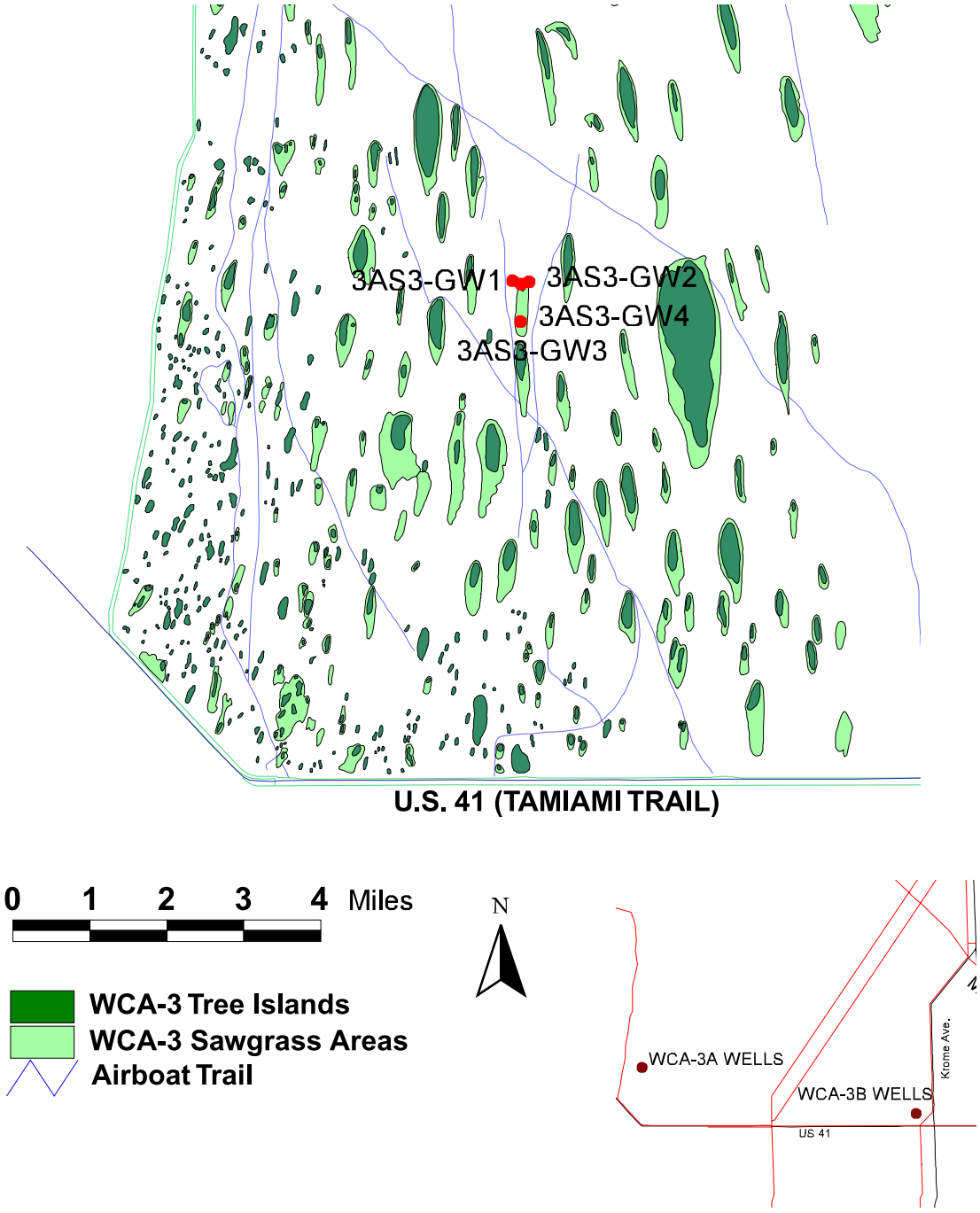



**Figure 2.** Well Sites at Tree Island 3AS3.

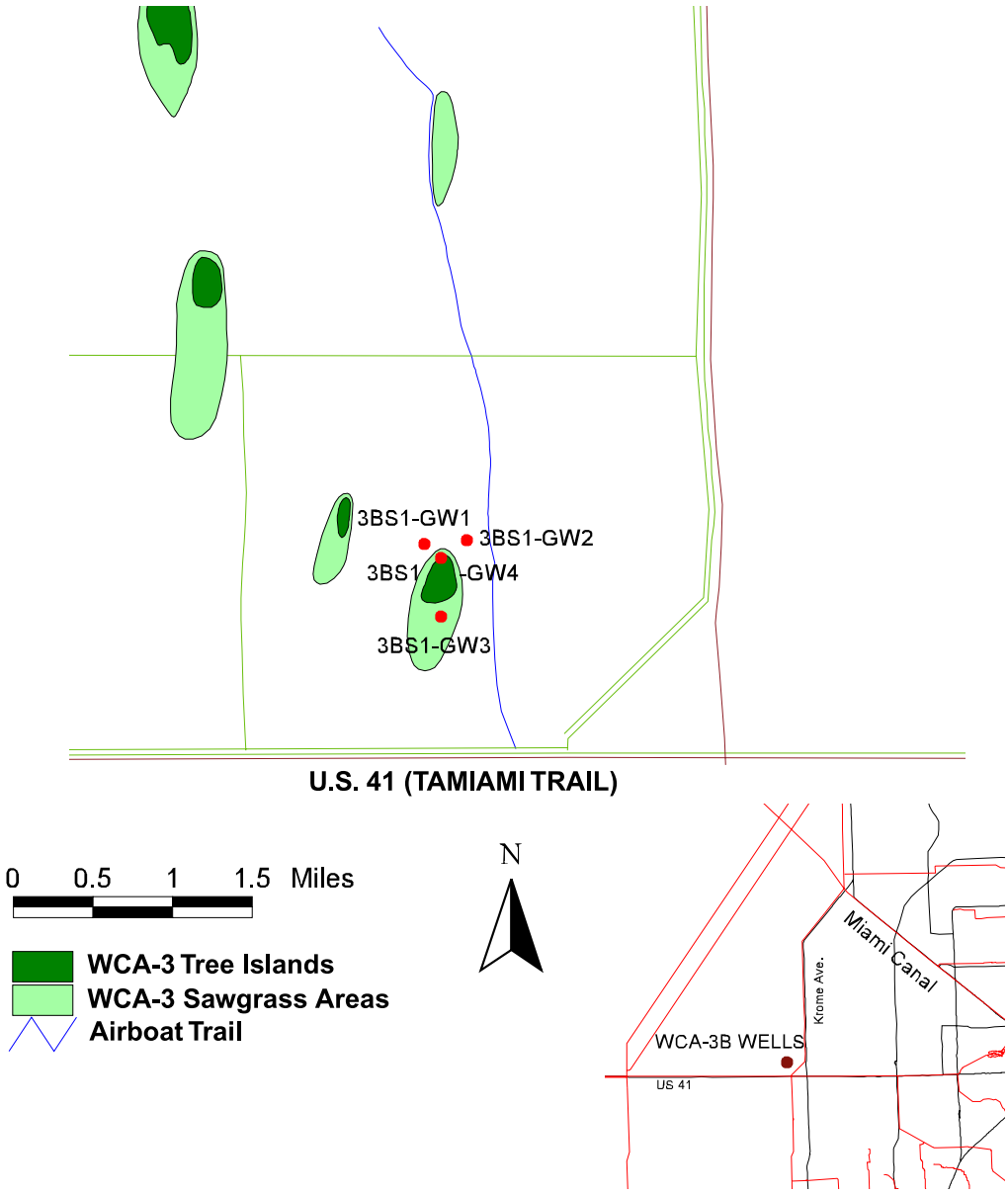



**Figure 3.** Well Sites at Tree Island 3BS1

# WELL CONSTRUCTION

## Drilling

Drilling on tree islands 3AS3 and 3BS1 was conducted during the latter part of 1999. A Request for Bid (RFB), along with a detailed Statement of Work (SOW), were prepared in May 1999. Contract C-1071 was awarded to Precision Drilling of Lake Worth, Florida. Drilling began in August 1999 and was completed in December 1999. Numerous delays in the work were experienced due to lightning, hurricanes, and equipment breakdowns.

Difficulty in site access and the need to avoid impacts on existing research made it necessary to use a rig small enough to be hand carried onto the tree island heads and transported to the sites by airboat. All wells associated with this project were drilled using a Hydra-Drill 2001 portable rig, manufactured by Deep Rock International. Supplies and equipment were transported from the marsh areas to the tree island heads on a wooden walkway. For the wells in the water, the rig was set up and bolted to a floating dock. The pilot holes were drilled, and well materials were installed through a hole cut into the dock platform. A more detailed description of the well drilling and installation is provided in **Appendix A**.

The drilling rig, drill rod, pumps, and hoses were steam cleaned before mobilization and between tree island sites to prevent cross-contamination. Shelby tubes, split-spoon liners, and caps were washed in Alconox and distilled water, then rinsed with distilled water before use. All casing, screen, and centralizers were steam cleaned before installation. Drilling personnel wore latex gloves while setting the casing.

## Geologic Sampling Methods

Shelby tubes (2-feet long) were pushed through the muck layers to refusal for collecting muck samples. The shelby tubes were labeled, and the north direction was marked. Once the shelby tube samples were retrieved, 6-inch diameter PVC surface casing was driven to the same depth. The annulus was cleaned out, and a 2-inch diameter temporary steel surface casing was installed. This temporary casing served to guide and stabilize the core barrel and bit. Coring began at the top of the limestone and continued until low recovery percentages, combined with fast drilling rates, indicated the need to switch to split-spoon sampling. No split-spoon samples were taken on island 3BS1 because the sampling interval was composed mostly of limestone. On and around island 3AS3, the limestone cap underlying the muck only extended from 5 to 8 feet; below that level, sand was found. Standard penetration tests were performed for all sand samples, according to ASTM Standard D-1586-84. Pictures of core samples and boring logs with details on lithology, sample penetration resistance, percent of materials recovered, and well construction are provided in **Appendix B**.

## Disposition of Samples

Shelby tubes from 3BS1 and 3AS3 were sent to the USGS in Reston, Virginia for analysis. Since the samples were damaged during shipping, they could not be analyzed.

Continuous coring was used throughout the limestone intervals in all wells. The core barrel used was 5-feet long. At times, shorter intervals were retrieved from the core barrel in response to equipment problems or changes in lithology. The cores were sent to Core Laboratories in Midland, Texas for permeability, porosity, and spectral gamma analyses, as well as for slabbing, thin sectioning, and photography. Permeability and porosity analyses aided in describing the water-transmitting capabilities of the sediments. Spectral gamma analysis was used to identify sediments with high proportions of naturally-occurring radioisotopes (potassium, uranium, and thorium), and also to correlate geophysical logs with depth in wells. The USGS Miami Subdistrict Office will perform a detailed hydrostratigraphic analysis of the cores and present their findings at a future date.

Split-spoon samples of sand were 2-feet long and were retained in clear plastic liners. These sand samples were submitted to Core Laboratories for permeability, porosity, and spectral gamma analyses. They will be sent to another laboratory for sieve analysis at a future date.

## Well Construction and Completion

With one exception, all boreholes were completed with dual construction: two wells open to different depths within the same borehole. **Figure 4** shows a general schematic of the well construction. A deeper 2-inch well and a shallower 3/4-inch piezometer were placed inside a 6-inch PVC outer casing. The shallow piezometers had 1-foot long PVC screens placed at depths ranging from 8 to 15 feet below bedrock. The deeper 2-inch wells had 2-foot PVC screens placed from 26 to 34 feet below bedrock. **Table 1** shows the well construction information for each site. Well 3BS1-GW4 was not dually constructed. The 3/4-inch piezometer was vandalized, and a replacement piezometer was installed in a separate borehole. Specific construction methods used for the dual-zone wells are described in **Appendix A**.

After each borehole annulus had been grouted, and before water level recording instrumentation was installed, each well was developed to remove fine particulate matter and any drilling fluids remaining in the formation. The 2-inch wells were developed by pumping for approximately one hour each with a 1 1/4-inch Honda pump. The 3/4-inch piezometers were developed for approximately one hour using a peristaltic pump.

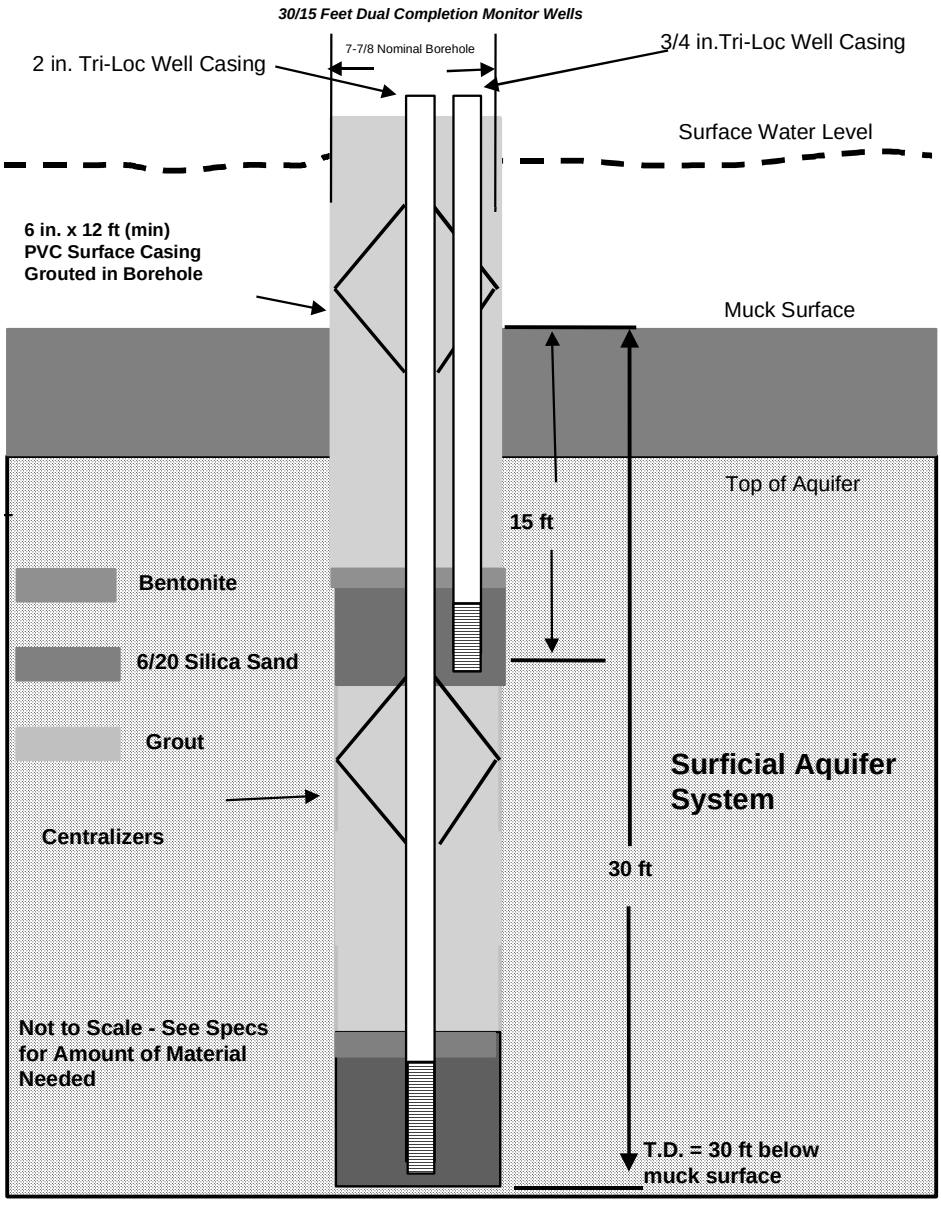



**Figure 4.** General Schematic of Dual Zone Monitor Well

**Table 1.** Tree Island Well Construction Information

| Station Name | State Planar Coordinates Easting | State Planar Northing | Measuring Point Elevation (ft NGVD, 1929) | Depth, Well Cased (ft below peat) | Depth, Well Drilled (ft below peat) | Top, Screen Interval (ft below peat) | Bottom, Screen Interval (ft below peat) | Top, Well Screen Elevation (ft NGVD, 1929) | Bottom, Well Screen Elevation (ft NGVD, 1929) | Well Diameter (in.) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3AS3-GW1 | 731335.50 | 553893.38 | 14.49 | 26.0 | 28 | 26.0 | 28.0 | -16.54 | -18.54 | 2 |
| 3AS3-GW1p | 731335.50 | 553893.38 | 14.50 | 9.0 | 10 | 9.0 | 10.0 | 0.22 | -0.78 | 3/4 |
| 3AS3-GW2 | 732504.91 | 553804.57 | 15.98 | 23.5 | 26 | 23.5 | 25.5 | -15.18 | -17.18 | 2 |
| 3AS3-GW2p | 732504.91 | 553804.57 | 16.01 | 9.0 | 10 | 9.0 | 10.0 | 0.40 | -0.60 | 3/4 |
| 3AS3-GW3 | 731902.37 | 551060.26 | 16.14 | 26.0 | 28 | 26.0 | 28.0 | -18.71 | -20.71 | 2 |
| 3AS3-GW3p | 731902.37 | 551060.26 | 16.13 | 8.0 | 9 | 8.0 | 9.0 | 0.38 | -0.62 | 3/4 |
| 3AS3-GW4 | 731918.67 | 553634.58 | 15.68 | 26.0 | 28 | 26.0 | 28.0 | -17.04 | -19.04 | 2 |
| 3AS3-GW4p | 731918.67 | 553634.58 | 15.68 | 7.0 | 8 | 7.0 | 8.0 | 2.06 | 1.06 | 3/4 |
| 3BS1-GW1 | 816940.41 | 526160.91 | 12.15 | 32.0 | 34 | 32.0 | 34.0 | -27.00 | -29.00 | 2 |
| 3BS1-GW1p | 816940.41 | 526160.91 | 12.13 | 14.0 | 15 | 14.0 | 15.0 | -8.77 | -9.77 | 3/4 |
| 3BS1-GW2 | 818356.79 | 526287.33 | 13.40 | 28.0 | 30 | 28.0 | 30.0 | -22.76 | -24.76 | 2 |
| 3BS1-GW2p | 818356.79 | 526287.33 | 13.40 | 12.0 | 13 | 12.0 | 13.0 | -7.14 | -8.14 | 3/4 |
| 3BS1-GW3 | 817494.33 | 523748.08 | 13.35 | 26.3 | 28 | 26.3 | 28.3 | -20.72 | -22.72 | 2 |
| 3BS1-GW3p | 817494.33 | 523748.08 | 13.35 | 13.0 | 14 | 13.0 | 14.0 | -8.35 | -9.35 | 3/4 |
| 3BS1-GW4 | 817494.33 | 525622.26 | 13.73 | 32.0 | 34 | 32.0 | 24.0 | -22.56 | -24.56 | 2 |
| 3BS1-GW4p | 817494.33 | 525622.26 | 13.73 | 14.0 | 15 | 14.0 | 15.0 | -3.18 | -4.18 | 3/4 |

Note:
All wells constructed with threaded schedule 40 PVC pipe.
Well screens all with 0.010" slots and packed with 30-20 silica sand.

All the completed well sites were instrumented with CR10X automatic water level data recorders, with pressure transducers installed only in the 2-inch wells. The 3/4-inch piezometers will be fitted with slim-line transducers in the future. One well site on each island includes a surface water stage gage and an electronic surface water elevation encoder. Battery power to the instrumentation is supplied by solar panels at each site. A typical tree island well site is shown in **Figure 5**. Water level and stage information is collected at 15-minute intervals and is transmitted by radio daily to SFWMD. These data are processed, reviewed, and archived on the SFWMD DBHYDRO database.

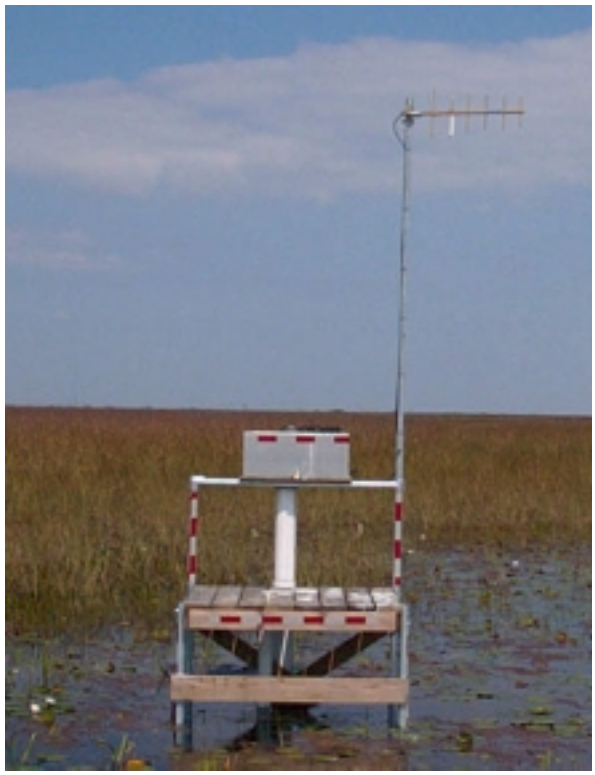


**Figure 5.** Typical Tree Island Well Site

In addition to the surface water-groundwater stations, a weather station was constructed in the marsh just east of tree island 3AS3. This station collects air temperature, barometric pressure, relative humidity, net and total solar radiation, photosynthetic radiation, rainfall, wind direction, wind gust, and wind speed data at 15-minute intervals. This information is transmitted daily to SFWMD for storage on the DBHYDRO database.

# GEOLOGY

## South Florida Geology

The geologic framework of the South Florida peninsula is well understood. A detailed account of South Florida geology is beyond the scope of this paper; however, there are many excellent regional water supply, geologic, and lithologic studies available. Among these are Parker et al., 1955; Klein and Hull, 1978; Fish and Stewart, 1991; and Enos and Perkins, 1977.

The peninsula of Florida is part of a much wider submerged plateau, the Floridan Plateau (Parker et al., 1955). The core of the Floridan Plateau is composed of igneous and metamorphic rocks that are thought to be an extension of the Appalachian Mountains (Enos and Perkins, 1977). Overlying this core in the South Florida region are more than 15,000 feet of sedimentary deposits ranging in age from Cretaceous (or possibly earlier) to Quaternary (Enos and Perkins, 1977). Pleistocene sediments in South Florida are of particular interest because they record different sea level stands, which occurred partly in

response to continental glaciation and interglacial periods during the Pleistocene epoch (Parker et al., 1955). Pleistocene stratigraphy has been further refined by Enos and Perkins (1977) into five marine units, representing high sea level stands separated by discontinuity surfaces (freshwater interbeds and subaerially-exposed surfaces) representing low sea level stands. These five time-stratigraphic units are referred to as Q-units 1 through 5. The Q-units do not necessarily correlate, on a one-to-one basis, with previous formational terminology (Enos and Perkins, 1977). In terms of traditionally used formation names, Pleistocene-age deposits underlying the Everglades tree islands at shallow depths include the Fort Thompson Formation and Miami Limestone.

### Fort Thompson Formation

The Fort Thompson Formation consists of alternating deposits of marine, brackish, and freshwater carbonates. It has been traced from its type locality just east of La Belle, onto the Lake Okeechobee-Everglades depression, east and south to the Atlantic Coastal Ridge in Miami, and west into Collier County (Parker et al., 1955). The marine units of the Fort Thompson are thought to correlate with high sea level stands, while the freshwater beds represent periods of low sea level and emergence (Enos and Perkins, 1977).

The Fort Thompson Formation can be separated into two parts, based on hydrologic characteristics. In the northern portion underlying the upper Everglades area, including northwest Broward County, it is typically less than 10 feet thick and has low permeability. The southern portion of the Fort Thompson Formation is extremely permeable, forming a major part of the Biscayne aquifer. The southern portion also thickens toward the Atlantic Ocean, becoming as thick as 80 feet in the Miami area (Parker et al., 1955).

### Miami Limestone

The Miami Limestone, first known as the Miami Oolite, is composed of massive to cross-bedded sandy oolitic deposits underlain by bryozoan limestones. It is located from the Atlantic Coastal Ridge near Boca Raton, south to Florida City, below Florida Bay, in the lower Florida Keys, and westward as far as the eastern edge of the Big Cypress Swamp (Parker et al., 1955). Hoffmeister (1974) suggested using the name Miami Limestone to include the bryozoan facies that occurs underneath and west of the oolitic facies.

The Miami Limestone overlies the Fort Thompson Formation. The oolitic facies is about 30 feet thick underneath the Atlantic Coastal Ridge in Miami, gradually thinning toward the west. The bryozoan facies is about 10 feet thick underneath the oolitic facies in Miami, appearing at land surface in the Everglades, and covering a total area of at least 2,000 square miles (Hoffmeister, 1974). Hoffmeister (1974) emphasizes that the oolitic and bryozoan features of the Miami Limestone are a near mirror image of present day conditions off the Bahama Bank and the shelf lagoon behind it.

## Site-Specific Tree Island Geology

The wells constructed for this project are very shallow, penetrating sediments of Quaternary age. It is probable that the cores obtained from these tree islands contain sediments from the Miami Limestone and Fort Thompson Formation (Fish and Stewart, 1991). Specific formations and/or depositional horizons (the Q-units of Enos and Perkins, 1977) for these tree island samples will be assigned and analyzed in a future report by the USGS.

The sediments retrieved from the project wells varied distinctly between the two islands. Samples obtained beneath the organic peat deposits on 3BS1 to depths of 35 feet were all composed primarily of limestone. The limestone underlying 3BS1 varied from massive and relatively impermeable to solution-riddled, extremely permeable, and sandy. In contrast, all samples from 3AS3 had only 5 to 10 feet of limestone underneath the peat, below which was a fine, poorly sorted mix of quartz and carbonate sand and silt. Pictures and general lithologic descriptions of the shallow sediments underlying tree islands 3AS3 and 3BS1 are provided in **Appendix B**.

# HYDROLOGY

## Surface Water Hydrologic Features

Drainage of the Everglades began in 1880. Before 1880, the Everglades landscape was likely a mixture of sloughs, narrow channels, sawgrass ridges, and tree islands maintained by a vast sheet of flowing water that had its source in overflow from Lake Okeechobee (SFWMD, 2000). Between 1906 and 1930, the construction of major canals and levees had substantially lowered water tables throughout the Everglades basin and had stopped Lake Okeechobee's natural overflow (SFWMD, 1999). After 1948, additional canals, levees, and structures were constructed by the Central and Southern Florida Flood Control District (now the South Florida Water Management District). By the 1960s, the levees and structures that impounded the Water Conservation Areas (WCAs) were complete. The WCAs are now managed with regulation schedules that determine the timing of flood control releases versus the maintenance of water levels to meet downstream needs (SFWMD, 1999).

Tree islands 3AS3 and 3BS1 are located in WCA-3, which covers an area of 915 square miles. WCA-3A and WCA-3B are separated by two interior levees (L-67A and L-67C). Major surface water inflows to WCA-3 are currently from the S-11 structures, the Miami Canal (and associated S-8, S-339, and S-340 structures), and the L-28 canal. Rainfall contributes about 59 percent (Reddy et al., 1994) of the total water input to WCA-3. Surface water releases from WCA-3 occur through the S-12 structures adjacent to Tamiami Trail.

## Hydrogeology

The wells for this project are shallow (34 feet below land surface [bls] or less), and lie entirely within the Surficial Aquifer System. The Surficial Aquifer System is present in most parts of Florida. It is commonly defined as all the rocks and sediments from land surface down to the top of the intermediate confining unit, which corresponds to the top of the Hawthorn Group in this study area (Fish and Stewart, 1991). The principal aquifer in the Surficial Aquifer System in South Florida is the Biscayne aquifer. The Biscayne is one of the most permeable water-bearing units in the world and is designated a sole-source aquifer in the Federal Register Notice of 1979 (Reese and Cunningham, 2000). The Miami Limestone and Fort Thompson Formation mentioned in the geology section of this report are considered part of the Biscayne aquifer (Fish and Stewart, 1991).

Tree island 3BS1 probably lies at the western extent of the Biscayne aquifer. A thin layer of Miami Limestone appears at the tops of the cores taken at that island. The hydrogeologic sections in Fish and Stewart (1991) show the presence of Miami Oolite in the vicinity of 3BS1, with hydraulic conductivity values ranging from 10 to 1,000 feet per day. The Fort Thompson Formation likely comprises the remaining length of core samples at 3BS1. Fish and Stewart (1991) report hydraulic conductivity values ranging from 100 to greater than 1,000 feet per day in the Fort Thompson near 3BS1.

Maps in Fish and Stewart (1991) show a thin layer of Miami Oolite in the 3AS3 area, although with a lower hydraulic conductivity range (10 to 100 feet per day). The sand underlying the limestone at 3AS3 is depicted as part of Fort Thompson in the same maps. The sand samples from 3AS3 may also represent the upper confining to semiconfining unit of the gray limestone aquifer (Reese and Cunningham, 2000), which they describe as “siliciclastics of low to very low hydraulic conductivity (sand, clayey sand, mudstone, and clay)….”

## Project Slug Tests

Slug tests were conducted on both the 2-inch deep and the 3/4-inch shallow project wells in an effort to get information on localized hydraulic properties of the sediments underlying the tree islands. The typical slug test involves the injection of a predetermined amount of distilled water into the borehole and measurement of the rate at which the elevated water level returns to static level. This test proved unsatisfactory because the injected water dissipated too rapidly to be measured. Ultimately, a pump-and-recovery method was used.

### Test Procedure

Upon arrival at the test sites, static water level measurements were taken. Pressure transducers were rinsed with distilled water, then lowered into both the deep and shallow wells to a depth of 1 or 2 feet from the bottom of the screens. One end of a cleaned suction hose was inserted into the well to be pumped, and the other end was connected to the pump. A 1-1/4 inch Honda centrifugal pump, capable of pumping 20-30 gallons per

minute (gpm), was used in the 2-inch wells. A peristaltic pump, capable of producing 0.26 gpm, and disposable Master-Flex tubing, were used in the 3/4-inch wells. Both pressure transducers were connected to a Hermit 3000 datalogger (manufactured by In-Situ, Inc.), and initial pressure readings were recorded.

The pump was started, and water level declines were monitored on the Hermit 3000. When the drawdown appeared to be stable, usually within a few minutes of starting the pump, the pump was shut off simultaneously with the initialization of automatically recorded readings from the pressure transducers. Recovering water levels were measured on a logarithmic time scale, with a maximum time between readings of 10 seconds. In all cases, although both wells were monitored while one was pumped, only the pumped well showed any changes in initial water level readings. This was probably due to the short pumping time and low pumping rates, rather than the lack of hydraulic connection between the shallow and deeper wells. When water levels recovered to their initial elevations, recording stopped, and the readings were viewed for acceptability. If the data showed too rapid a recovery, the test was repeated for a longer time to improve data collection.

## Results

**Table 2** shows the results of the slug test analyses as well as the parameter values used in the analyses. Hydraulic conductivity values for each well were analyzed with the Bouwer-Rice and the Hvorslev methods, using both the AQTESOLV and AQUIFER TEST software packages. Values for hydraulic conductivity (K) ranged from 0.58 feet/day to 103.6 feet/day in the shallow piezometers on 3AS3, and was calculated at an average of 1.07 feet/day in the one piezometer tested on 3BS1. K values ranged from 1.5 to 16.08 feet/day in the deeper 2-inch wells on 3AS3, and from 30.82 to 184 feet/day in the 2-inch wells on 3BS1. The raw data and curves for the slug tests are provided in **Appendix C**.

Three of the four piezometers on 3BS1 could not be tested because the peristaltic pump could not stress them enough to create a drawdown. Inability to stress the wells during pumping and nearly continual lost circulation during drilling suggest that hydraulic conductivity in the shallow zone on 3BS1 is fairly high. The shallow zone on 3AS3, however, appears to have a wide range of hydraulic conductivity. The limestone in which these piezometers were screened is fairly thin (5 to 10 feet thick), and its porosity appears to be controlled by large secondary solution openings. The range of K values in the shallow zone of 3AS3 may simply reflect the immediate environment surrounding the individual well screens.

Hydraulic conductivity values in the deeper zone of 3AS3 were an order of magnitude lower, on average, than those in the deeper zone of 3BS1. This is expected since 3AS3 deeper wells are screened in fine sand, while those in 3BS1 are screened in porous limestone.

## Table 2. Slug Test Analysis on Tree Island Wells

| Well Name | Parameters Used in Analysis | | | | Height of Water Column Above Bottom of Screen (ft) | Hydraulic Conductivity (ft/day) | Analysis Method Used | Software Used | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | Screen Length (ft) | Casing Radius (ft) | Gravel Pack Radius (ft) | Aquifer Thickness (ft) | | | | | |
| 3AS3-GW1 | 2.00 | 0.08 | 0.25 | 40.00 | 28.10 | 13.60 | Bouwer-Rice | Aquifer Test | Screen set in sand |
| 3AS3-GW1 | 2.00 | 0.08 | 0.25 | 40.00 | 28.10 | 15.80 | Hvorslev | Aquifer Test | |
| 3AS3-GW1 | 2.00 | 0.08 | 0.25 | 40.00 | 28.10 | 13.55 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW1 | 2.00 | 0.08 | 0.25 | 40.00 | 28.10 | 16.08 | Hvorslev | AQTESOLV | |
| 3AS3-GW1p | 1.00 | 0.03 | 0.17 | 40.00 | 10.34 | 31.10 | Bouwer-Rice | Aquifer Test | Screen set in limestone. Instantaneous recovery, very few data points |
| 3AS3-GW1p | 1.00 | 0.03 | 0.17 | 40.00 | 10.34 | 41.76 | Hvorslev | Aquifer Test | |
| 3AS3-GW1p | 1.00 | 0.03 | 0.17 | 40.00 | 10.34 | 74.21 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW1p | 1.00 | 0.03 | 0.17 | 40.00 | 10.34 | 103.60 | Hvorslev | AQTESOLV | |
| 3AS3-GW2 | 2.00 | 0.08 | 0.25 | 40.00 | 26.70 | 6.00 | Bouwer-Rice | Aquifer Test | Screen set in sand |
| 3AS3-GW2 | 2.00 | 0.08 | 0.25 | 40.00 | 26.70 | 7.20 | Hvorslev | Aquifer Test | |
| 3AS3-GW2 | 2.00 | 0.08 | 0.25 | 40.00 | 26.70 | 6.23 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW2 | 2.00 | 0.08 | 0.25 | 40.00 | 26.70 | 7.52 | Hvorslev | AQTESOLV | |
| 3AS3-GW2p | 1.00 | 0.03 | 0.17 | 40.00 | 10.14 | 34.80 | Bouwer-Rice | Aquifer Test | Screen set in limestone. Instantaneous recovery, very few data points |
| 3AS3-GW2p | 1.00 | 0.03 | 0.17 | 40.00 | 10.14 | 50.10 | Hvorslev | Aquifer Test | |
| 3AS3-GW2p | 1.00 | 0.03 | 0.17 | 40.00 | 10.14 | 43.17 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW2p | 1.00 | 0.03 | 0.17 | 40.00 | 10.14 | 60.47 | Hvorslev | AQTESOLV | |
| 3AS3-GW3 | 2.00 | 0.08 | 0.25 | 40.00 | 30.17 | 2.10 | Bouwer-Rice | Aquifer Test | Screen set in sand |
| 3AS3-GW3 | 2.00 | 0.08 | 0.25 | 40.00 | 30.17 | 2.40 | Hvorslev | Aquifer Test | |
| 3AS3-GW3 | 2.00 | 0.08 | 0.25 | 40.00 | 30.17 | 2.06 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW3 | 2.00 | 0.08 | 0.25 | 40.00 | 30.17 | 2.48 | Hvorslev | AQTESOLV | |
| 3AS3-GW3p | 1.00 | 0.03 | 0.17 | 40.00 | 10.50 | 5.70 | Bouwer-Rice | Aquifer Test | Screen set in limestone |
| 3AS3-GW3p | 1.00 | 0.03 | 0.17 | 40.00 | 10.50 | 6.90 | Hvorslev | Aquifer Test | |
| 3AS3-GW3p | 1.00 | 0.03 | 0.17 | 40.00 | 10.50 | 5.96 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW3p | 1.00 | 0.03 | 0.17 | 40.00 | 10.50 | 8.41 | Hvorslev | AQTESOLV | |
| 3AS3-GW4 | 2.00 | 0.08 | 0.25 | 40.00 | 27.40 | 1.60 | Bouwer-Rice | Aquifer Test | Screen set in sand |
| 3AS3-GW4 | 2.00 | 0.08 | 0.25 | 40.00 | 27.40 | 1.90 | Hvorslev | Aquifer Test | |
| 3AS3-GW4 | 2.00 | 0.08 | 0.25 | 40.00 | 27.40 | 1.50 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW4 | 2.00 | 0.08 | 0.25 | 40.00 | 27.40 | 1.80 | Hvorslev | AQTESOLV | |
| 3AS3-GW4p | 1.00 | 0.03 | 0.17 | 40.00 | 8.20 | 0.60 | Bouwer-Rice | Aquifer Test | Screen set in limestone |
| 3AS3-GW4p | 1.00 | 0.03 | 0.17 | 40.00 | 8.20 | 0.80 | Hvorslev | Aquifer Test | |
| 3AS3-GW4p | 1.00 | 0.03 | 0.17 | 40.00 | 8.20 | 0.58 | Bouwer-Rice | AQTESOLV | |
| 3AS3-GW4p | 1.00 | 0.03 | 0.17 | 40.00 | 8.20 | 0.85 | Hvorslev | AQTESOLV | |
| 3BS1-GW1 | | | | | | | | | Screen set in limestone; could not get drawdown |
| 3BS1-GW1p | | | | | | | | | Screen set in limestone; could not get drawdown |
| 3BS1-GW2 | 2.00 | 0.08 | 0.25 | 80.00 | 31.45 | 138.70 | Bouwer-Rice | Aquifer Test | Screen set in limestone |
| 3BS1-GW2 | 2.00 | 0.08 | 0.25 | 80.00 | 31.45 | 149.80 | Hvorslev | Aquifer Test | |
| 3BS1-GW2 | 2.00 | 0.08 | 0.25 | 80.00 | 31.45 | 130.70 | Bouwer-Rice | AQTESOLV | |
| 3BS1-GW2 | 2.00 | 0.08 | 0.25 | 80.00 | 31.45 | 184.00 | Hvorslev | AQTESOLV | |
| 3BS1-GW2p | | | | | | | | | Screen set in limestone; very little drawdown, instantaneous recovery |
| 3BS1-GW3 | | | | | | | | | Site inaccessible at time of test |
| 3BS1-GW3p | 1.00 | 0.03 | 0.17 | 80.00 | 14.13 | 0.93 | Bouwer-Rice | Aquifer Test | Screen set in limestone; Needed additional well development |
| 3BS1-GW3p | 1.00 | 0.03 | 0.17 | 80.00 | 14.13 | 1.27 | Hvorslev | Aquifer Test | |
| 3BS1-GW3p | 1.00 | 0.03 | 0.17 | 80.00 | 14.13 | 0.85 | Bouwer-Rice | AQTESOLV | |
| 3BS1-GW3p | 1.00 | 0.03 | 0.17 | 80.00 | 14.13 | 1.24 | Hvorslev | AQTESOLV | |
| 3BS1-GW4 | 2.00 | 0.08 | 0.25 | 80.00 | 31.25 | 30.82 | Bouwer-Rice | Aquifer Test | Screen set in limestone; very little drawdown |
| 3BS1-GW4 | 2.00 | 0.08 | 0.25 | 80.00 | 31.25 | 39.02 | Hvorslev | Aquifer Test | |
| 3BS1-GW4 | 2.00 | 0.08 | 0.25 | 80.00 | 31.25 | 31.66 | Bouwer-Rice | AQTESOLV | |
| 3BS1-GW4 | 2.00 | 0.08 | 0.25 | 80.00 | 31.25 | 40.01 | Hvorslev | AQTESOLV | |
| 3BS1-GW4p | | | | | | | | | Screen set in limestone; unable to test, no drawdown |

## Groundwater-Surface Water Interaction

One of the goals of this project is to better understand the relationship between groundwater and surface water in the Everglades. It is hypothesized that there is a high degree of hydraulic connection between the surface water and groundwater regimes in the Everglades, and that vertical gradients may be either upward or downward, depending on local conditions and seasonal factors. Data collected from the Everglades Nutrient Removal Project Wells show gradient reversals between shallow and deep dual-zone wells, and between wells and surface water levels (Harvey et al., 2000).

Preliminary data from the 3AS3 and 3BS1 stations show a consistent downward vertical gradient between surface water and groundwater. These data, however, are inconclusive because of frequent problems with instrument operation and problems with the initial surveyed reference elevations at these sites.

## Future Research

### Phase 2 Well Installation

A contract (Request for Quote [RFQ] 01-005) was awarded to Precision Drilling in November 2000 to construct four additional monitor wells sites at a third tree island (3AN1) in northern WCA-3A. Work is expected to begin on these new sites in early Summer 2001. These wells will be similar in construction and configuration to the sites at 3AS3 and 3BS1.

## Instrumentation Needs

Phase 2 wells will be outfitted with the same type of instrumentation as Phase 1 wells. Additionally, three slim-line transducers will be installed in the 3/4-inch piezometers on the heads of 3BS1, 3AS3, and 3AN1. Instrumenting the piezometers will make it much easier to compare vertical ground water gradients during heavy rainfalls and drought, as well as with seasonal variations in surface water stage.

## Determination of Gradients

Due to frequent instrument failure, errors in surveyed reference elevations, and the ongoing resolution of these data acquisition problems, it was not possible to make determinations about groundwater gradients in this report. A second report is planned for late 2001 to cover this information.

## Water Quality

Water quality parameters are currently being sampled bi-annually at the 3AS3 and 3BS1 sites. These parameters include phosphorus, nitrogen as nitrite, sulfate, nitrogen as ammonia, NOX, calcium, potassium, magnesium, sodium, iron, total dissolved solids,

alkalinity, total organic carbon, and chemical oxygen demand. These data will be presented in the Phase II report expected to be published in late 2001. Also included will be the results of stable isotope sampling budgeted for Fiscal Year 2001.

## Additional Lithologic Data

Detailed analysis of core and sand samples will be presented in a future report. This report will include porosity, permeability, and spectral gamma analyses of cores; sieve analysis of sand samples; and detailed hydrostratigraphic analysis of cores from the USGS Miami Subdistrict Office.

# REFERENCES

American Society of Testing and Materials. 1992. *Standard Penetration Test and Split Barrel Sampling of Soils*. D-1586-84. Philadelphia, PA: American Society of Testing and Materials.

American Society of Testing and Materials. 1993. *Standard Practice for Diamond Core Drilling for Site Investigation*. D-2113-83. Philadelphia, PA: American Society of Testing and Materials.

AQTESOLV for Windows 95/98/NT, Version 2.5, Professional.©1996-1999, HydroSOLVE, Inc., by Glenn M. Duffield.

Aquifer Test for Windows, Version 2.57. Waterloo Hydrogeologic, Inc., by Thomas Roehrich.

Enos, P. and R.D. Perkins. 1977. Quaternary Sedimentation in South Florida. Geological Society of America Memoir 147.

Fish, J.E. and M. Stewart. 1991. *Hydrogeology of the Surficial Aquifer System, Dade County, Florida*. Water Resources Investigations Report 90-4108. U.S. Geological Survey, Tallahassee, FL.

Harvey, J.W., S.L. Krupa, C.J. Gefvert, J. Choi, R.H. Mooney, and J.B. Giddings. 2000. Interaction between Ground Water and Surface Water in the Northern Everglades and Relation to Water Budgets and Mercury Cycling: Study Methods and Appendixes. U. S. Geological Survey Open-File Report 00-168.

Hoffmeister, J.E. 1974. Land from the Sea. Coral Gables: University of Miami Press.

Klein, Howard and J.E. Hull. 1978. *Biscayne Aquifer, Southeast Florida*. Water Resources Investigations Report 78-107, U.S. Geological Survey, Tallahassee, FL.

Parker, G.G., G.E. Ferguson, S.K. Love, and others. 1955. Water Resources of Southeastern Florida. Water Supply Paper 1255, U.S. Geological Survey, Tallahassee, FL.

Reddy, K.R., Y. Wang, W.F. DeBusk, and S. Newman, 1994. Physico-Chemical Properties of Soils in Water Conservation Area 3 (WCA-3) of the Everglades. Institute of Agricultural Sciences, University of Florida. Gainesville, FL.

Reese, Ronald S. and Kevin J. Cunningham. 2000. *Hydrogeology of the Gray Limestone Aquifer in Southern Florida*. Water Resources Investigations Report 99-4213, U.S. Geological Survey, Tallahassee, FL.

SFWMD. 1999. *Everglades Interim Report*. South Florida Water Management District, West Palm Beach, FL.

SFWMD. 2000. *Everglades Consolidated Report*. South Florida Water Management District, West Palm Beach, FL.

van der Valk, A., D. Mason, P. Wetzel, F. Sklar, D. Gawlik, S. Newman, Y. Wu, S. Miao, and C. McVoy. 1998. *Proposed Plan of Work for Tree Island Research*, Draft v. 2.2.

Florida Center for Environmental Studies and South Florida Water Management District, West Palm Beach, FL.

Win-Situ Instrument Control Package, Version 2.18.0.0. © 1994, 1997 by In-Situ, Inc.

# APPENDIX A

# STATEMENT OF WORK

A Statement of Work was prepared to solicit bids for construction of eight dual-zone monitor wells on two tree islands in Water Conservation Area 3 (WCA-3). This appendix contains detailed specifications for well construction, equipment decontamination, sample retrieval, and minimization of site impacts.

# TECHNICAL SPECIFICATIONS
# DRILLING PROGRAM FOR
# WATER CONSERVATION AREA-3
# TREE ISLAND STUDY
# CONTRACT 10717

## 1. General Information and Overview - Scope of Work

This drilling program is part of a hydrogeologic and hydrochemical evaluation of the surface water/ground water interaction underlying the tree islands in Water Conservation Area #3 (WCA-3) (**Figure A-1**). Tree islands are topographic high points within the Everglades that provide suitable habitat for a wide variety of terrestrial plants and animals. The tree islands in WCA-3 are typically tear-shaped, with the long axis parallel to surface water flow. The tallest trees and shrubs are found on the upstream end of the island, the head, which is usually the widest part of the island. Behind the head is an elongated v-shaped area called the tail, which is dominated by lower elevation vegetation such as shrubs and sawgrass. Tree island vegetation is less flood-tolerant than other Everglades vegetation. Maximum elevations of the highest tree islands are only slightly above mean annual maximum water levels. The changes in the physical and biological character of tree islands are considered to be sensitive indicators of problems caused by water management practices in place since the late 1940s. The South Florida Water Management District (District) and other state and federal agencies are conducting ongoing scientific research of vegetation, soil, water quality, and wildlife on the tree islands, including those selected for this drilling program.

This project involves highly specialized drilling, detailed hydrogeologic data acquisition, and monitor well installation in the interior portions of WCA-3. The District has selected two tree island sites within WCA-3 (**Figure A-2**). Each site will have four dual-zone monitor wells. Each dual-zone monitor well will be constructed using 2-inch PVC casing with a 2-foot screened interval at approximately 20 to 30 feet below land surface (bls) and a ¾-inch PVC casing with a 1-foot screened interval at approximately 10 to 15 bls, both constructed within the same borehole. At each site, one dual-zone monitor well will be constructed in the head of the tree island, and three other dual-zone monitor wells will be placed outside the tree island (**Figures A-3** and **A-4**).

Access to each site will be via airboat only, using established paths through the underlying vegetation (**Figure A-5**). The drilling rig should be of a size capable of being transported by an airboat, such as the Hydra-Drill (manufactured by DeepRock Mfg.) or approved equal, and should provide ample and safe working conditions. Airboat deployment will be possible at the boat ramps located along Tamiami Trail in Miami-Dade County (**Figure A-2**). It is recommended that the Contractor visit the sites prior to mobilization to become familiar with the access routes and site conditions.

The Contractor shall be responsible for providing all transportation to and from each site via airboat during all drilling and well construction operations. The District will provide an on site geologist during drilling and testing operations to collect pertinent field samples and data, and to oversee well construction operations. Based on the availability of funds, the District may only complete a portion of the estimated work. The District reserves the right to terminate the contract without any further restitution other than payment for services rendered and material installed.

## 2. Permits

The District will acquire all permits to enter onto and construct these wells on public lands. The Contractor shall be responsible for obtaining any other local, state, or federal drilling permits or occupational licenses and for providing notification to local municipalities prior to the start of drilling operations. The Contractor shall also conform to any local or county ordinances pertaining to noise levels and working hours, etc. to avoid any unnecessary delays. Should any unanticipated delays occur due to permit acquisition, the District reserves the right to postpone the start of this contract.

## 3. Mobilization, Demobilization and Site Cleanup and Staging Area Security

The District requires one lump-sum price quotation for mobilization, demobilization and site restoration per site. Mobilization shall include costs for all materials, equipment and labor required to prepare the site for drilling operations, installation of appropriate pit or surface casing, and conducting any other measures that the Contractor feels is necessary to protect and secure their equipment during drilling operations. There will be two mobilizations required for this project: one for the initial project set-up, and a second for the move between tree islands.

Part of the mobilization/set-up and demobilization costs will entail fulfilling several **environmental requirements.** The cost for providing the following equipment/ facilities and services shall be part of the mobilization/demobilization price:

(A). The loading and staging area(s) will not be secured. Although surrounded by water, private airboats are allowed in this area. Drilling equipment should be secured to avoid mishaps in regards to the general public. The Contractor shall maintain the site and staging area in an orderly and functional manner during all drilling and well construction operations. Inoperable equipment or equipment that will not be used within a 1-week period shall not be allowed to be stored or to remain on site. The Contractor shall also be responsible for removing all debris and trash from the drill sites and staging areas daily. There are no storage facilities available at the staging area.

(B). The Contractor shall steam clean the rig, drilling components, and all materials to be emplaced in the well bores according to the guidelines in Section 7 Equipment Cleaning.

(C). The Contractor must containerize all well cuttings, drilling fluids, and development waters while on the water and discharge the materials onto the staging area levee. **No discharge of cuttings or fluids will be permitted in the water**. These waste materials must be brought back to the WCA-3 staging area and disposed of in accordance with all federal, state, and local regulations. Well cuttings consisting of sands, mucks, and rock fragments may be disposed on the levees of WCA-3. All cuttings disposed of in this manner must be dried and leveled to existing grade at the time of placement, creating no physical obstructions.

(D). The Contractor shall comply with all OSHA/EPA requirements regarding heavy equipment, electrical, and mechanical operations, storage of compressed and flammable gases, and storage and handling of hazardous materials. Necessary personal safety equipment and containment and absorbent materials will be required on site for the duration of drilling operations. If conditions exist that may be in violation of either OSHA or EPA standards, a site visit from the appropriate representative may be requested by the District.

Once all drilling and well construction operations have ceased, the Contractor shall be required to remove all equipment, level all remaining drill cuttings on the levees, and restore the site to original grade and condition. This price quote shall include all material and labor required for restoration, including restoring the original grade and removing all construction equipment and debris.

## 4. Equipment and Personnel

The District requires that a water well contractor licensed in the State of Florida and/or appropriate Water Management District or County be responsible for work performed under this Contract**. A copy of a current Florida Water Well Contractor license must be submitted with the proposal.** All equipment utilized by the Contractor and any subcontractor shall be in good working order. The Contractor shall provide and operate drilling and support equipment with adequate load/weight capacity for the projected drilling depths. There will be no compensation for downtime incurred due to equipment failure or personnel problems. Unnecessary delays or work stoppages because of equipment or personnel problems will not be accepted nor considered a valid reason for extending the length of the contract.

## 5. Site Description

The project is located in WCA-3, within Miami-Dade County, west of FL 997 (Krome Avenue), and north of US 41 Tamiami Trail (**Figure A-2**). The organic material ("muck") underlying the entire WCA-3 ranges from 5 to 25 feet thick. It is anticipated that the muck is underlain by porous limestone; however, there may be lenses or pockets of sand occurring as well. The ground/surface water levels in WCA-3 are very dynamic and are a function of rainfall and the S-12 control structures located beneath US 41. Wet

season surface water levels are generally 2 to 3 feet above ground level, which would provide adequate water for airboat deployment. **Figures A-6** and **A-7** are photographs of the tree island sites. **Figure A-8** shows conditions of dense vegetation likely to be found in the tree island heads.

## 6. Minimizing Impacts to Sites

Impacts to the sites as a result of drilling activities and increased human presence must be minimized to avoid affecting ongoing research.

(A). Airboat trips to the sites should be kept to a minimum, and should occur along the same routes when possible.
(B). Airboat operators should avoid directing prop wash toward the islands.
(C). Personnel must follow specific, established trails when working on the tree island heads.
(D). Activities in the tree island heads must be restricted to specified and small areas.
(E). Containerized cuttings, drilling fluids, development waters, and trash should be removed from the tree islands daily.
(F). No vegetation will be cut or pruned without permission from a District biologist involved with the tree island research. Ongoing research equipment such as litter traps, tree tags, and deer exclosures must not be disturbed (**Figure A-9**).
(G). If, during drilling activities, dry weather conditions make the risk of wildfires high, personnel must refrain from smoking or use of potential ignition sources.

## 7. Equipment Cleaning

(A). The Contractor is allowed to use reasonable amounts of surface water from the drill site via the drilling rig. All water should be pumped into a holding tank on site and allowed to settle prior to use. The water tank should be clean and free from loose particles. The Contractor shall steam clean and flush all tanks before mobilizing to the site.

(B). The Contractor shall steam clean (utilizing alconox soap) the rig prior to starting any drilling efforts and before moving from one tree island to the next. The drilling rig components (augers, bits, temporary casing) should be steamed cleaned between holes and each of the areas (WCA-3). All drill rod, bits, augers, casing (temporary and permanent), and auger flights must be cleaned prior to drilling each location.

(C). The Contractor shall provide ample buckets, brushes, water and alconox solution to clean the split spoons, shelby tubes and coring barrels between holes. The Contractor shall provide multiple split spoons/shelby tubes/coring devices to speed the sampling process.

(D). The Contractor shall provide ample saw horses or a small bench to support the riser and screens prior to installation. Steam cleaning of the well risers, screens, centralizers and well cap should be done on the staging areas. Since the sites are located in the water, the steamed cleaned well items should be wrapped in plastic to be transported to the sites via airboat. During the installation of the wells, all personnel shall wear latex gloves to prevent contamination.

(E). All pumps, grout barrels, shovels, wheelbarrows, and hoses should be steam cleaned prior to use and between each borehole.

## 8. Formation Samples

The District will provide a resident geologist who will collect, describe, and photograph samples and cores obtained during pilot-hole drilling operations. The Contractor shall provide the District Geologist safe access to inspect the Shelby tube and rock samples, and shall accommodate the District Geologist in retrieving representative samples, including moderating drill rates and circulation, if necessary.

(A). *Thin Wall Samplers* – The standard used for the thin wall samplers will be **ASTM 1587-83**. A thin-walled (Shelby tube) sampler shall be utilized when penetrating muck. It is estimated that anywhere from 5 to 25 feet of muck will be encountered in the center of the tree islands. The Contractor shall supply all materials needed to fulfill sampling requirements.

(B). *Standard Penetration Tests (SPT)* – It is anticipated that little sand will be encountered below the muck or within the limestone at these sites. However, should significant amounts of sand occur, the Contractor should be prepared to perform standard penetration tests. All standard penetration tests shall be performed in accordance with **ASTM Standard No. D-1586-84**. SPTs shall be used during pilot-hole drilling through unconsolidated detrital sediments. Clear plastic liners (with caps) within the split spoons are required to fulfill sampling requirements. The Contractor shall provide rigid, corrugated cardboard boxes to store recovered split spoon samples.

(C). *Rock Coring* – Rock coring operations shall be conducted as outlined in the **ASTM Standard No. D-2113-83.** During coring operations, an NX core barrel (or other pre-approved method) is required and the recovered rock cores will be stored in 2-foot cardboard core boxes provided by the Contractor.

## 9. Drilling Logs

The Contractor shall furnish the District with a daily drilling record. The log shall accurately describe the following: geologic materials and depths encountered, depths of lost circulation zone(s) and methods of regaining circulation, drilling rate, time, depth,

description of any unusual occurrences or problems during drilling, diameters and lengths of drill rod and casing, and any other work performed at the site. The District will provide a blank drillers log for the driller in the field. The Contractor must have copies of handwritten daily logs available on site for review by the District, if necessary. The District will perform geophysical logging on pilot holes.

## 10. Wells

**Table A-1** summarizes the monitor wells required to complete the proposed work plan. The diagram provided in **Figure A-10** is representative of all wells to be constructed in this project. This project requires the use of drilling procedures that minimize disturbance to plants, animals, and substrates. Construction of the wells outside the tree islands will be performed from the airboat. For the wells constructed on the tree island heads, it is anticipated that a **hand-carried tripod-mounted portable rig** such as the model manufactured by Acker Drill Company will be used. ***No trees will be removed from the sites for any reason.*** Any trimming or pruning of trees deemed necessary for gaining access for drilling shall be performed under the guidance and supervision of a District biologist. Utmost care must be taken to avoid disturbing or damaging plant and animal ecology, or disruption of other scientific studies taking place. This may require consultation and coordination with District biologists.

**Table A-1.** Well Names, Sample Methods, and Footages

| Dual Well Name | Maximum Estimated Water Depth (ft) | Estimated Organic Layer Thickness (ft) | Total Blank PVC Casing(1) (ft) (2”/ ¾”) | Total PVC 0.010 Slot Screen (ft) (2”/ ¾”) | Total Shelby Tube/ Split Spoon/Coring Footage per Bore Hole |
|---|---|---|---|---|---|
| 3AS3-GW1 | 4 | 5 | 28/13 | 2/1 | 30 |
| 3AS3-GW2 | 4 | 5 | 28/13 | 2/1 | 30 |
| 3AS3-GW3 | 4 | 5 | 28/13 | 2/1 | 30 |
| 3AS3-GW4 | 4 | 10 | 28/13 | 2/1 | 30 |
| 3BS1-GW1 | 4 | 5 | 28/13 | 2/1 | 30 |
| 3BS1-GW2 | 4 | 5 | 28/13 | 2/1 | 30 |
| 3BS1-GW3 | 4 | 5 | 28/13 | 2/1 | 30 |
| 3BS1-GW4 | 4 | 10 | 28/13 | 2/1 | 30 |
| Totals | | | Total Blank PVC Pipe Footage = 224/104 | Total PVC Screen Footage = 16/8 | 240 ft |
| Does not include riser above muck to surface water elevations. Estimated riser needed is 12 feet | | | | | |

## 11. Recommended Procedures

Listed below is the summary of the procedures and proposed sequence of activities to be conducted at each site.

(A.) Mobilize to deployment area located on the US 41 right-of-way perimeter of WCA-3; proceed to the designated sites via approved water trails.

(B.) Set up drill rig at designated locations, ferry equipment and supplies to site, prepare equipment for drilling operations.

(C.) Install 6-inch diameter pit or surface casing by driving it into the substrate until refusal or to the first competent limestone unit. This will help to prevent lost circulation and erosion in the underlying organic sediments.

(D.) Begin pilot-hole drilling using a 2-15/16 inch tri-cone bit. If mud rotary drilling is used, the Contractor shall provide an efficient de-sander (if necessary) to maintain optimal mud weights (8.5 to 9.0 lbs/gal) to minimize invasion and formation damage. ***Under no circumstances shall any drilling fluids be discharged into the surrounding surface water.***

Begin split spoon or coring operations depending on underlying lithology at each site. Label all SPT clear plastic liners with well name, date, sample interval, and sample number and indicate the top and bottom. During coring, include well name, date, sample interval, and sample number on all core box covers. Indicate core tops and bottoms and direction of sample layout.

(E.) Circulate drilling fluids, then trip drill rod out of borehole. Install new sub and attach 7-7/8 inch drill bit (or other size bit acceptable to the District) and ream pilot hole. Upon completion, circulate drilling fluids to insure a clean bore-hole prior to geophysical logging.

(F.) Geophysical logging will be conducted on the reamed pilot hole by District staff. The Contractor is responsible for providing a clear, straight, and stable hole. The Contractor shall provide all necessary pulleys needed to attach to the gantry of the drilling rig for geophysical logging operations. If the borehole is left open overnight or longer prior to geophysical logging, the Contractor will be requested to tag the bottom with the drill bit and recirculate drilling fluids to the total depth. Estimated logging time is 2 to 4 hours per well. The Contractor shall be placed on standby and compensated at an hourly rate during all geophysical logging operations.

(G.) The Contractor shall recirculate drilling fluids to the total depth prior to set-

ting well casing. All centralizers, well riser and well screens shall be steam cleaned as stated in Section 6 - Equipment Cleaning. **Latex gloves shall be worn at all times during the installation process**.

(H.) A 30/15-foot dual-zone monitor well shall be assembled in the following manner: a) assemble 2-foot section of well screen to first riser; b) install two stainless steel centralizers at the appropriate locations (every 10 feet) on the risers and spread centralizers to the correct diameter; c) anchor centralizers to 30-foot section of the dual-zone well; d) assemble the dual-completion support devices (supplied by the District) and attach to the 30-foot section of PVC in three places: between the two centralizers, above the top centralizer, and at the top of the pipe. **Once in place, tighten the dual-completion support device screws on the 30-foot section of 2-inch PVC pipe only.**

(I.) Well installation will begin by inserting the 30-foot section of 2-inch PVC pipe into the reamed borehole. Once 15 feet of the 30-foot section of pipe is installed, the second 3/4-inch PVC well casing will be attached to the first string of PVC pipe. The first dual-completion support device will be attached to the second well at 13 feet from the top of the primary well. The drill crew will continue to lower the two joined wells into the borehole, attaching the second dual-completion device at 8 or 9 feet from the top, and securing the final dual-completion device just below the top.

(J.) Once the two lengths of PVC pipe are installed to their appropriate depths, the sand pack, bentonite seal, and grout can be emplaced. All sand packs must be pumped into the borehole via a 1-inch tremie pipe and placed to within 1 to 4 feet above the well screen. Placement of the sand pack will be confirmed by a hard tag. A bentonite seal shall be placed on top of each sand pack and then grouted to either the next well screen or to land surface using a 5% bentonite-cement slurry. All grouting work performed shall conform to State of Florida well drilling practices and to AWWA standards. The Contractor shall be responsible for calculating volumes pumped during grouting operations. A minimum of eight (8) hours setting time shall be required between successive cement lifts. All subsequent cement lifts shall be tagged by the tremie method prior to installing an additional stage.

(K.) Once the final lift has had time to set (over 8 hours), the well shall be developed until the water becomes clear or water quality field parameters become stable. All development water needs to be containerized on the airboat. Once the airboat leaves the site (greater than one quarter of a mile) the water can be discharged to surface water if all state and federal water quality criteria has been met. At the minimum, the well shall be developed for one hour.

## 12. Casing (PVC) and Slotted Screen

The Contractor shall provide Schedule 40 PVC Tri-Loc riser and screens (or equivalent). The Contractor shall provide 0.010 inch slotted screen in 2-foot sections for the 2-inch wells and in 1-foot sections for the ¾-inch wells. All well casings and screen joints shall be connected by threaded connections with manufacturer-supplied "O" rings. The District will only authorize payment for casing installed to the actual depth and grouted into place back to land surface. All casing and slotted screen shall be of new first quality material and free of defects in workmanship and handling.

## 13. Well Casing Centralizers

All wells shall be fitted with two centralizers. The spacing of the centralizers shall begin at the muck line and shall be constructed of stainless steel. If different material is proposed, it must be approved by the District prior to the commencement of any field work. Marking for the spacing and installation of the centralizers shall be done prior to the installation of the riser and screens into the boreholes.

## 14. Cement Grouting

All work performed shall conform to State of Florida well drilling practices and to AWWA standards. The Contractor shall be responsible for calculating volumes pumped during grouting operations. The District's Geologist will review methods and volumes prior to commencement of pumping cement grout. No method shall be permitted that fails to place grout from the bottom of the annular space to the surface. A minimum of eight (8) hours setting time shall be required between successive cement lifts. All subsequent cement lifts shall be tagged by the tremie method prior to installing an additional stage. The price shall include all necessary equipment, materials, and subcontractor services required to properly cement the casing as specified.

## 15. Wellhead Completion

All wells completed in the WCA-3 must have 2” and ¾” vented plastic expandable caps and must be surrounded by a 6-inch PVC locking surface casing, cemented into the formation and rising three to five feet above the existing surface water stage. The surface casing will provide ample support and protection for the well. The cement within the annular space of the 6-inch casing and the two piezometers must be cemented up to a point 4 inches from the top. The 6-inch casing must have two ½-inch diameter drain holes drilled 180-degrees apart to allow interior drainage (**Figure A-10**). The Contractor is responsible for preparing and supplying well completion diagrams for all completed dual-zone wells.

## 16. Well Development

The District requires all monitor wells to be developed by centrifugal pumping methods until all visible particulate matter has been removed from the formation waters. If the centrifugal method does not achieve the desired results, other methods (air lift,

swabbing, etc.) may be required by the District. The discharge water from the pump should be contained and removed offsite for wells located in the water. The development water can be drained from the holding tanks at a District-approved site. The Contractor shall furnish all equipment, pumps, oil/water separators for use on the compressors, compressors, piping, and appurtenances required to successfully develop each well. Well development is considered to be successful when maximum flow is obtained and water quality field parameter measurements become stable, as determined by the on site District Geologist.

## 17. Well Abandonment

Should a borehole be unacceptable for well installation, the consultant/contractor shall abandon the hole by grouting the hole from bottom to surface as required by the District's Geologist and following SFWMD abandonment procedures. If a well is declared abandoned by the District Geologist due to the Contractor's failure to complete the drilling, place casings at the depth not specified by the District Geologist, or because of lost tool, or for any other Contractor failures to complete the well in a satisfactory manner, then no payment will be made to the Contractor for the abandonment operations. Under these circumstances, the Contractor must provide a new well to the original specifications at no cost to the District.

If a well is declared abandoned by the District Geologist due to any reason not the fault of the Contractor, then the Contractor will be compensated for performing the approved abandonment plan on a time and materials basis, to be agreed upon in writing between the District and the Contractor.

## 18. Standby Time

During the normal progression of work, the Contractor will be authorized standby time when it is necessary for District personnel to perform work or conduct tests that are not specified in the Contract. The Contractor will be notified in advance and the amount of time authorized will be mutually agreed upon and noted on the Contractor's daily logs.

## 19. Extra Work

During the length of this Contract, it may be necessary for the District Geologist to perform work of an experimental nature on the wells which may require the service of the drilling crew and/or additional equipment. In such an event, the Contractor shall furnish such assistance and shall state the anticipated extent of the effort. Start and stop of extra work shall be recorded in the Contractor's daily logs and in the logs maintained by the District's resident Geologist.

## 20. Project Schedule

Because of the critical bird nesting period in July, drilling activities must be coordinated with other ongoing District research. Drilling may begin as early as July 1, 1999 for the wells located in the water surrounding the tree islands. Drilling activities on the tree island heads must begin July 31, 1999 or later to avoid disturbing nesting birds. District biologists must be notified at least one week in advance of any drilling activity in July. Wells shall be constructed in as brief a time as possible to minimize impacts to the sites and to ongoing research. All drilling operations under this contract must be finished by September 1, 1999 to assure that billing activities are completed by September 30, 1999.

## 21. Final Deliverables

Deliverables to the District shall include:

(A) Successful construction, installation, and development of all monitor wells mentioned above.
(B) Successful debris (cuttings/containerized cuttings/drill fluids) removal from drilling area/staging area, and site restoration.
(C) Daily drilling logs and well completion diagrams.

## 22. Payment Schedule

The Contractor shall provide unit prices for each line item in the proposal form in Section 23. The District will pay one half of the approved cost for the project (excepting hourly charges to be determined during the course of the work) to the Contractor upon mobilization to the site. The remainder of payment due will be remitted upon completion of the project.

The project manager is Steve Krupa, Sr. Hydrogeologist. He can be reached by telephone at (561) 682-6923 or via email at skrupa@sfwmd.gov. If Steve Krupa is unavailable, contact Cindy Bevier at (561) 682-2540 or via email at cbevier@sfwmd.gov.

## 23. Final Line Item Format

**COST PROPOSAL FOR WELLS**
**RFB NO. _____ PROPOSAL ITEMS**
**WCA-3 DRILLING**
**(ESTIMATED QUANTITIES)**
**Page 1 of 2**

| ITEM DESCRIPTION | ESTIMATED QUANTITY Item/Sites/Total | UNIT | UNIT PRICE | TOTAL PRICE |
|---|---|---|---|---|
| 1. Mob. & Demob./Site Restoration -WCA-3 | 1 | Lump Sum | | |
| 2. Mob. & Demob. For Internal Project Moves | 1 | Lump Sum | | |
| 3. Shelby Tube Sampler (ASTM-D-1587-83) used for organic sediments | 8 Holes @ 15 ft = 120 Linear ft Divided by 2 ft per tube = 60 tubes | ShelbyTube | | |
| 4 Standard Penetration Test (ASTM-D-1586-84) used for unconsolidated sands | 8 Holes @ 5 ft = 40 Linear ft Divided by 2 ft per Spoon = 20 Spoons | Spoon | | |
| 5. NX Coring (or previously approved method) (ASTM-D-2113-85) used for consolidated limestone | 8 Holes @ 15 ft = 120 Linear ft Divided by 5 ft Barrel Length = 24 Core Barrels | 5 ft Barrel | | |
| 6. 2-inch PVC Riser (Installed) | 8 wells @ 28 ft plus 8 times 12 ft of riser above muck = 320 Linear ft | ft | | |
| 7. ¾ Inch PVC Riser (Installed) | 8 wells @ 13 ft plus 8 times 12 ft of riser above muck = 200 Linear ft | ft | | |

## 23. Final Line Item Format (Continued)

**COST PROPOSAL FOR WELLS**
**RFB NO. _____ PROPOSAL ITEMS**
**WCA-3 DRILLING**
**(ESTIMATED QUANTITIES)**
**Page 2 of 2**

| ITEM DESCRIPTION | ESTIMATED QUANTITY Item/Sites/Total | UNIT | UNIT PRICE | TOTAL PRICE |
|---|---|---|---|---|
| 8. 2-in. Screen (2 ft length - Installed) | 8 Screens @ 2 ft = 16 ft | ft | | |
| 9. 30/15 ft – 3/4-in. Screen Dual Completion (1 ft length - Installed) | 8 Screens @ 1 ft = 8 ft | ft | | |
| 10. SS Centralizers (Installed) | 8 wells @ 2 Centralizers Per Well = 16 Centralizers | Each | | |
| 11. 6 in. by 12 ft Protective Surface Casing (Installed) | 2 Sites @ 4 per Site Times 12 per Section = 96 Linear ft | ft | | |
| 12. 6/20 Silica Sand (Washed - Installed) | | 50 lb Bag | | |
| 13. Bentonite (Med. Grade Chips - Installed) | | 50 lb Bag | | |
| 14. Cement (94 lb Bag - Installed) | | Bag | | |
| 15. Standby Time | | Hour | | |
| 16. Extra Work | | Hour | | |
| 17. Well Development | | Hour | | |
| | | Total Cost _____ | | |

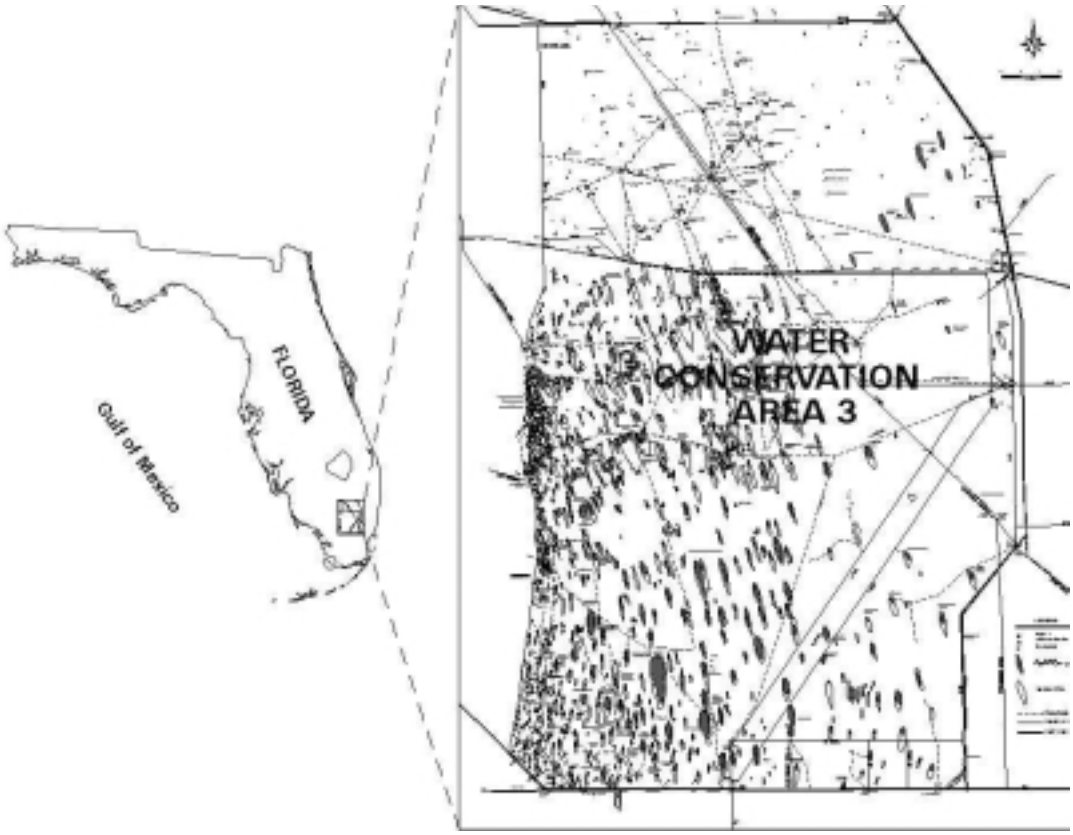



**Figure A-1.** Water Conservation Area 3

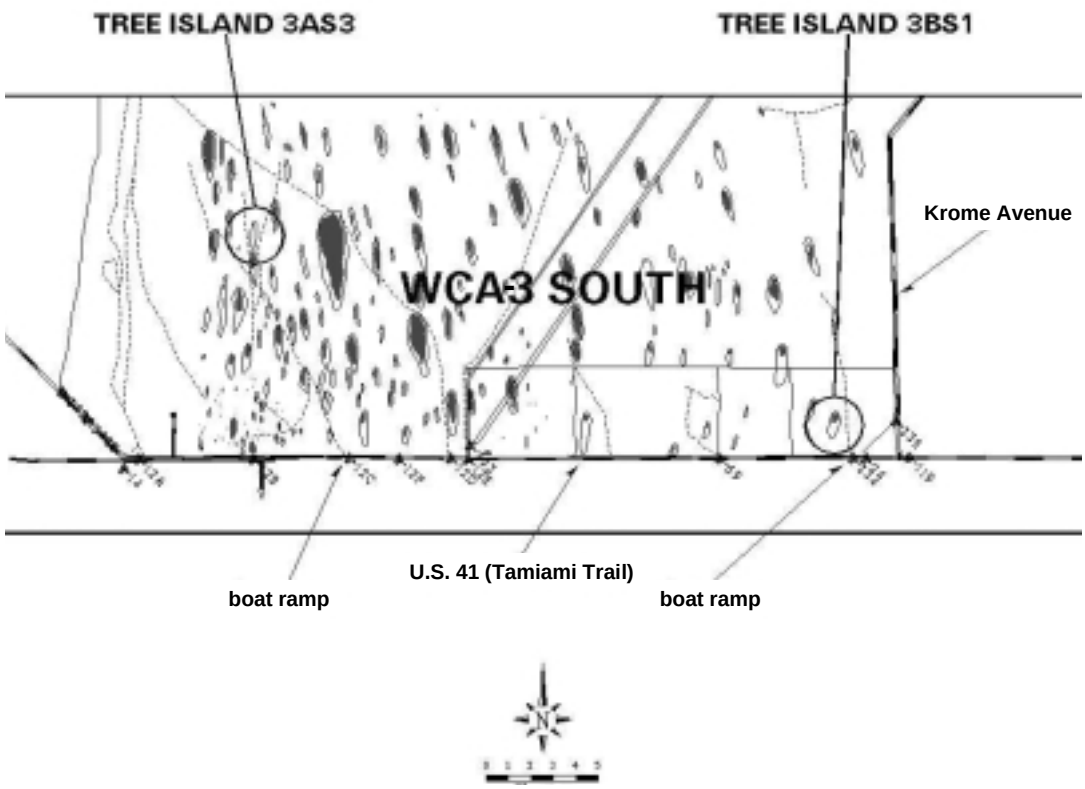



**Figure A-2.** Tree Island Drilling Sites

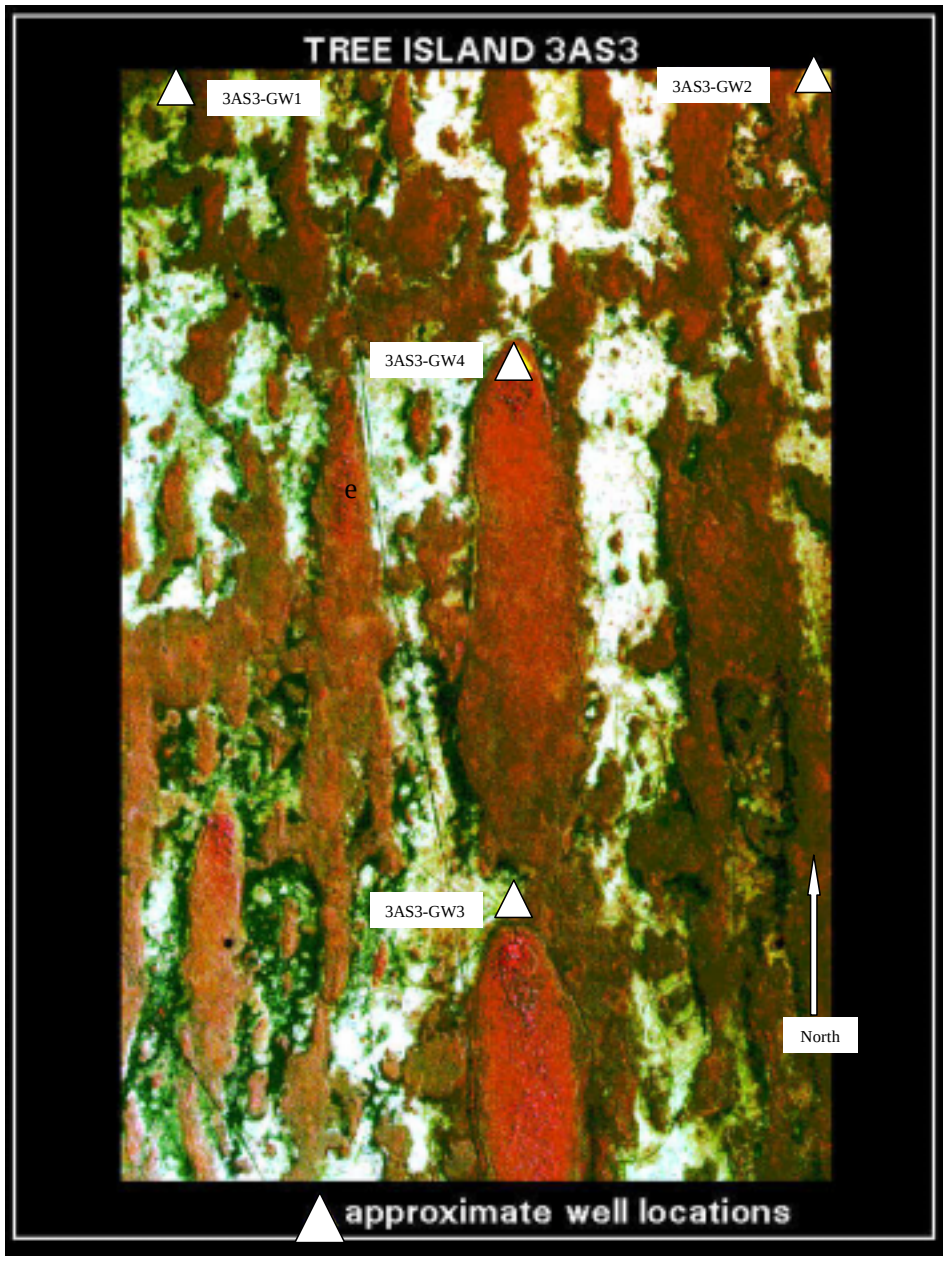



**Figure A-3.** Well Locations in WCA-3A

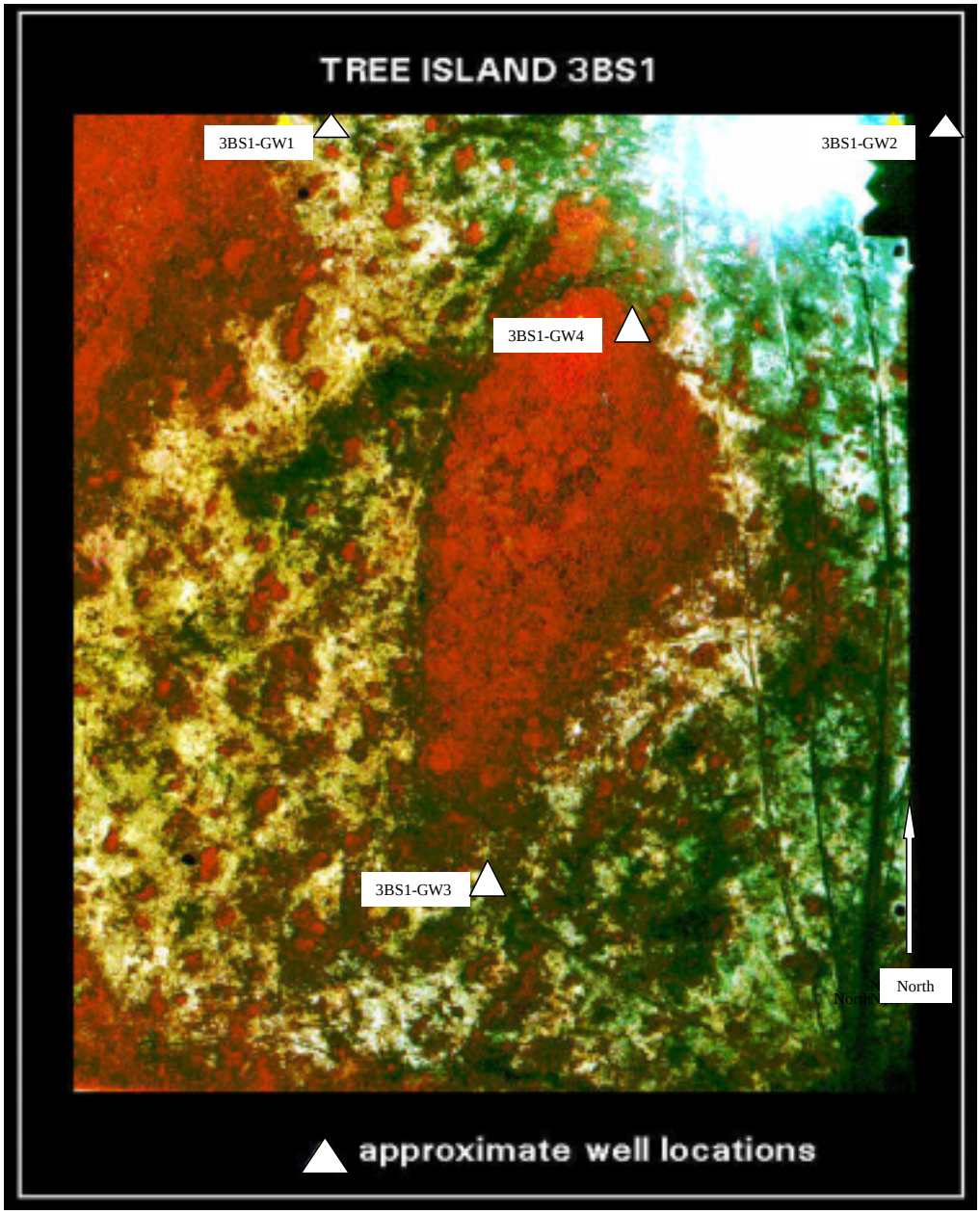



**Figure A-4.** Well Locations in WCA-3B

**Figure A-5.** Airboat Trail in WCA-3

**Figure A-6.** Tree Island 3AS3, Looking South

**Figure A-7.** Tree Island 3BS1, Looking Northwest

**Figure A-8.** Interior of Head of Tree Island 3AS3

**Figure A-9.** Typical Ongoing Research in Tree Island Head

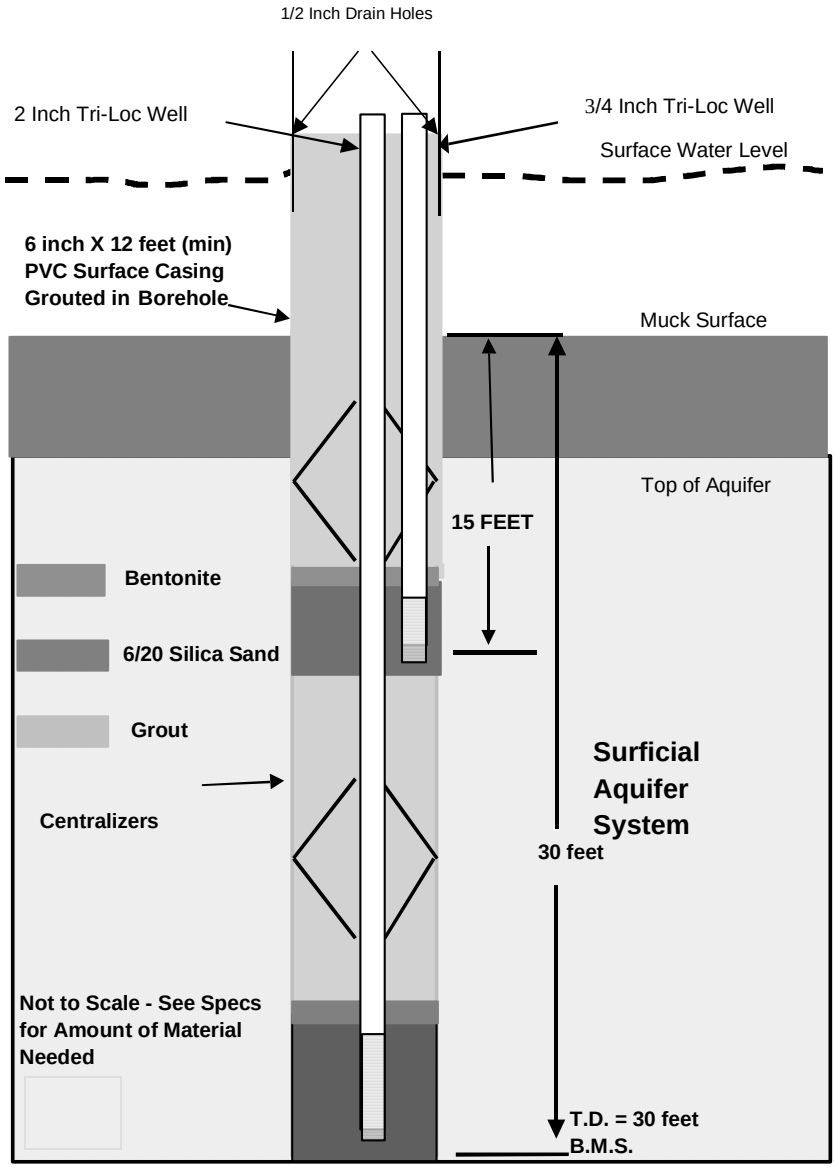



**Figure A-10.** 30/15-ft Dual Completion Monitor Well

# APPENDIX B

# CORE SAMPLES AND BORING LOGS

Pictures of core samples and boring logs with details on lithology, sample penetration resistance, percent of materials recovered, and well construction are provided in this appendix. Pictures and general lithologic descriptions of the shallow sediments underlying tree islands 3AS3 and 3BS1 are included.

Color pictures of intact core samples are included in this appendix. These limestone cores are labeled with the well name and depth at which they were obtained. All depths are reported in feet below the top of the peat layer.

Test boring logs for each well sites are provided after the pictures. These logs contain information obtained during the drilling, sampling, and geophysical logging of the wells, as well as a graphical representation of the sediments and the final constructed depths of the wells. In the left half of the "Sample Type" column, a solid black line represents shelby tube samples, a half black/half white line represents cored samples, and an "X" represents split-spoon samples. The right half of the "Sample Type" column depicts the amount of sample that was actually recovered from the sampling length attempted. If half the column is shaded black, then 50 percent of the sample was recovered. The natural gamma log trace gives a relative view of the amount of gamma radiation present in the sediments near the borehole. Peaks in the natural gamma traces often correspond to changes in lithology or color of the sediments.

A suite of geophysical logs was run in each of the well bores before constructing the wells. These logs, provided in this appendix, include natural gamma, spontaneous potential, caliper, long- and short-normal resistivity, lateral resistivity, fluid resistivity, specific conductance, and temperature logs.

The natural gamma log detects naturally occurring gamma radiation within a foot of the borehole wall. Sediments such as clay, phosphatic sand, and limestone or sand coated with radioactive isotopes will appear as peaks in a natural gamma log. The units are in American Petroleum Institute gamma ray units.

The spontaneous potential log records voltages that develop at contacts between shale or clay and sand. This log is affected by the chemistry of the borehole fluids, adjacent rock fluids, and salinity. Voltage is measured in millivolts.

Caliper logs measure the diameter of the borehole and are useful in detecting washed-out zones, cave-ins, or swelling clays. Caliper logs are depicted in units of inches.

Normal resistivity logs (16-inch short-normal and 64-inch long-normal) aid in determining water quality by measuring the electrical resistance in the borehole and formation fluids. The short and long designations refer to the spacing of the electrodes on the logging probe. The 16-inch short-normal log basically reads the mud-invaded or disturbed zone of the borehole, while the 64-inch long-normal reads both the invaded zone and into the formation. Resistivity is inversely correlated with conductivity; therefore, saline water would be indicated by lower resistivity log values and fresh water by higher resistivity values. The lateral resistivity logs are similar to the short- and long-normal

resistivity logs, except that they measure resistivity beyond the invaded zone. All these resistivity logs are in units of ohm-meters.

Fluid resistivity logs measure the resistivity within the borehole fluids, while the specific conductance logs measure the conductivity within the borehole fluids. These two logs plot as mirror-images to each other, since resistivity is the inverse of conductivity. Fluid resistivity is measured in ohm-meters, while specific conductivity is plotted in microsiemens per centimeter.

The temperature log measures temperature ($^{O}$F) in the borehole immediately adjacent to the probe.


**Figure B-1.** Core from Well 3AS3-GW1, 4 to 11.5 ft below Peat


**Figure B-2.** Core from Well 3AS3-GW1, 11.5 to 14.5 ft below Peat


**Figure B-3.** Core from Well 3AS3-GW2, 5 to 12 ft below Peat


**Figure B-4.** Core from Well 3AS3-GW3, 5 to 12 ft below Peat


**Figure B-5.** Core from Well 3AS3-GW4, 3.5 to 14 ft below Peat


**Figure B-6.** Core from Well 3BS1-GW1, 5 to 18.5 ft below Peat


**Figure B-7.** Core from Well 3BS1-GW1, 18.5 to 33.5 ft below Peat


**Figure B-8.** Core from Well 3BS1-GW2, 5.5 to 19 ft below Peat


**Figure B-9.** Core from Well 3BS1-GW2, 19 to 29 ft below Peat


**Figure B-10.** Core from Well 3BS1-GW3, 5.5 to 21.5 ft below Peat


**Figure B-11.** Core from Well 3BS1-GW3, 21.5 to 28.5 ft below Peat


**Figure B-12.** Core from Well 3BS1-GW4, 8.5 to 12.5 ft below Peat


**Figure B-13.** Core from Well 3BS1-GW4, 12.5 to 24 ft below Peat


**Figure B-14.** Core from Well 3BS1-GW4, 24 to 34 ft below Peat

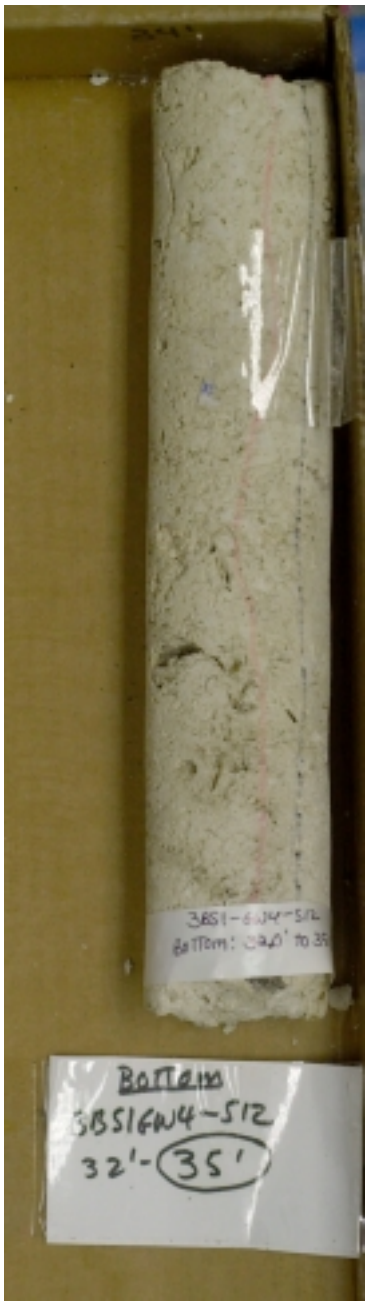



**Figure B-15.** Core from Well 3BS1-GW4, 24 to 34 ft below Peat

Page 1 of 2

# TEST BORING LOG

| | | | | | |
|---|---|---|---|---|---|
| BORING/WELL NO.: 3AS3-GW1 | | | | | |
| PROJECT NO./NAME: 3AS3-GW1/Tree Island Project | | | LOCATION: WCA-3A | | |
| DRILLING CONTRACTOR/DRILLER: Precision Drilling/M. Millican | | | | | |
| GEOLOGIST/OFFICE: C. Bevier/SFWMD | | | | | |
| DRILLING EQUIPMENT/METHOD: Hydra-Drill/Mud Rotary | | SIZE/TYPE OF BIT: 6" | | SAMPLING METHOD: Core/Split Spoon | START/FINISH DATE: 12/20/99-12/21/99 |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA.: PVC/2"-3/4" | SCREEN: TYPE Slotted | MAT. PVC | LENGTH | DIA. SLOT SIZE 0.010 |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE | TOP OF WELL CASING: 14.49 | TOP & BOTTOM SCREEN | | |

REMARKS: Dual-zone construction. Deep well is 2" diameter, screened from 26 to 28 ft. Shallow well is 3/4" diameter, screened from 9 to 10 ft.

| Depth (ft) | Sample Type & Recovery | Sample Number | Penetration Resistance Blows/6" N-Value | Unified Classification | LOG OF TEST BORING: DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|
| | | S-1 | | | Organic material, peat | |
| | | S-2 | | | | |
| | | S-3 | | | 3.8 Hard, white to orange coralline limestone. Mod. permeability through secondary solutioning. 4.5 | |
| 5 | | S-4 | | | Very hard white to yellow/brown micritic limestone. Impermeable. 6.0 | |
| | | S-5 | | | Hard white limestone as above, with interbedded sandy zones having good secondary porosity. 10.5 | |
| 10 | | S-6 | | | Hard, white, sandy limestone with large recrystallized shell fragments. High permeability. 11.5 White to gray shelly limestone with abundant gastropod casts and molds. Very high permeability. 14.5 | |
| | | S-8 | 2/2/3/3 5 | | As above, with increasing amounts of sand. Quartz and carbonate grains, poorly sorted (silt-size to v. coarse), subangular to subrounded. 16.0 | |
| 15 | | S-9 | 5/8/7/8 15 | | White quartz/carbonate sand & shell fragments. Silt to granule-size, mostly medium. Poorly sorted. Trace dark minerals. | |
| | | S-10 | 3/3/5/5 8 | | | |

Natural Gamma (API-GR) 0 20 40 60 80 100

Graphic Litho Log

SFWMD.GDT 12/28/00

**Figure B-16.** Test Boring Log for Well 3AS3-GW1 (Sheet 1 of 2)

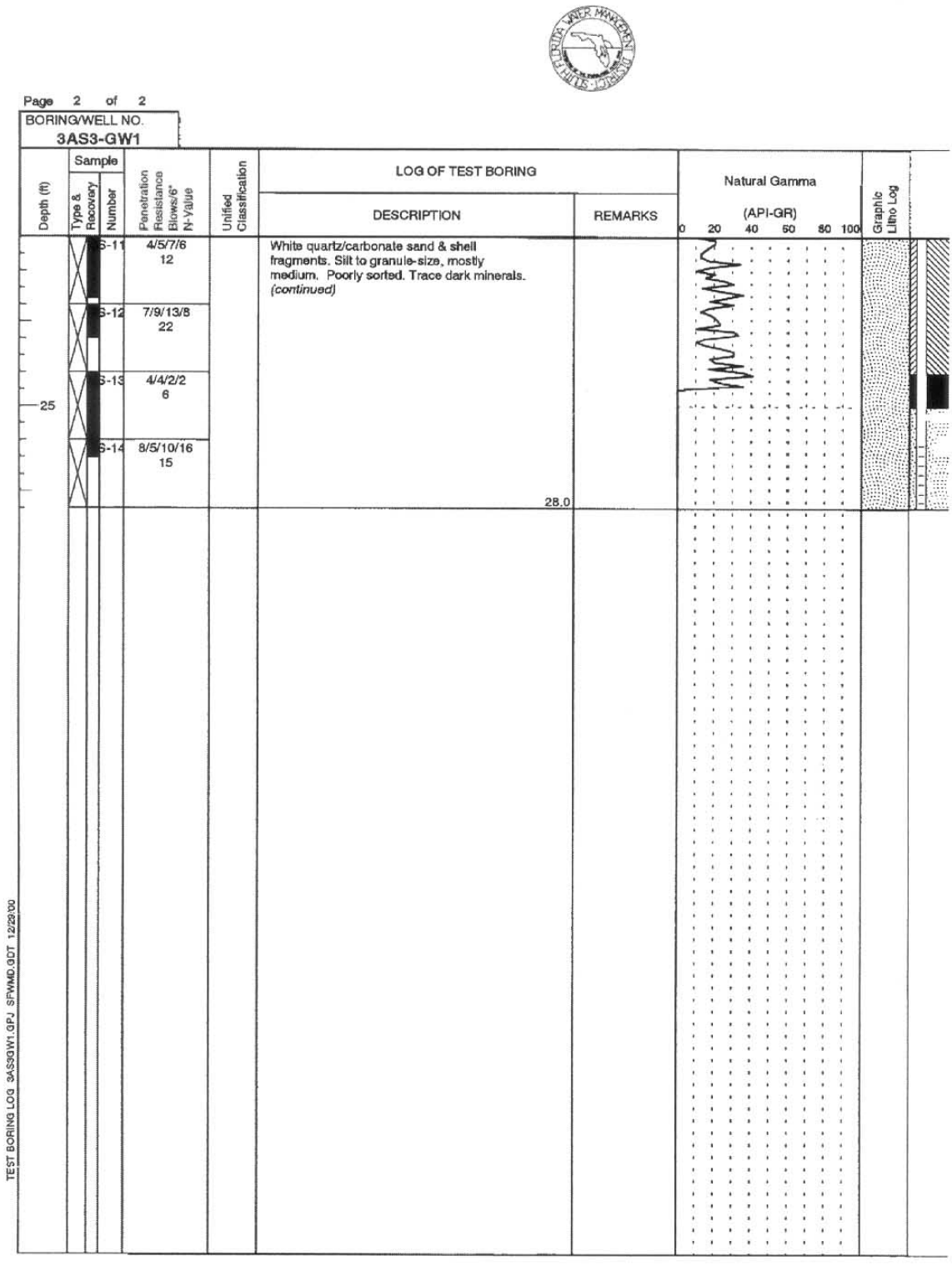
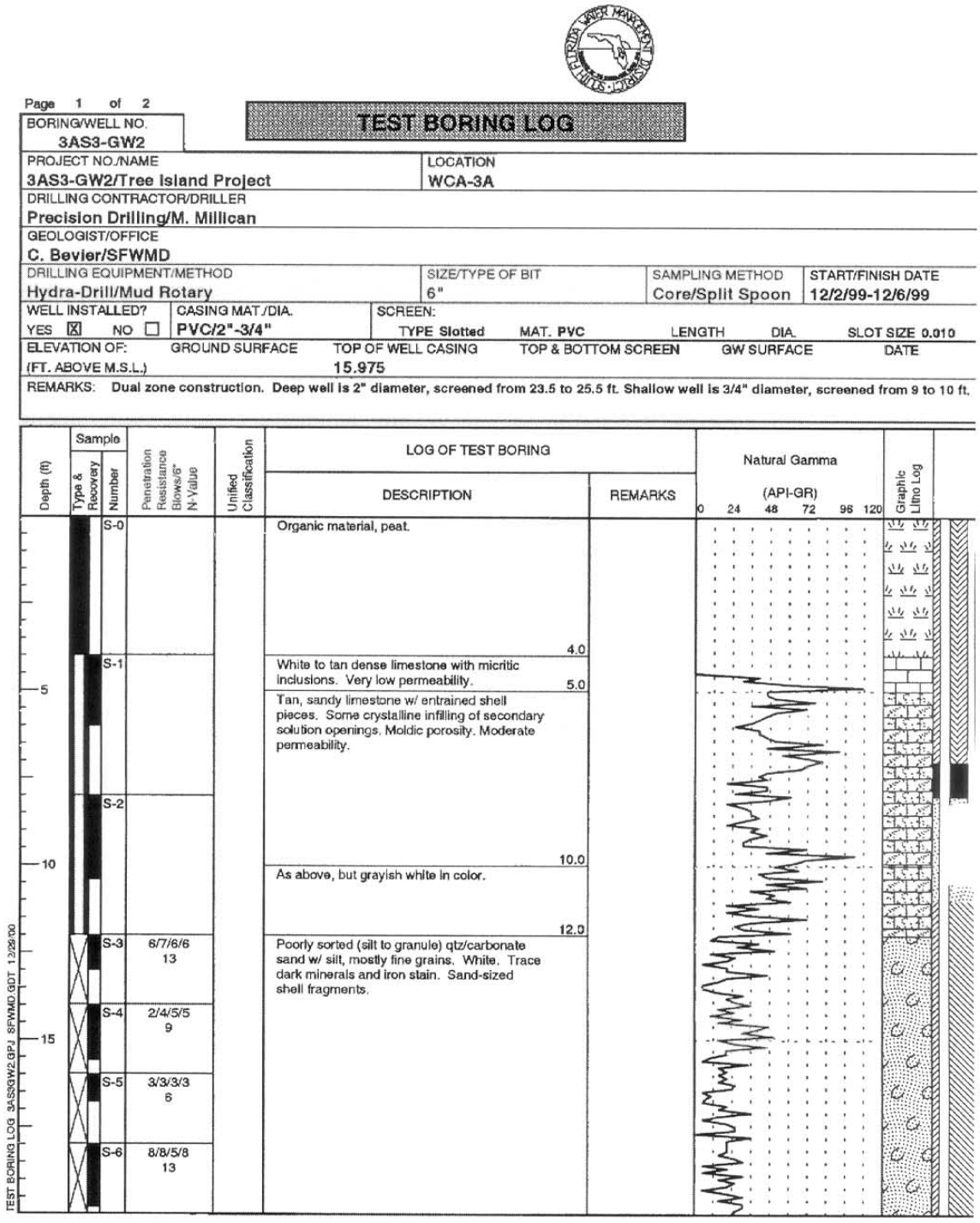



**Figure B-17.** Test Boring Log for Well 3AS3-GW1 (Sheet 2 of 2)



Page 1 of 2

**TEST BORING LOG**

| | | | | |
|---|---|---|---|---|
| BORING/WELL NO. 3AS3-GW2 | | | | |
| PROJECT NO./NAME: 3AS3-GW2/Tree Island Project | LOCATION: WCA-3A | | | |
| DRILLING CONTRACTOR/DRILLER: Precision Drilling/M. Millican | | | | |
| GEOLOGIST/OFFICE: C. Bevier/SFWMD | | | | |
| DRILLING EQUIPMENT/METHOD: Hydra-Drill/Mud Rotary | SIZE/TYPE OF BIT: 6" | SAMPLING METHOD: Core/Split Spoon | START/FINISH DATE: 12/2/99-12/6/99 | |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA.: PVC/2"-3/4" | SCREEN: TYPE Slotted | MAT. PVC | LENGTH DIA. SLOT SIZE 0.010 |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE | TOP OF WELL CASING: 15.975 | TOP & BOTTOM SCREEN | GW SURFACE DATE |

REMARKS: Dual zone construction. Deep well is 2" diameter, screened from 23.5 to 25.5 ft. Shallow well is 3/4" diameter, screened from 9 to 10 ft.

| Depth (ft) | Sample Type & Recovery | Sample Number | Penetration Resistance Blows/6" N-Value | Unified Classification | LOG OF TEST BORING: DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|
| | | S-0 | | | Organic material, peat. | |
| | | | | | 4.0 | |
| 5 | | S-1 | | | White to tan dense limestone with micritic inclusions. Very low permeability. | |
| | | | | | 5.0 | |
| | | S-2 | | | Tan, sandy limestone w/ entrained shell pieces. Some crystalline infilling of secondary solution openings. Moldic porosity. Moderate permeability. | |
| 10 | | | | | 10.0 | |
| | | | | | As above, but grayish white in color. | |
| | | | | | 12.0 | |
| | | S-3 | 6/7/6/6 13 | | Poorly sorted (silt to granule) qtz/carbonate sand w/ silt, mostly fine grains. White. Trace dark minerals and iron stain. Sand-sized shell fragments. | |
| 15 | | S-4 | 2/4/5/5 9 | | | |
| | | S-5 | 3/3/3/3 6 | | | |
| | | S-6 | 8/8/5/8 13 | | | |

Natural Gamma (API-GR): 0 24 48 72 96 120

Graphic Litho Log

TEST BORING LOG 3AS3GW2.GPJ SFWMD.GDT 1/3/29/00

**Figure B-18.** Test Boring Log for Well 3AS3-GW2 (Sheet 1 of 2)

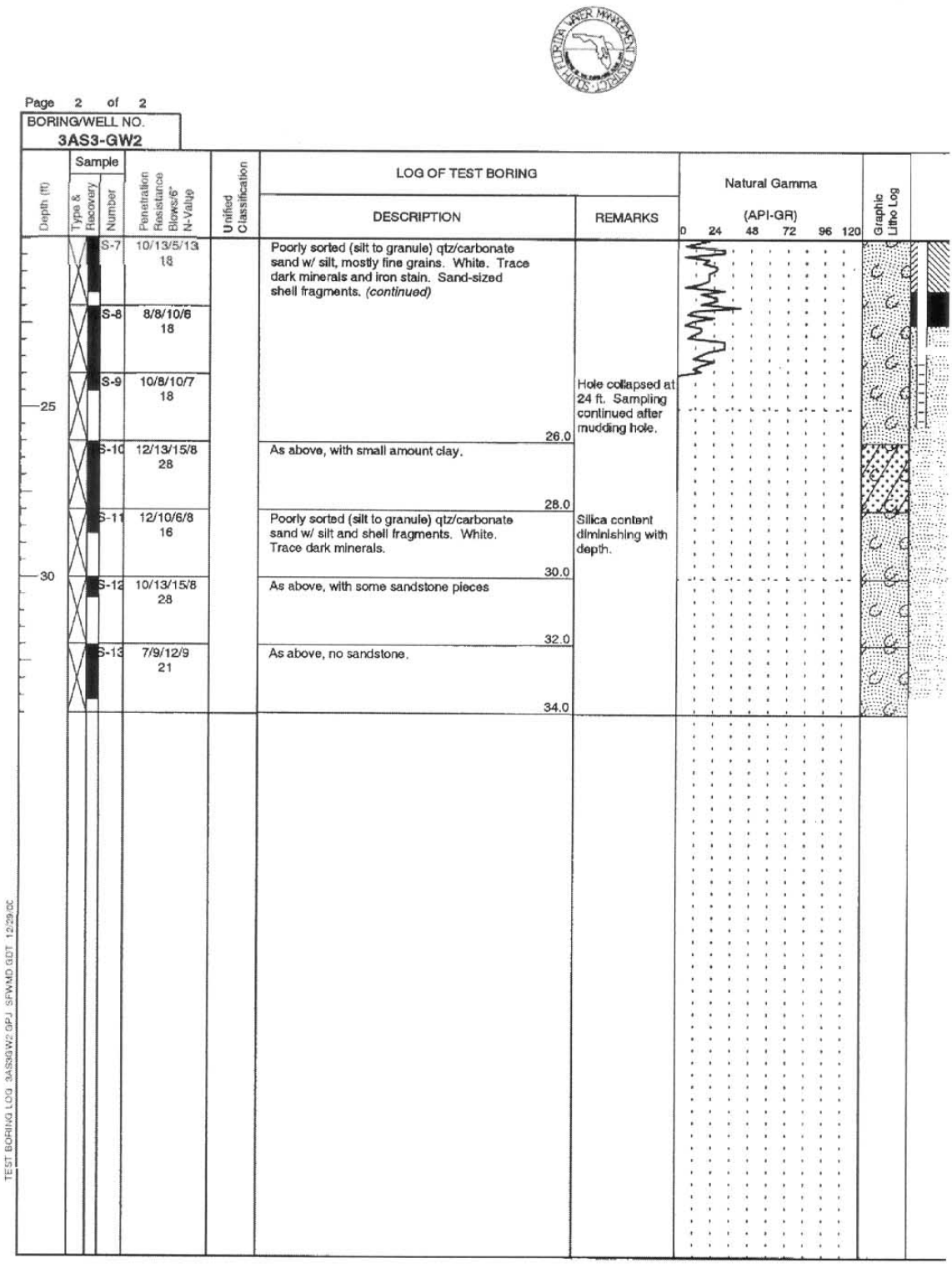
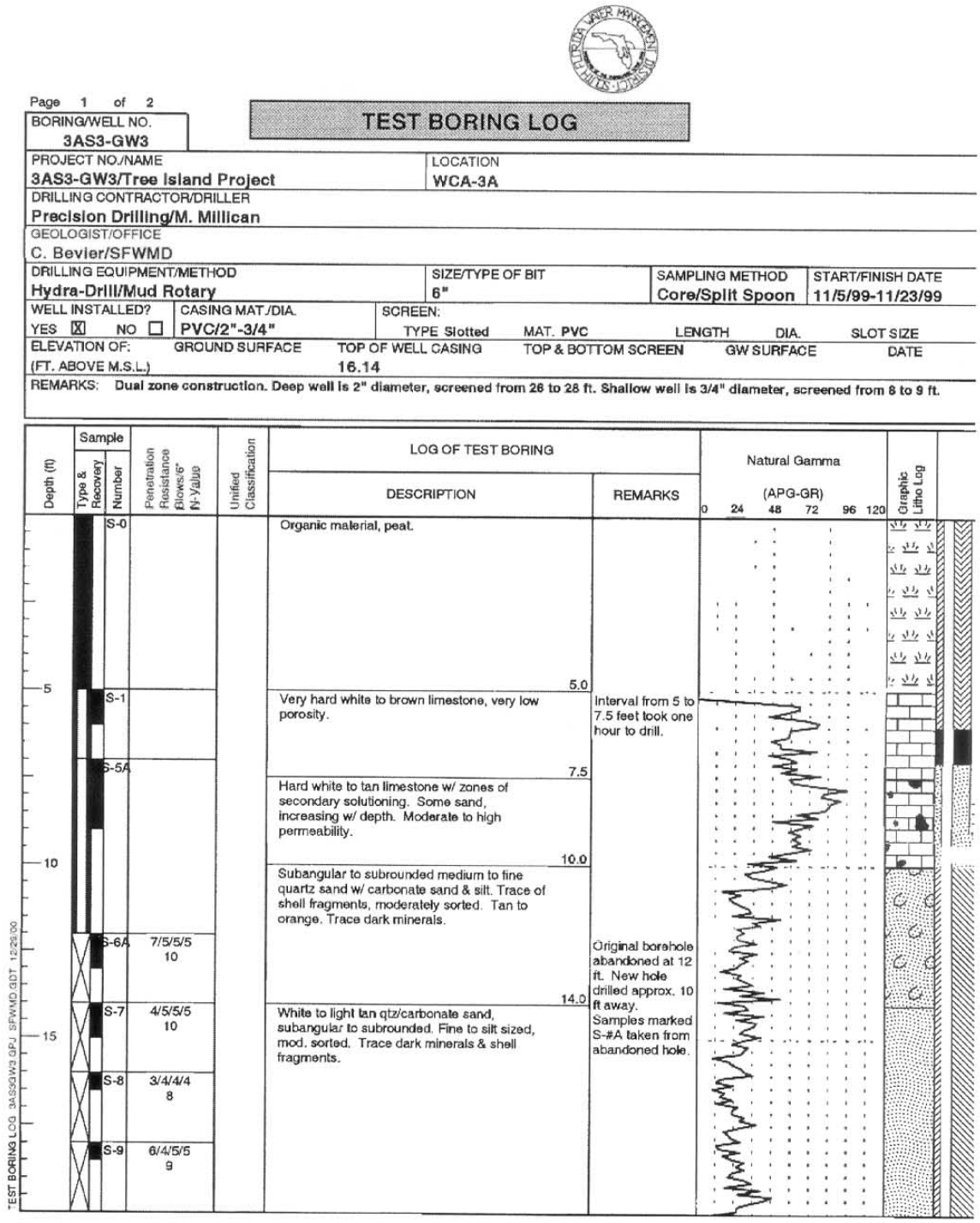



**Figure B-19.** Test Boring Log for Well 3AS3-GW2 (Sheet 2 of 2)



Page 1 of 2

**TEST BORING LOG**

| | |
|---|---|
| BORING/WELL NO. | 3AS3-GW3 |
| PROJECT NO./NAME | 3AS3-GW3/Tree Island Project |
| LOCATION | WCA-3A |
| DRILLING CONTRACTOR/DRILLER | Precision Drilling/M. Millican |
| GEOLOGIST/OFFICE | C. Bevier/SFWMD |
| DRILLING EQUIPMENT/METHOD | Hydra-Drill/Mud Rotary |
| SIZE/TYPE OF BIT | 6" |
| SAMPLING METHOD | Core/Split Spoon |
| START/FINISH DATE | 11/5/99-11/23/99 |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA. PVC/2"-3/4" |
| SCREEN: TYPE Slotted | MAT. PVC LENGTH DIA. SLOT SIZE |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE TOP OF WELL CASING 16.14 TOP & BOTTOM SCREEN GW SURFACE DATE |

REMARKS: **Dual zone construction. Deep well is 2" diameter, screened from 26 to 28 ft. Shallow well is 3/4" diameter, screened from 8 to 9 ft.**

| Depth (ft) | Sample Type & Recovery | Sample Number | Penetration Resistance Blows/6" N-Value | Unified Classification | LOG OF TEST BORING: DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|
| 0 | | S-0 | | | Organic material, peat. | |
| 5.0 | | | | | | |
| 5 | | S-1 | | | Very hard white to brown limestone, very low porosity. | Interval from 5 to 7.5 feet took one hour to drill. |
| 7.5 | | | | | Hard white to tan limestone w/ zones of secondary solutioning. Some sand, increasing w/ depth. Moderate to high permeability. | |
| 10.0 | | | | | | |
| 10 | | S-5A | | | Subangular to subrounded medium to fine quartz sand w/ carbonate sand & silt. Trace of shell fragments, moderately sorted. Tan to orange. Trace dark minerals. | |
| | | S-6A | 7/5/5/5 10 | | | Original borehole abandoned at 12 ft. New hole drilled approx. 10 ft away. Samples marked S-#A taken from abandoned hole. |
| 14.0 | | | | | | |
| 15 | | S-7 | 4/5/5/5 10 | | White to light tan qtz/carbonate sand, subangular to subrounded. Fine to silt sized, mod. sorted. Trace dark minerals & shell fragments. | |
| | | S-8 | 3/4/4/4 8 | | | |
| | | S-9 | 6/4/5/5 9 | | | |

Natural Gamma (APG-GR) 0 24 48 72 96 120

Graphic Litho Log

TEST BORING LOG 3AS3GW3.GPJ SFWMD.GDT 12/28/00

**Figure B-20.** Test Boring Log for Well 3AS3-GW3 (Sheet 1 of 2)

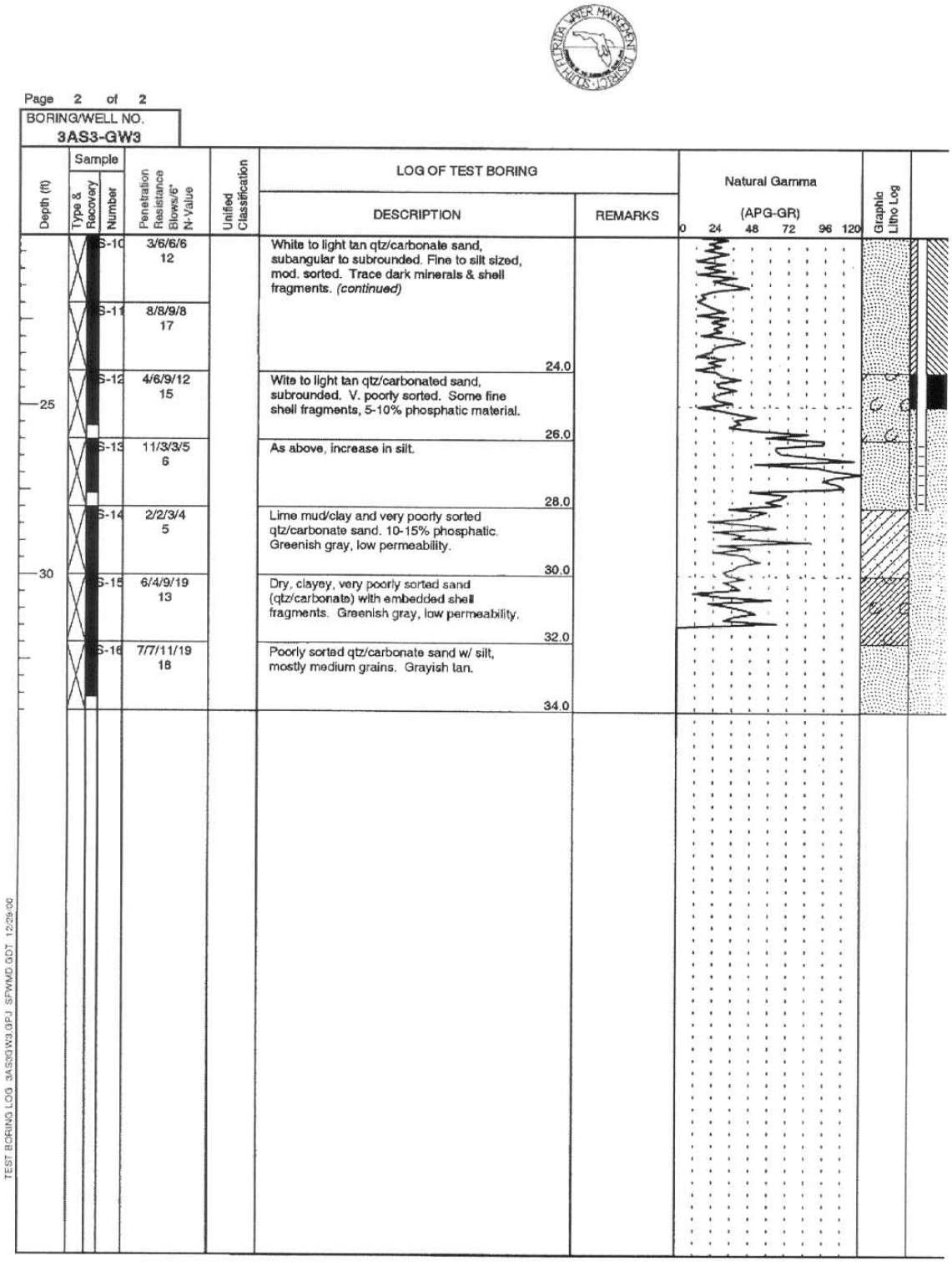



**Figure B-21.** Test Boring Log for Well 3AS3-GW3 (Sheet 2 of 2)

Page 1 of 2

**TEST BORING LOG**

| | | | | |
|---|---|---|---|---|
| BORING/WELL NO.: 3AS3-GW4 | | | | |
| PROJECT NO./NAME: 3AS3-GW4/Tree Island Project | LOCATION: WCA-3A | | | |
| DRILLING CONTRACTOR/DRILLER: Precision Drilling/M. Millican | | | | |
| GEOLOGIST/OFFICE: C. Bevier/SFWMD | | | | |
| DRILLING EQUIPMENT/METHOD: Hydra-Drill/Mud Rotary | SIZE/TYPE OF BIT: 6" | SAMPLING METHOD: Core/Split Spoon | START/FINISH DATE: 12/8/99-12/11/99 | |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA.: PVC/2"-3/4" | SCREEN: TYPE Slotted | MAT. PVC | LENGTH DIA. SLOT SIZE 0.010 |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE | TOP OF WELL CASING: 15.682 | TOP & BOTTOM SCREEN | GW SURFACE DATE |

REMARKS: Dual zone construction. Deep well is 2" diameter, screened from 26 to 28 ft. Shallow well is 3/4" diameter, screened from 7 to 8 ft.

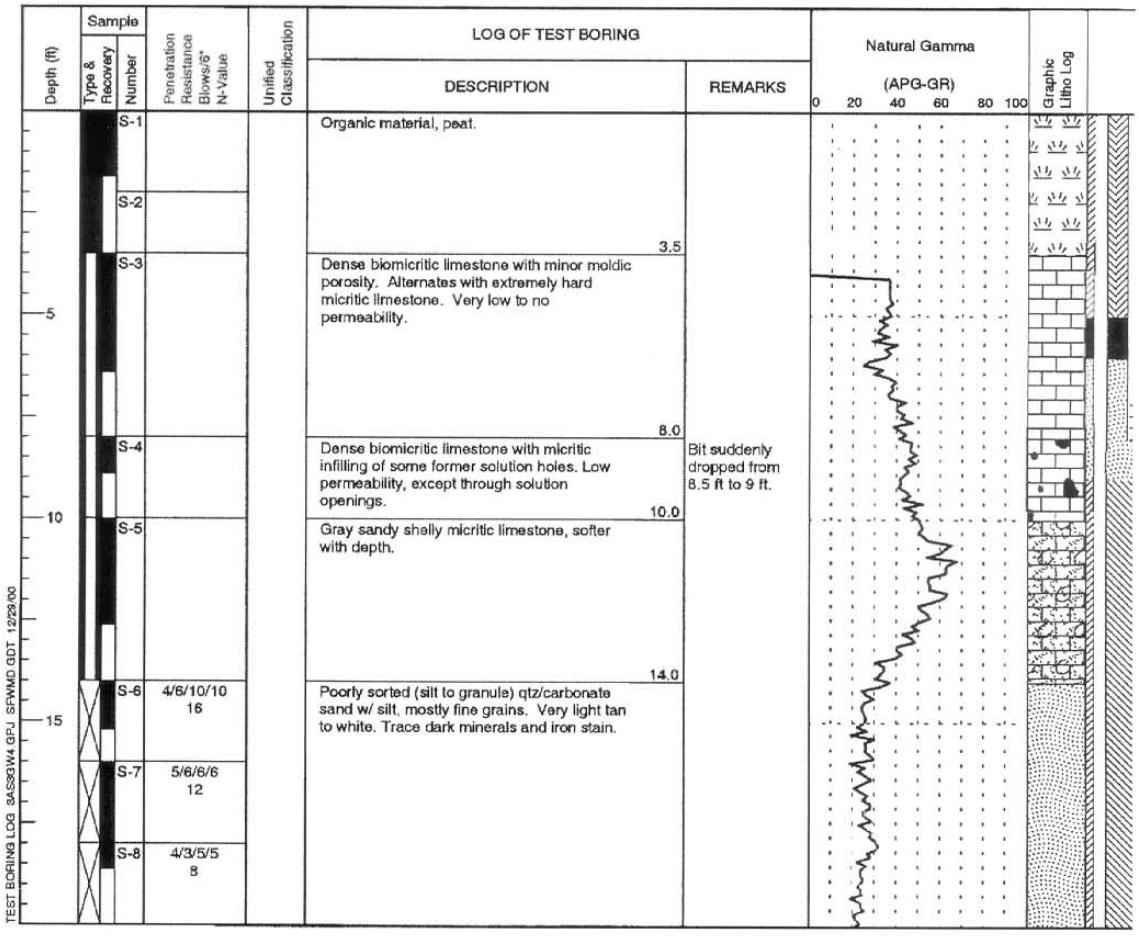



**Figure B-22.** Test Boring Log for Well 3AS3-GW4 (Sheet 1 of 2)

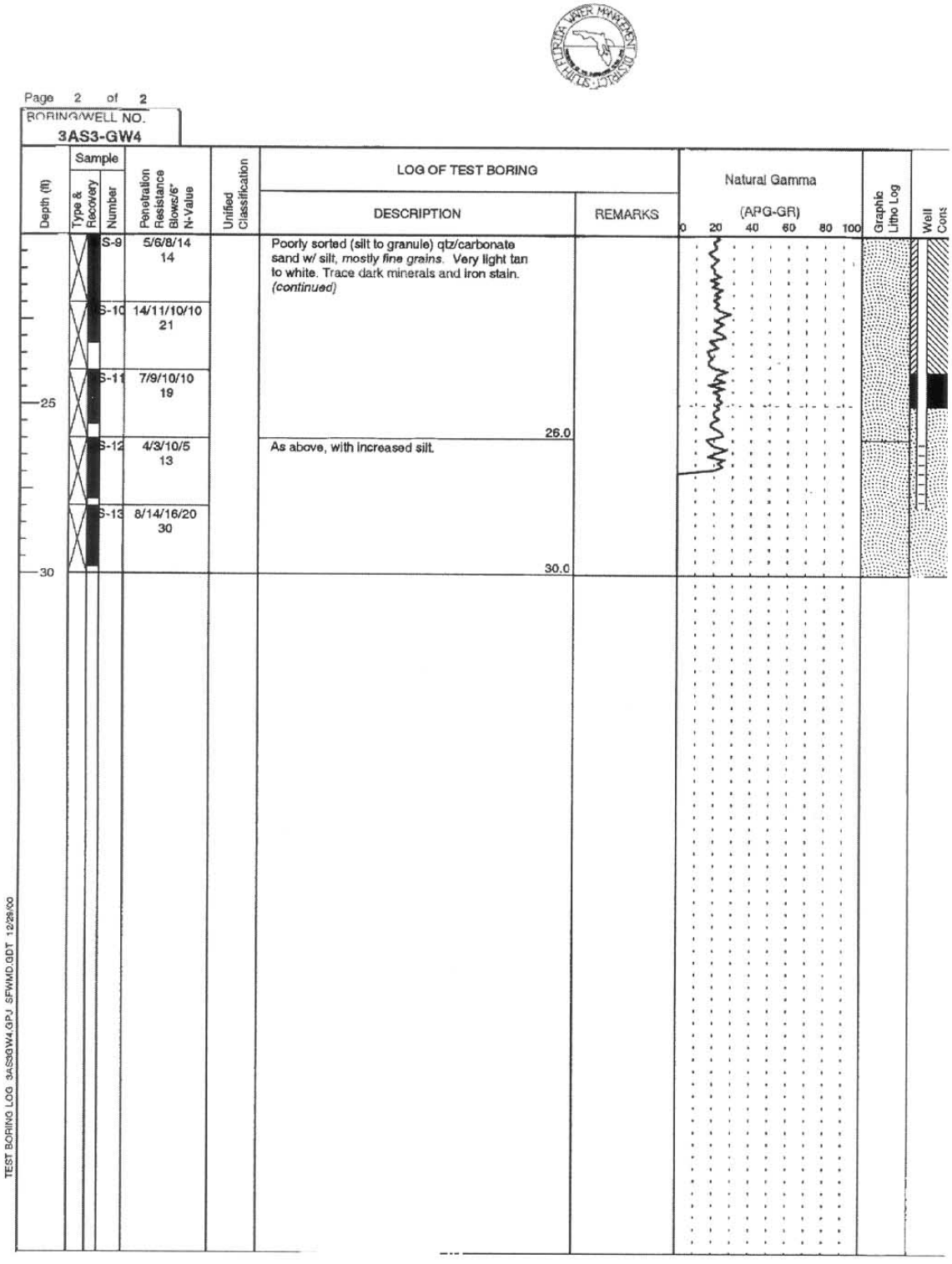



**Figure B-23.** Test Boring Log for Well 3AS3-GW4 (Sheet 2 of 2)

Page 1 of 2

# TEST BORING LOG

| | |
|---|---|
| BORING/WELL NO. | 3BS1-GW1 |
| PROJECT NO./NAME | 3BS1-GW1/Tree Island Project |
| LOCATION | WCA-3B |
| DRILLING CONTRACTOR/DRILLER | Precision Drilling/M. Millican |
| GEOLOGIST/OFFICE | C. Bevier/SFWMD |
| DRILLING EQUIPMENT/METHOD | Hydra-Drill/Mud Rotary |
| SIZE/TYPE OF BIT | 6" |
| SAMPLING METHOD | Core |
| START/FINISH DATE | 9/28/99-10/4/99 |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA. PVC/2"-3/4" |
| SCREEN: TYPE Slotted | MAT. PVC LENGTH DIA. SLOT SIZE 0.01 |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE TOP OF WELL CASING TOP & BOTTOM SCREEN |

REMARKS: Dual zone construction. Deep well is 2" diameter, screened from 32-34 ft. Shallow well is 3/4" diameter, screened from 14-15 ft.

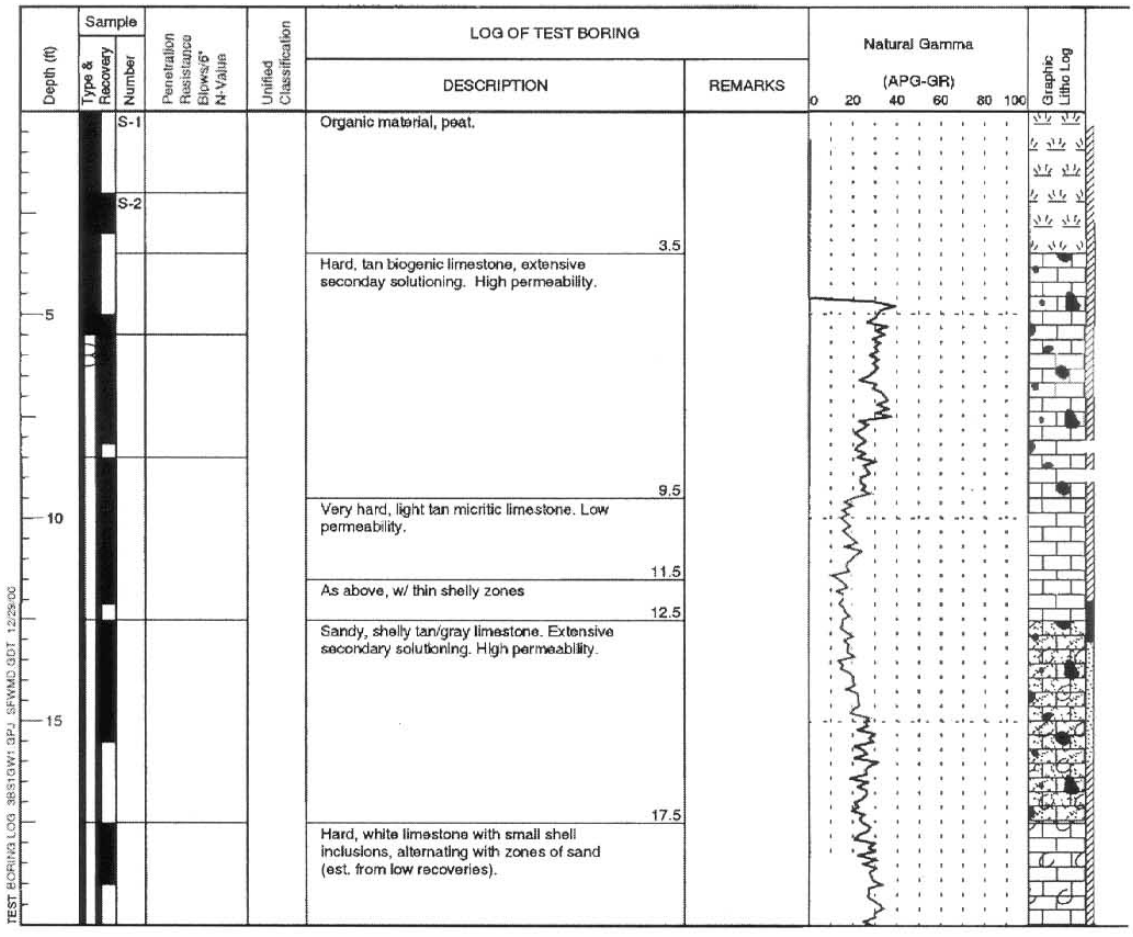



**Figure B-24.** Test Boring Log for Well 3BS1-GW1 (Sheet 1 of 2)

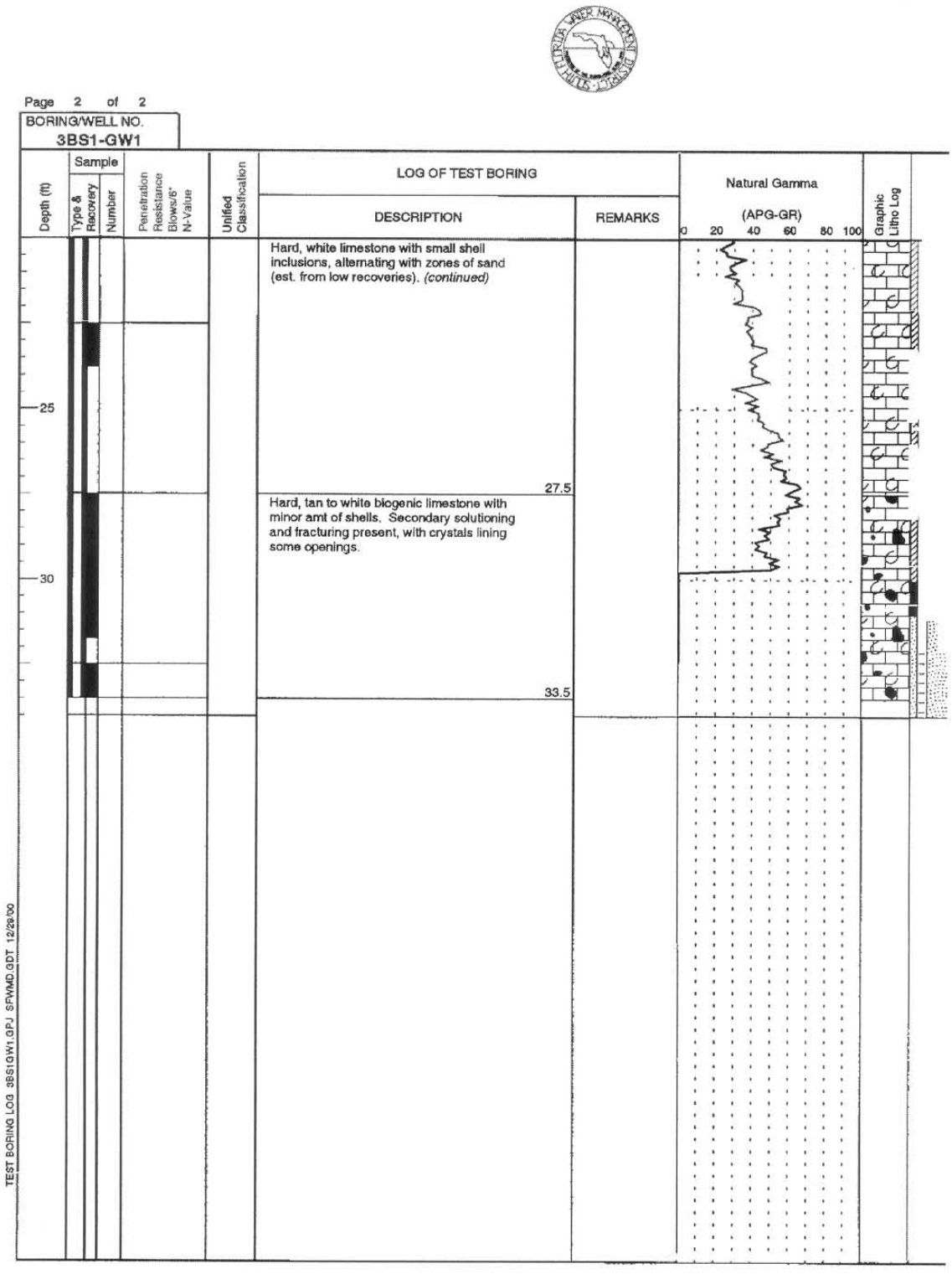



**Figure B-25.** Test Boring Log for Well 3BS1-GW1 (Sheet 2 of 2)

Page 1 of 2

# TEST BORING LOG

| | | | | |
|---|---|---|---|---|
| BORING/WELL NO.: 3BS1-GW2 | | | | |
| PROJECT NO./NAME: 3BS1-GW2/Tree Island Project | LOCATION: WCA-3B | | | |
| DRILLING CONTRACTOR/DRILLER: Precision Drilling/M. Millican | | | | |
| GEOLOGIST/OFFICE: C. Bevier/SFWMD | | | | |
| DRILLING EQUIPMENT/METHOD: Hydra-Drill/Mud Rotary | SIZE/TYPE OF BIT: 6" | SAMPLING METHOD: Core | START/FINISH DATE: 9/10/99-10/4/99 | |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA.: PVC/2"-3/4" | SCREEN: TYPE Slotted | MAT. PVC | LENGTH DIA. SLOT SIZE 0.010 |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE | TOP OF WELL CASING | TOP & BOTTOM SCREEN | GW SURFACE DATE |

REMARKS: Dual zone construction. **Deep well is 2" diameter, screened from 28-30 ft. Shallow well is 3/4" diameter, screened from 12-13 ft.**

| Depth (ft) | Sample Type & Recovery | Sample Number | Penetration Resistance Blows/6" N-Value | Unified Classification | LOG OF TEST BORING: DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|
| 0 | | S-1 | | | Organic material, peat. | |
| | | S-2 | | | | |
| 5 | B | | | | 5.5 | |
| | | S-3 | | | Tan limestone (coralline?), extensive secondary solutioning. Very high permeability. | |
| | | | | | 8.0 | |
| | | | | | Hard white limestone w/ fossil shell molds. Secondary solutioning not as extensive as above. 9.0 | |
| 10 | | S-4 | | | White to tan porous limestone with shell molds. Zones of extensive secondary solutioning with very high permeability. | |
| | | | | | 13.5 | |
| | | | | | Dense, white limestone with shell molds. Low to moderate permeability. 14.0 | |
| 15 | | S-5 | | | Dense, white limestone with shell molds and micritic intraclasts. Low to moderate permeability. | |
| | | | | | 19.0 | |
| | | S-6 | | | Crumbly, sandy, shelly white limestone. Very high permeability. | |

Natural Gamma (API-GR): 0 20 40 60 80 100

Graphic Litho Log

TEST BORING LOG 3BS1GW2.GPJ SFWMD.GDT 12/29/00

**Figure B-26.** Test Boring Log for Well 3BS1-GW2 (Sheet 1 of 2)

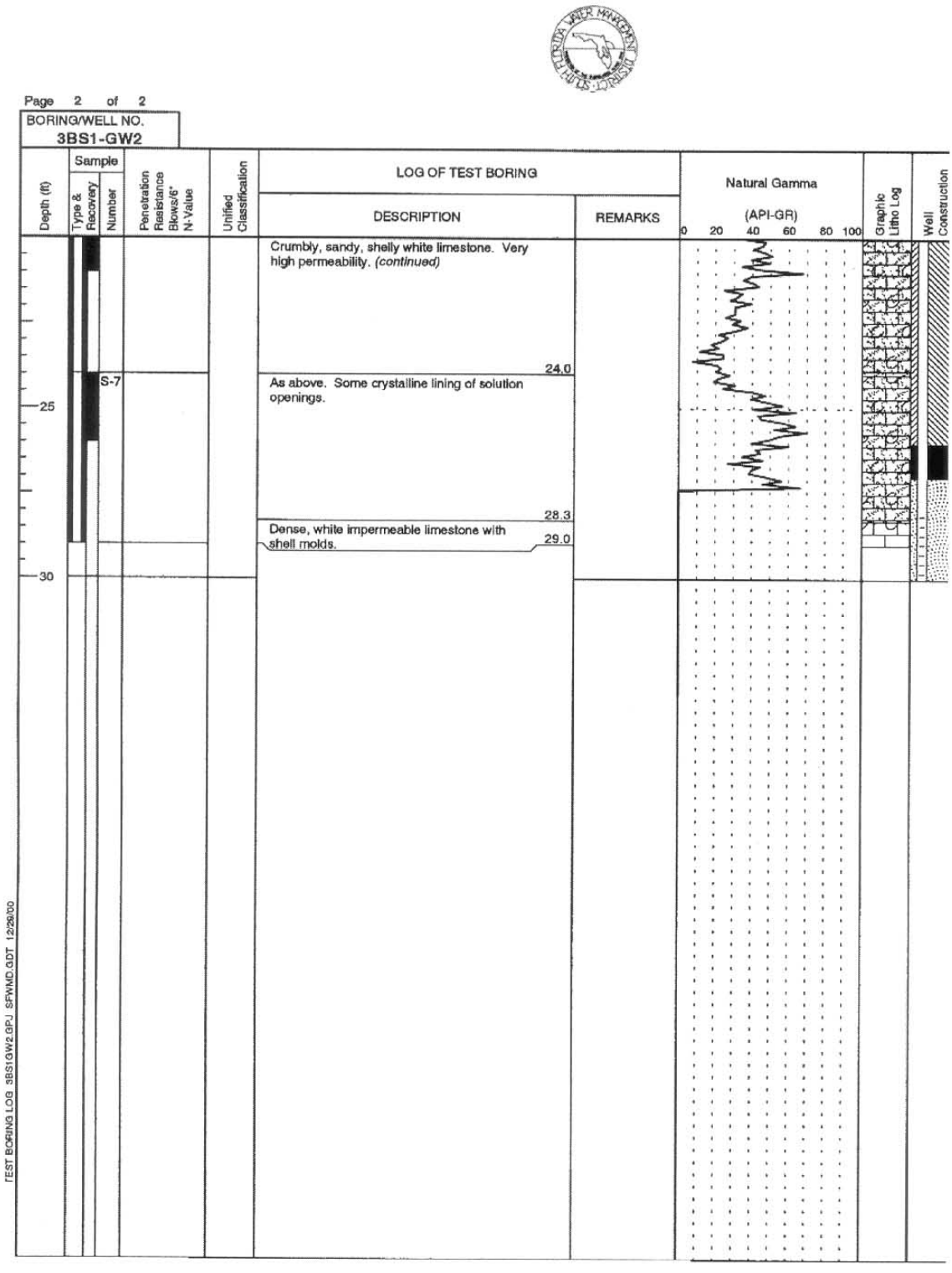
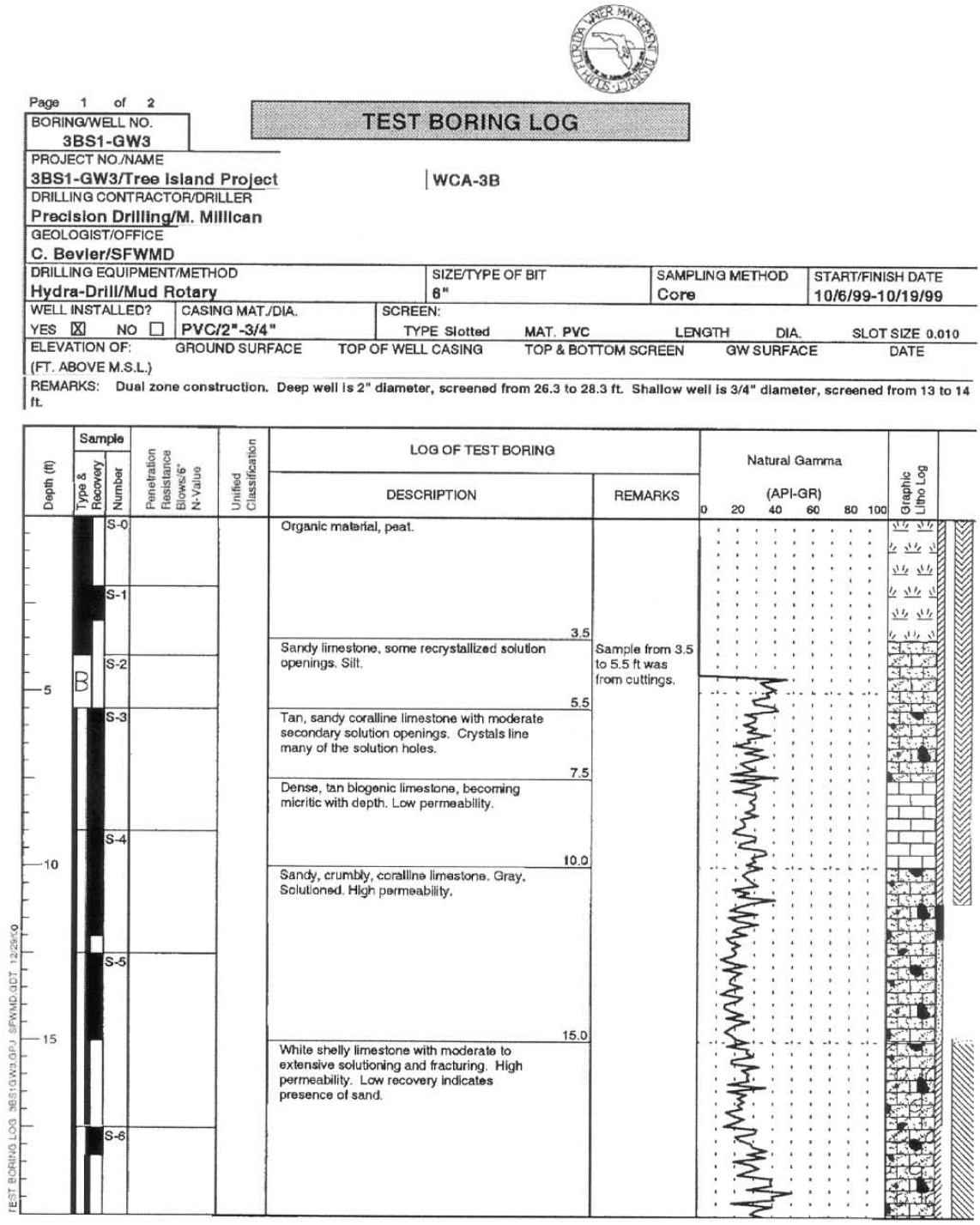



**Figure B-27.** Test Boring Log for Well 3BS1-GW2 (Sheet 2 of 2)



Page 1 of 2

**TEST BORING LOG**

| | | | |
|---|---|---|---|
| BORING/WELL NO. **3BS1-GW3** | | | |
| PROJECT NO./NAME **3BS1-GW3/Tree Island Project** | **WCA-3B** | | |
| DRILLING CONTRACTOR/DRILLER **Precision Drilling/M. Millican** | | | |
| GEOLOGIST/OFFICE **C. Bevier/SFWMD** | | | |
| DRILLING EQUIPMENT/METHOD **Hydra-Drill/Mud Rotary** | SIZE/TYPE OF BIT **6"** | SAMPLING METHOD **Core** | START/FINISH DATE **10/6/99-10/19/99** |
| WELL INSTALLED? YES ☒ NO ☐ | CASING MAT./DIA. **PVC/2"-3/4"** | SCREEN: TYPE **Slotted** MAT. **PVC** LENGTH DIA. SLOT SIZE **0.010** | |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE | TOP OF WELL CASING | TOP & BOTTOM SCREEN / GW SURFACE / DATE |

REMARKS: **Dual zone construction. Deep well is 2" diameter, screened from 26.3 to 28.3 ft. Shallow well is 3/4" diameter, screened from 13 to 14 ft.**

| Depth (ft) | Sample Type & Recovery | Sample Number | Penetration Resistance Blows/6" N-Value | Unified Classification | LOG OF TEST BORING — DESCRIPTION | REMARKS | Natural Gamma (API-GR) 0 20 40 60 80 100 | Graphic Litho Log |
|---|---|---|---|---|---|---|---|---|
| | | S-0 | | | Organic material, peat. | | | |
| | | S-1 | | | 3.5 | | | |
| | | S-2 | | | Sandy limestone, some recrystallized solution openings. Silt. | Sample from 3.5 to 5.5 ft was from cuttings. | | |
| 5 | | S-3 | | | 5.5 Tan, sandy coralline limestone with moderate secondary solution openings. Crystals line many of the solution holes. | | | |
| | | S-4 | | | 7.5 Dense, tan biogenic limestone, becoming micritic with depth. Low permeability. | | | |
| 10 | | S-5 | | | 10.0 Sandy, crumbly, coralline limestone. Gray. Solutioned. High permeability. | | | |
| 15 | | S-6 | | | 15.0 White shelly limestone with moderate to extensive solutioning and fracturing. High permeability. Low recovery indicates presence of sand. | | | |

TEST BORING LOG 3BS1GW3.GPJ SFWMD.GDT 12/29/0

**Figure B-28.** Test Boring Log for Well 3BS1-GW3 (Sheet 1 of 2)

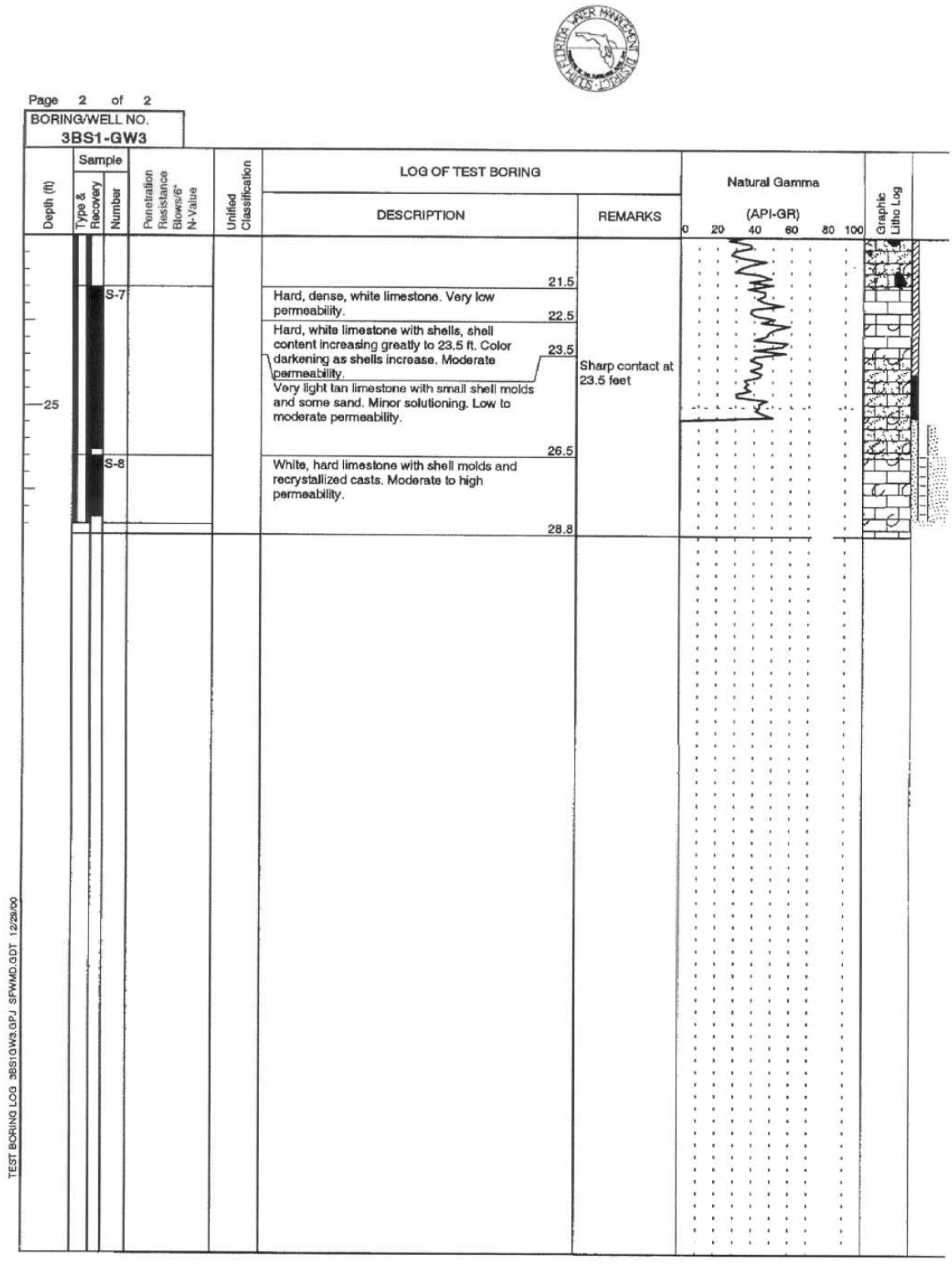
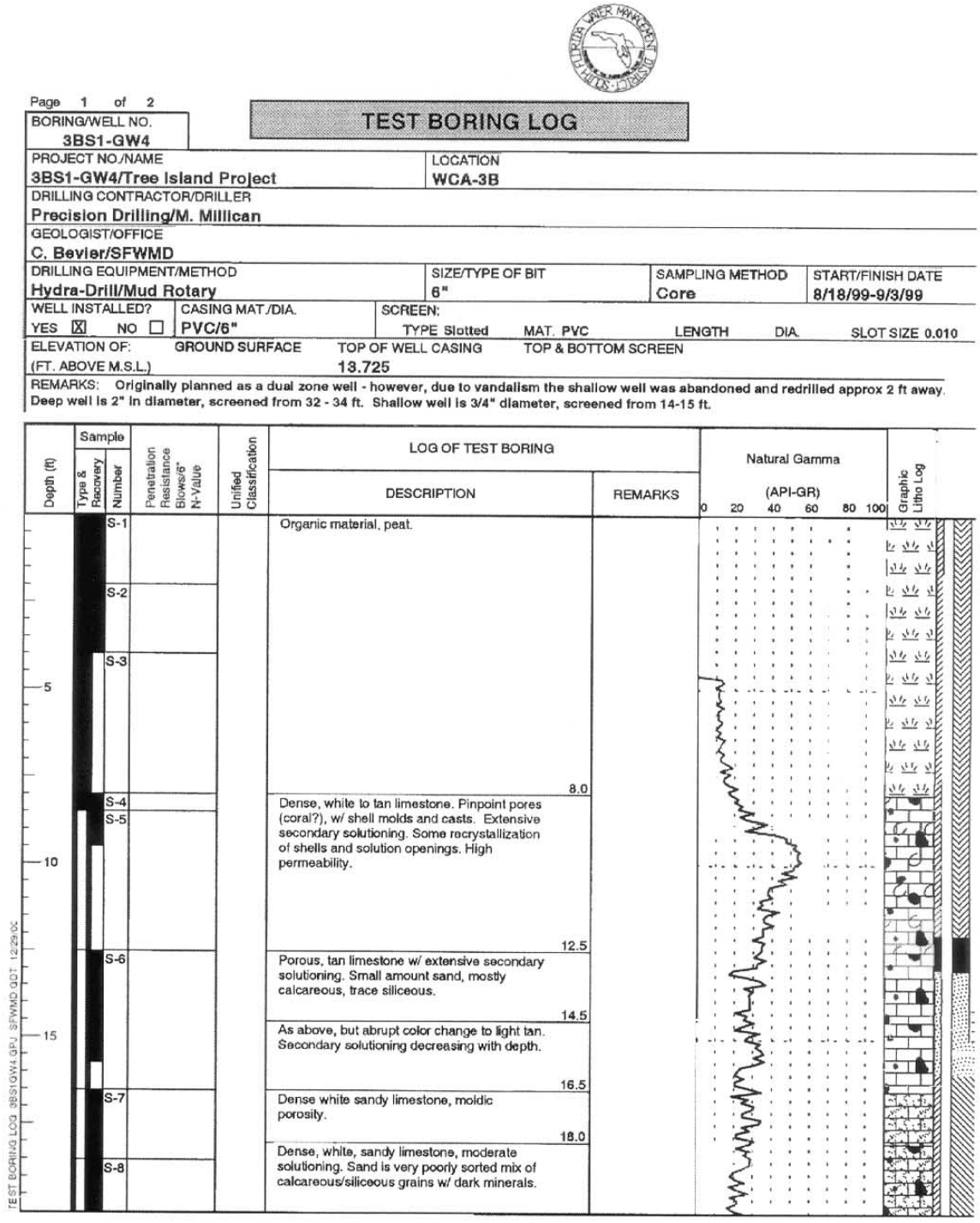



**Figure B-29.** Test Boring Log for Well 3BS1-GW3 (Sheet 2 of 2)



Page 1 of 2

# TEST BORING LOG

| | |
|---|---|
| BORING/WELL NO. | 3BS1-GW4 |
| PROJECT NO./NAME | 3BS1-GW4/Tree Island Project |
| LOCATION | WCA-3B |
| DRILLING CONTRACTOR/DRILLER | Precision Drilling/M. Millican |
| GEOLOGIST/OFFICE | C. Bevier/SFWMD |
| DRILLING EQUIPMENT/METHOD | Hydra-Drill/Mud Rotary |
| SIZE/TYPE OF BIT | 6" |
| SAMPLING METHOD | Core |
| START/FINISH DATE | 8/18/99-9/3/99 |
| WELL INSTALLED? | YES ☒ NO ☐ |
| CASING MAT./DIA. | PVC/6" |
| SCREEN: | TYPE Slotted MAT. PVC LENGTH DIA. SLOT SIZE 0.010 |
| ELEVATION OF: (FT. ABOVE M.S.L.) | GROUND SURFACE 13.725 TOP OF WELL CASING TOP & BOTTOM SCREEN |

REMARKS: **Originally planned as a dual zone well - however, due to vandalism the shallow well was abandoned and redrilled approx 2 ft away. Deep well is 2" in diameter, screened from 32 - 34 ft. Shallow well is 3/4" diameter, screened from 14-15 ft.**

| Depth (ft) | Sample Type & Recovery | Sample Number | Penetration Resistance Blows/6" N-Value | Unified Classification | LOG OF TEST BORING: DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|
| | | S-1 | | | Organic material, peat. | |
| | | S-2 | | | | |
| | | S-3 | | | | |
| 5 | | | | | | |
| | | S-4 | | | | |
| | | S-5 | | | Dense, white to tan limestone. Pinpoint pores (coral?), w/ shell molds and casts. Extensive secondary solutioning. Some recrystallization of shells and solution openings. High permeability. | |
| 10 | | | | | | |
| | | S-6 | | | Porous, tan limestone w/ extensive secondary solutioning. Small amount sand, mostly calcareous, trace siliceous. | |
| 15 | | | | | As above, but abrupt color change to light tan. Secondary solutioning decreasing with depth. | |
| | | S-7 | | | Dense white sandy limestone, moldic porosity. | |
| | | S-8 | | | Dense, white, sandy limestone, moderate solutioning. Sand is very poorly sorted mix of calcareous/siliceous grains w/ dark minerals. | |

8.0 12.5 14.5 16.5 18.0

Natural Gamma (API-GR) 0 20 40 60 80 100

Graphic Litho Log

TEST BORING LOG 3BS1GW4.GPJ SFWMD GDT 12/29/0

**Figure B-30.** Test Boring Log for Well 3BS1-GW4 (Sheet 1 of 2)

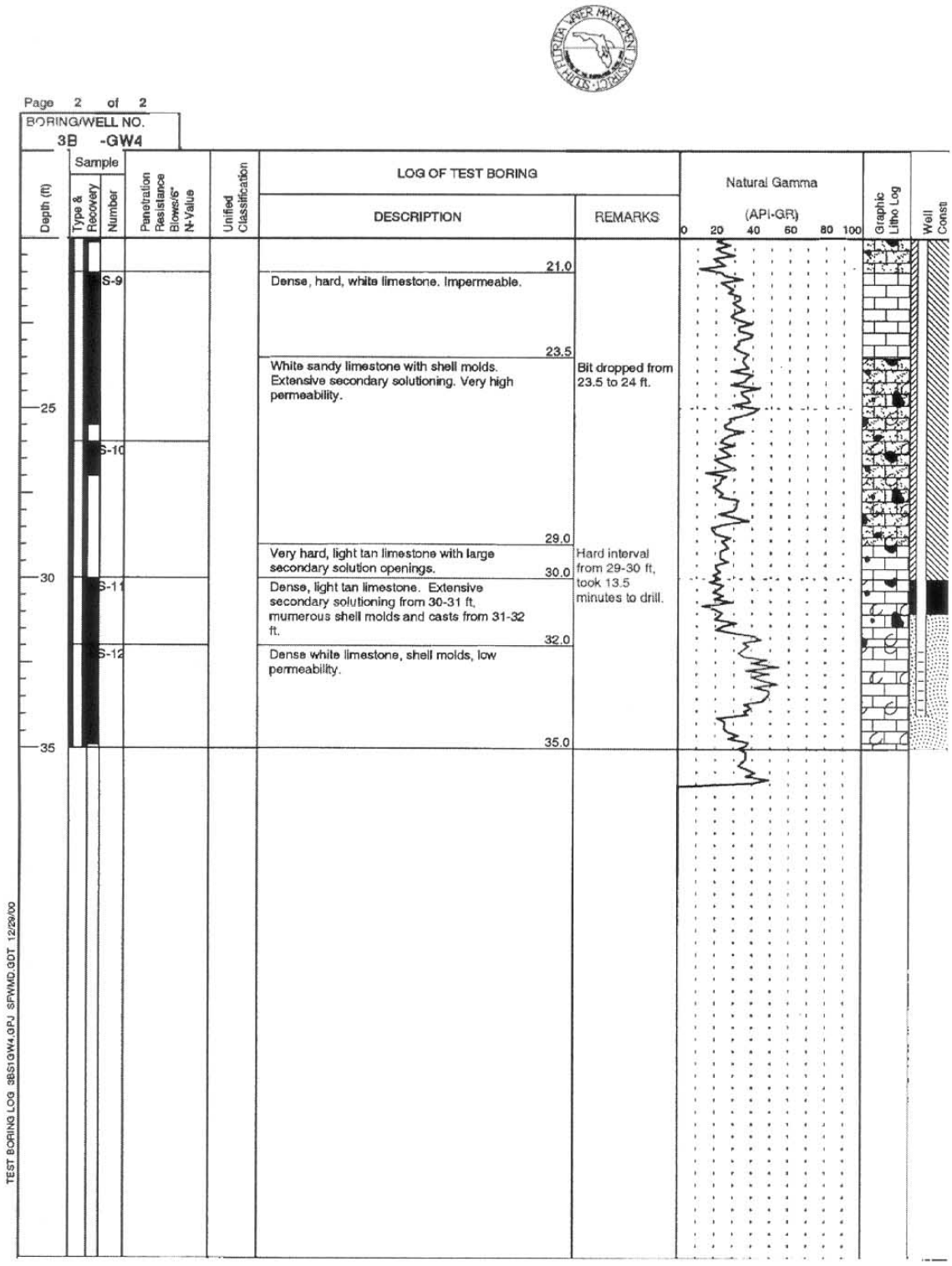



**Figure B-31.** Test Boring Log for Well 3BS1-GW4 (Sheet 2 of 2)

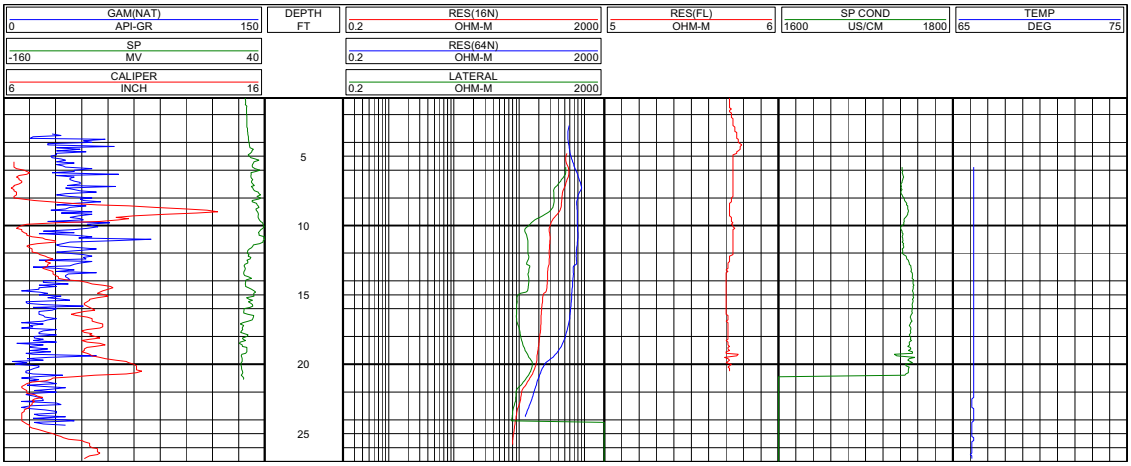



**Figure B-32.** Geophysical Logs for Well 3AS3-GW1

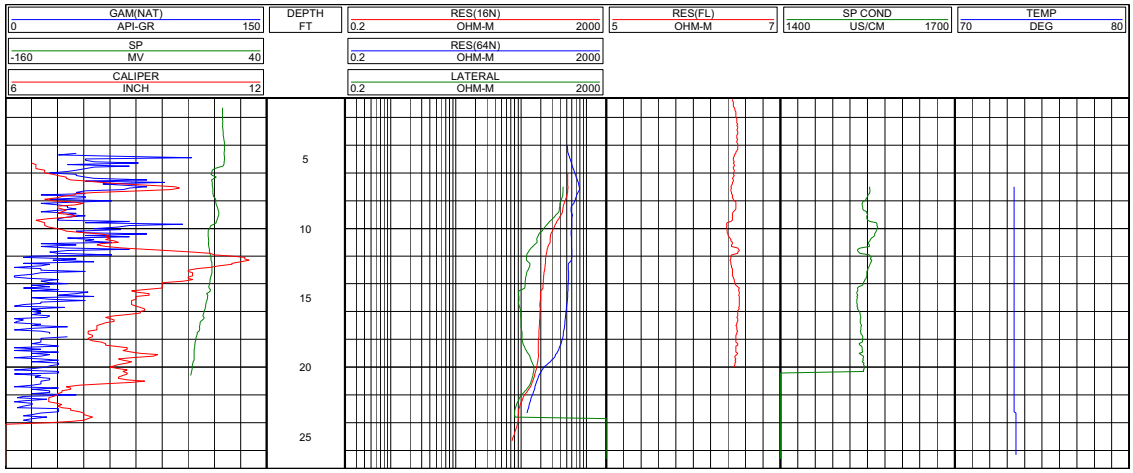



**Figure B-33.** Geophysical Logs for Well 3AS3-GW2

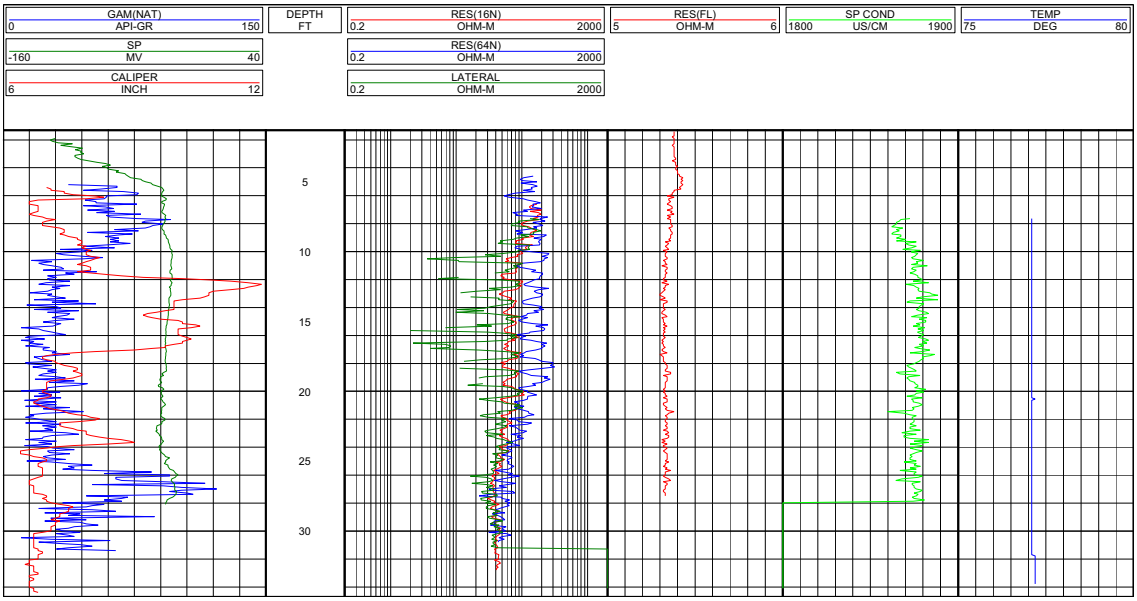



**Figure B-34.** Geophysical Logs for Well 3AS3-GW3

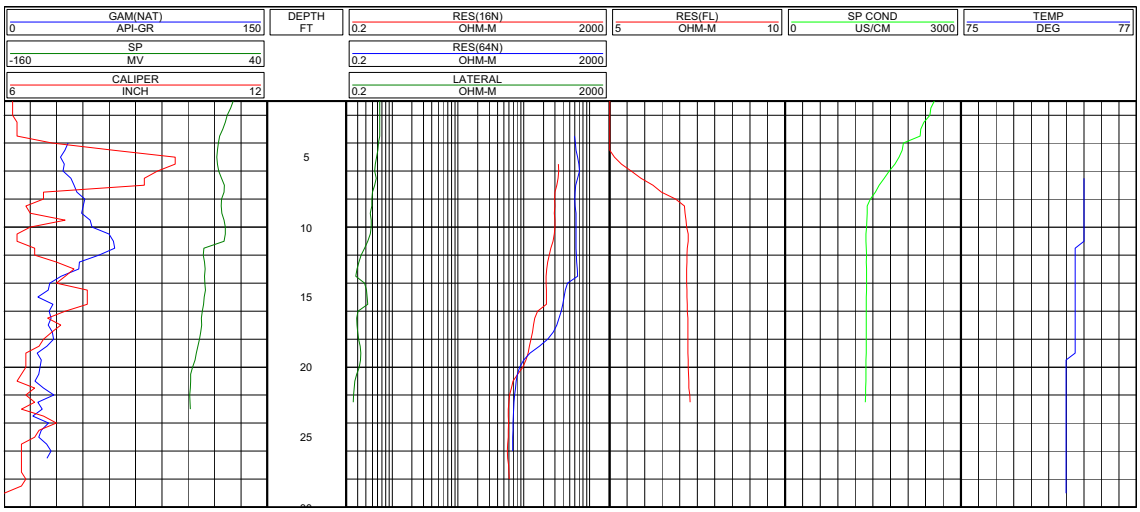



**Figure B-35.** Geophysical Logs for Well 3AS3-GW4

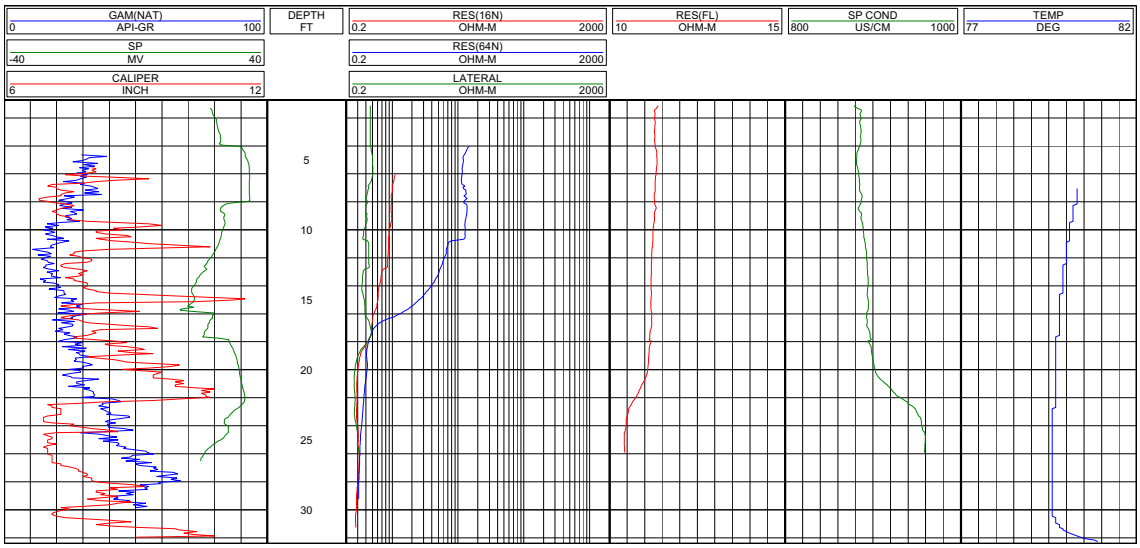



**Figure B-36.** Geophysical Logs for Well 3BS1-GW1

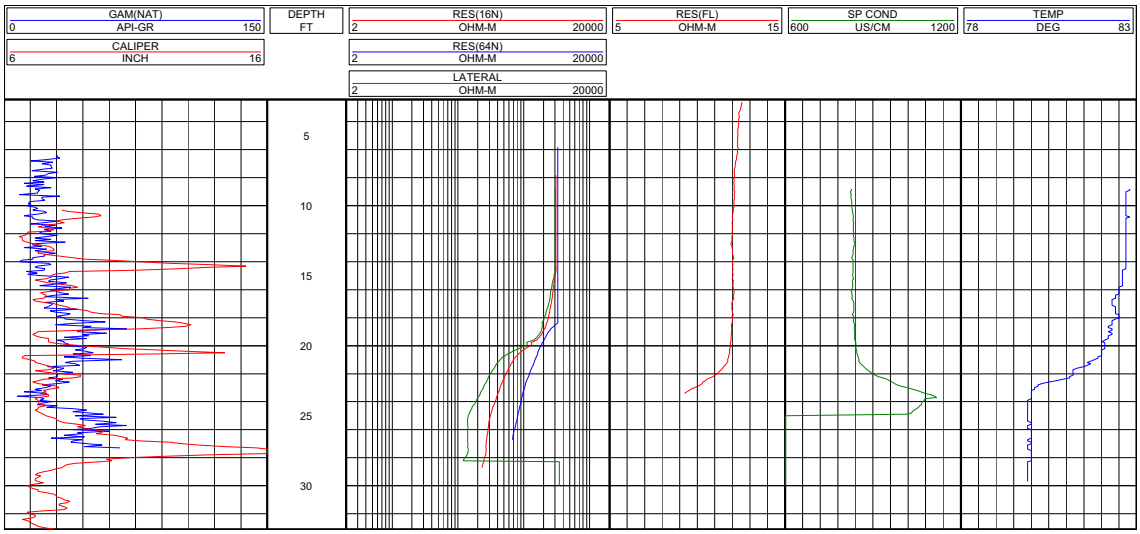



**Figure B-37.** Geophysical Logs for Well 3BS1-GW2

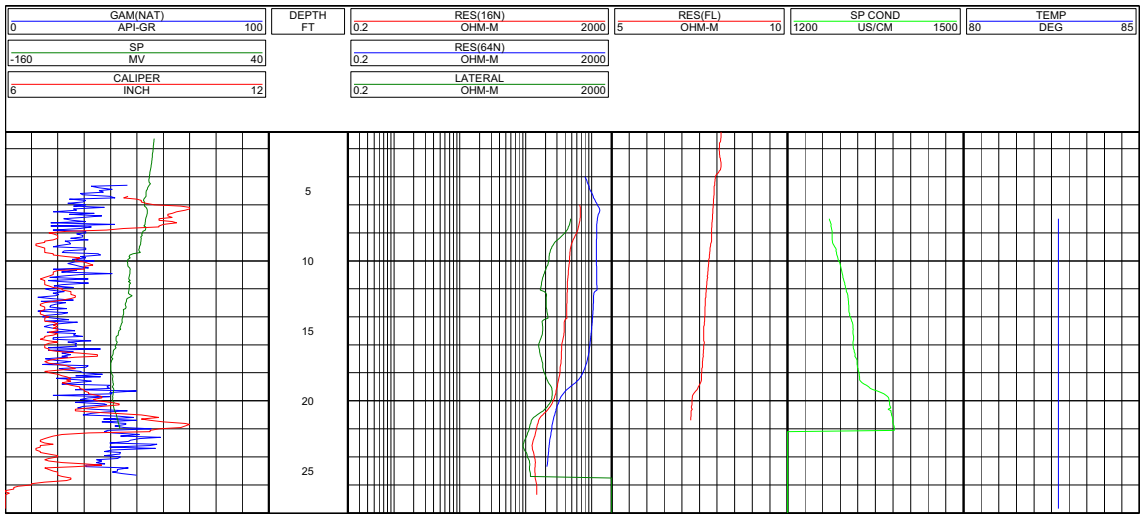



**Figure B-38.** Geophysical Logs for Well 3BS1-GW3

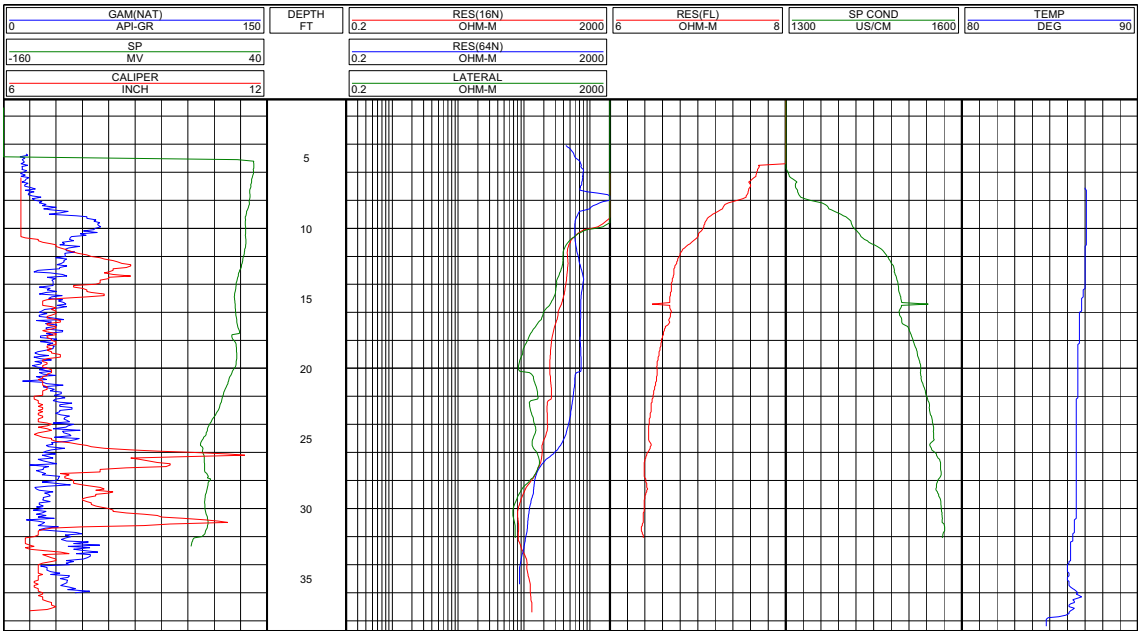



**Figure B-39.** Geophysical Logs for Well 3BS1-GW4

# APPENDIX C

# RAW DATA AND CURVES FOR SLUG TESTS

This appendix contains graphical representations of data (**Figures C-1** through **C-22**), as well as raw data obtained during slug tests on project wells (**Tables C-1** through **C-11**), and results of two different solution methods per slug test. The raw data were generated from WINSITU software, which takes all the test parameters and measurements from the Hermit 3000 datalogger and pressure transducers used during the tests, and presents this information in tabular form. The "Elapsed Time" ("ET") column reports elapsed time (in minutes) since the pump was turned off. The "Feet $H_2O$" columns depict the water level in feet below the top of the well casing. These numbers decrease as time elapses, and the water in the well returns to its prepumped level.

The graphs of the slug tests show the measurements in semi-log format, with displacement below the top of the well casing on the Y-axis and elapsed time on the X-axis. The slope of the straight line through the points is used in two different slug test solution methods to obtain a value for K, which is the hydraulic conductivity. The term "y0" refers to the initial displacement of water below the top of the well casing.

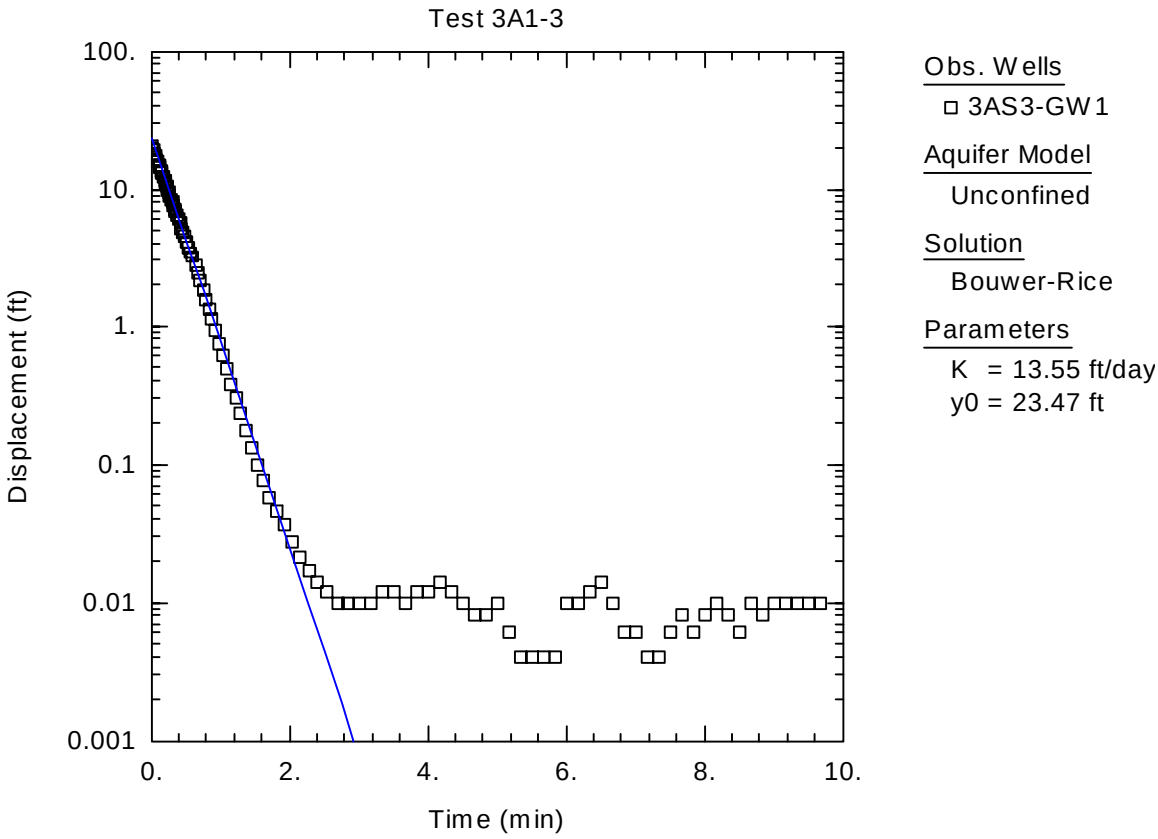



**Figure C-1.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW1, Bouwer-Rice Solution

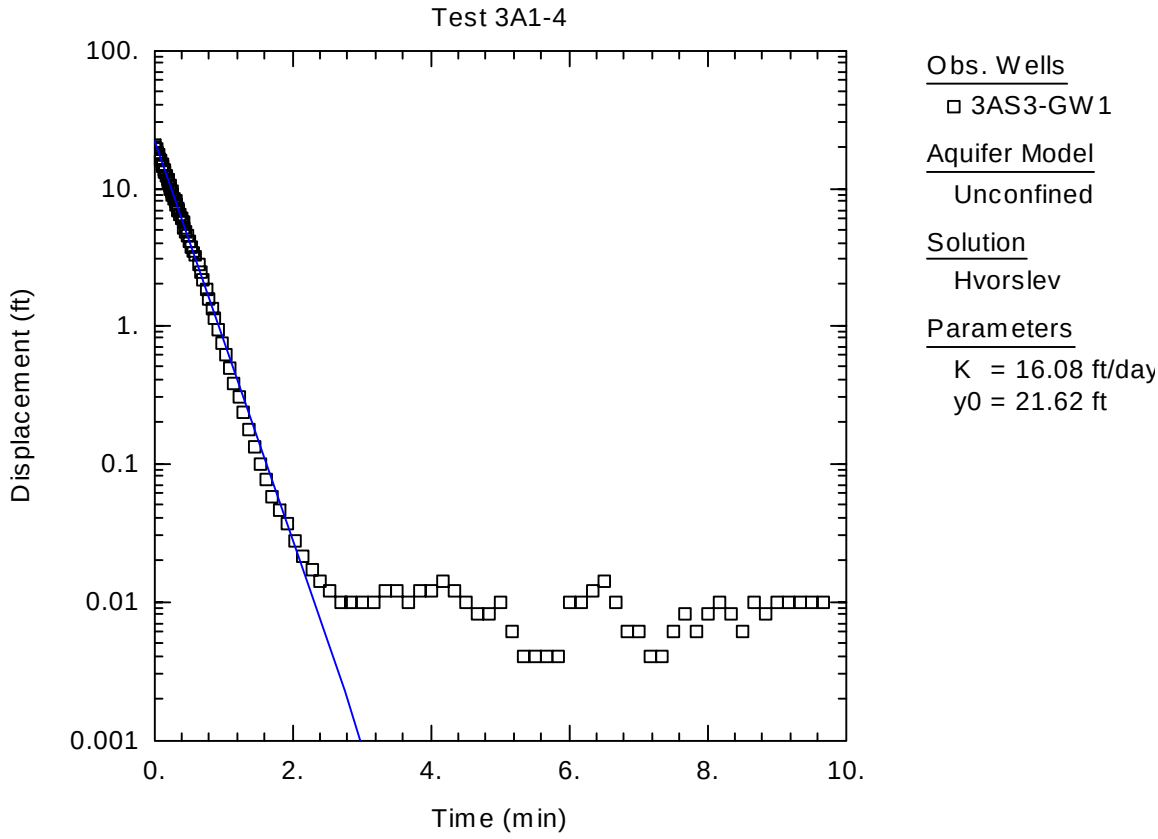



**Figure C-2.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW1, Hvorslev Solution

**Table C-1.** Raw Data Obtained from Slug Test of 3AS3-GW1

| | | | | | |
|---|---|---|---|---|---|
| IN_SITU INC. | Hermit 3000 | | | | |
| Report generated: | 9/11/00 | 15:55:23 | | | |
| Report from file: | C:\WINSITU\3AGW1.BIN | | | | |
| DataMgr Version | 2.18.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW1 | | | |
| Test defined on: | 2/23/00 | 15:14:12 | | | |
| Test started on: | 2/23/00 | 15:16:27 | | | |
| Test stopped on: | 2/23/00 | 15:26:15 | | | |
| Test extracted on: | 2/23/00 | 15:35:49 | | | |
| Data gathered using logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667 minutes | | | | |
| TOTAL DATA SAMPLES | 102 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | Top of casing (TOC) | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | Channel Definition | | | | |
| Pressure head at reference: | 6.709 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | Channel Definition | | | | |
| Pressure head at reference: | 26.602 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |

**Table C-1.** Raw Data Obtained from Slug Test of 3AS3-GW1(Continued)

| Report from file: | C:\WINSITU\3AGW1.BIN | | | | |
|---|---|---|---|---|---|
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date | Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg |
| --- | --- | --- | --- | --- | --- |
| 2/23/00 | 15:16:27 | 0 | 0.017 | 20.281 | 30.34 |
| 2/23/00 | 15:16:27 | 0.0163 | 0.017 | 19.978 | 30.343 |
| 2/23/00 | 15:16:28 | 0.0327 | 0.017 | 19.147 | 30.34 |
| 2/23/00 | 15:16:29 | 0.049 | 0.017 | 18.343 | 30.34 |
| 2/23/00 | 15:16:30 | 0.0653 | 0.017 | 17.482 | 30.343 |
| 2/23/00 | 15:16:31 | 0.0817 | 0.012 | 16.677 | 30.34 |
| 2/23/00 | 15:16:32 | 0.098 | 0.017 | 15.891 | 30.34 |
| 2/23/00 | 15:16:33 | 0.1143 | 0.012 | 15.135 | 30.338 |
| 2/23/00 | 15:16:34 | 0.1307 | 0.012 | 14.432 | 30.34 |
| 2/23/00 | 15:16:35 | 0.147 | 0.012 | 13.719 | 30.34 |
| 2/23/00 | 15:16:36 | 0.1633 | 0.008 | 13.026 | 30.34 |
| 2/23/00 | 15:16:37 | 0.1797 | 0.012 | 12.353 | 30.34 |
| 2/23/00 | 15:16:38 | 0.196 | 0.012 | 11.708 | 30.34 |
| 2/23/00 | 15:16:39 | 0.2123 | 0.012 | 11.094 | 30.34 |
| 2/23/00 | 15:16:40 | 0.2287 | 0.008 | 10.509 | 30.34 |
| 2/23/00 | 15:16:41 | 0.245 | 0.008 | 9.964 | 30.34 |
| 2/23/00 | 15:16:42 | 0.2613 | 0.008 | 9.438 | 30.34 |
| 2/23/00 | 15:16:43 | 0.2777 | 0.008 | 8.944 | 30.34 |
| 2/23/00 | 15:16:44 | 0.294 | 0.008 | 8.481 | 30.343 |
| 2/23/00 | 15:16:45 | 0.3103 | 0.008 | 8.043 | 30.338 |
| 2/23/00 | 15:16:46 | 0.3267 | 0.008 | 7.626 | 30.34 |
| 2/23/00 | 15:16:47 | 0.3433 | 0.008 | 7.201 | 30.338 |
| 2/23/00 | 15:16:48 | 0.361 | -0.001 | 6.817 | 30.338 |
| 2/23/00 | 15:16:49 | 0.3797 | 0.008 | 6.434 | 30.34 |
| 2/23/00 | 15:16:50 | 0.3995 | -0.001 | 6.037 | 30.338 |
| 2/23/00 | 15:16:52 | 0.4205 | 0.004 | 5.65 | 30.338 |
| 2/23/00 | 15:16:53 | 0.4427 | -0.001 | 5.264 | 30.336 |
| 2/23/00 | 15:16:54 | 0.4662 | -0.001 | 4.883 | 30.34 |
| 2/23/00 | 15:16:56 | 0.491 | -0.001 | 4.507 | 30.338 |
| 2/23/00 | 15:16:58 | 0.5173 | -0.001 | 4.133 | 30.34 |
| 2/23/00 | 15:16:59 | 0.5453 | -0.001 | 3.77 | 30.34 |
| 2/23/00 | 15:17:01 | 0.575 | -0.001 | 3.415 | 30.338 |
| 2/23/00 | 15:17:03 | 0.6063 | -0.001 | 3.213 | 30.34 |
| 2/23/00 | 15:17:05 | 0.6395 | -0.005 | 2.714 | 30.34 |
| 2/23/00 | 15:17:07 | 0.6747 | -0.001 | 2.389 | 30.338 |
| 2/23/00 | 15:17:09 | 0.712 | -0.001 | 2.088 | 30.34 |
| 2/23/00 | 15:17:12 | 0.7515 | -0.005 | 1.807 | 30.34 |
| **Report from file:** | **C:\WINSITU\3AGW1.BIN** | | | | |
| | | | **Chan[1]** | **Chan[3]** | **Chan[0]** |
| **Date** | **Time** | **ET (min)** | **Feet $H_2O$** | **Feet $H_2O$** | **Inches Hg** |
| --- | --- | --- | --- | --- | --- |
| 2/23/00 | 15:17:14 | 0.7933 | -0.005 | 1.548 | 30.338 |
| 2/23/00 | 15:17:17 | 0.8377 | -0.001 | 1.314 | 30.34 |
| 2/23/00 | 15:17:20 | 0.8847 | -0.005 | 1.103 | 30.34 |
| 2/23/00 | 15:17:23 | 0.9345 | -0.001 | 0.912 | 30.338 |
| 2/23/00 | 15:17:26 | 0.9872 | -0.001 | 0.748 | 30.338 |

**Table C-1.** Raw Data Obtained from Slug Test of 3AS3-GW1(Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 | 15:17:29 | 1.043 | -0.001 | 0.606 | 30.338 |
| 2/23/00 | 15:17:33 | 1.1022 | -0.005 | 0.484 | 30.338 |
| 2/23/00 | 15:17:36 | 1.1648 | -0.005 | 0.38 | 30.34 |
| 2/23/00 | 15:17:40 | 1.2312 | -0.005 | 0.298 | 30.338 |
| 2/23/00 | 15:17:45 | 1.3015 | -0.001 | 0.23 | 30.338 |
| 2/23/00 | 15:17:49 | 1.376 | -0.005 | 0.176 | 30.336 |
| 2/23/00 | 15:17:54 | 1.455 | -0.001 | 0.131 | 30.34 |
| 2/23/00 | 15:17:59 | 1.5387 | -0.001 | 0.1 | 30.338 |
| 2/23/00 | 15:18:04 | 1.6272 | -0.001 | 0.075 | 30.338 |
| 2/23/00 | 15:18:10 | 1.721 | -0.001 | 0.057 | 30.336 |
| 2/23/00 | 15:18:16 | 1.8203 | -0.005 | 0.045 | 30.336 |
| 2/23/00 | 15:18:22 | 1.9257 | -0.001 | 0.036 | 30.338 |
| 2/23/00 | 15:18:29 | 2.0372 | -0.001 | 0.027 | 30.338 |
| 2/23/00 | 15:18:36 | 2.1553 | -0.005 | 0.021 | 30.338 |
| 2/23/00 | 15:18:43 | 2.2805 | -0.005 | 0.017 | 30.338 |
| 2/23/00 | 15:18:51 | 2.413 | -0.001 | 0.014 | 30.34 |
| 2/23/00 | 15:19:00 | 2.5535 | -0.005 | 0.012 | 30.338 |
| 2/23/00 | 15:19:09 | 2.7023 | -0.001 | 0.01 | 30.338 |
| 2/23/00 | 15:19:18 | 2.8598 | -0.005 | 0.01 | 30.338 |
| 2/23/00 | 15:19:28 | 3.0265 | -0.001 | 0.01 | 30.338 |
| 2/23/00 | 15:19:38 | 3.1932 | -0.001 | 0.01 | 30.338 |
| 2/23/00 | 15:19:48 | 3.3598 | -0.001 | 0.012 | 30.336 |
| 2/23/00 | 15:19:58 | 3.5265 | -0.001 | 0.012 | 30.338 |
| 2/23/00 | 15:20:08 | 3.6932 | -0.001 | 0.01 | 30.34 |
| 2/23/00 | 15:20:18 | 3.8598 | -0.001 | 0.012 | 30.34 |
| 2/23/00 | 15:20:28 | 4.0265 | -0.001 | 0.012 | 30.338 |
| 2/23/00 | 15:20:38 | 4.1932 | -0.001 | 0.014 | 30.338 |
| 2/23/00 | 15:20:48 | 4.3598 | -0.001 | 0.012 | 30.34 |
| 2/23/00 | 15:20:58 | 4.5265 | -0.001 | 0.01 | 30.34 |
| 2/23/00 | 15:21:08 | 4.6932 | -0.001 | 0.008 | 30.338 |
| 2/23/00 | 15:21:18 | 4.8598 | -0.001 | 0.008 | 30.34 |
| 2/23/00 | 15:21:28 | 5.0265 | 0.004 | 0.01 | 30.343 |
| 2/23/00 | 15:21:38 | 5.1932 | -0.001 | 0.006 | 30.338 |
| 2/23/00 | 15:21:48 | 5.3598 | -0.001 | 0.004 | 30.34 |
| 2/23/00 | 15:21:58 | 5.5265 | -0.001 | 0.004 | 30.34 |
| 2/23/00 | 15:22:08 | 5.6932 | -0.001 | 0.004 | 30.34 |
| 2/23/00 | 15:22:18 | 5.8598 | -0.001 | 0.004 | 30.338 |
| 2/23/00 | 15:22:28 | 6.0265 | 0.004 | 0.01 | 30.338 |
| 2/23/00 | 15:22:38 | 6.1932 | 0.004 | 0.01 | 30.34 |
| 2/23/00 | 15:22:48 | 6.3598 | 0.004 | 0.012 | 30.336 |
| 2/23/00 | 15:22:58 | 6.5265 | 0.008 | 0.014 | 30.34 |
| 2/23/00 | 15:23:08 | 6.6932 | 0.004 | 0.01 | 30.34 |
| 2/23/00 | 15:23:18 | 6.8598 | 0.004 | 0.006 | 30.34 |
| | | | | | |
| **Report from file:** | **C:\WINSITU\3AGW1.BIN** | | | | |
| | | | **Chan[1]** | **Chan[3]** | **Chan[0]** |
| **Date** | **Time** | **ET (min)** | **Feet $H_2O$** | **Feet $H_2O$** | **Inches Hg** |
| 2/23/00 | 15:23:28 | 7.0265 | 0.004 | 0.006 | 30.336 |
| 2/23/00 | 15:23:38 | 7.1932 | 0.004 | 0.004 | 30.336 |
| 2/23/00 | 15:23:48 | 7.3598 | 0.004 | 0.004 | 30.336 |
| 2/23/00 | 15:23:58 | 7.5265 | 0.004 | 0.006 | 30.338 |
| 2/23/00 | 15:24:08 | 7.6932 | 0.004 | 0.008 | 30.336 |

**Table C-1.** Raw Data Obtained from Slug Test of 3AS3-GW1(Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 | 15:24:18 | 7.8598 | 0.004 | 0.006 | 30.334 |
| 2/23/00 | 15:24:28 | 8.0265 | 0.004 | 0.008 | 30.336 |
| 2/23/00 | 15:24:38 | 8.1932 | 0.008 | 0.01 | 30.334 |
| 2/23/00 | 15:24:48 | 8.3598 | 0.008 | 0.008 | 30.332 |
| 2/23/00 | 15:24:58 | 8.5265 | 0.008 | 0.006 | 30.334 |
| 2/23/00 | 15:25:08 | 8.6932 | 0.004 | 0.01 | 30.336 |
| 2/23/00 | 15:25:18 | 8.8598 | 0.004 | 0.008 | 30.334 |
| 2/23/00 | 15:25:28 | 9.0265 | 0.004 | 0.01 | 30.334 |
| 2/23/00 | 15:25:38 | 9.1932 | 0.008 | 0.01 | 30.332 |
| 2/23/00 | 15:25:48 | 9.3598 | 0.008 | 0.01 | 30.334 |
| 2/23/00 | 15:25:58 | 9.5265 | 0.004 | 0.01 | 30.336 |
| 2/23/00 | 15:26:08 | 9.6932 | 0.012 | 0.01 | 30.334 |

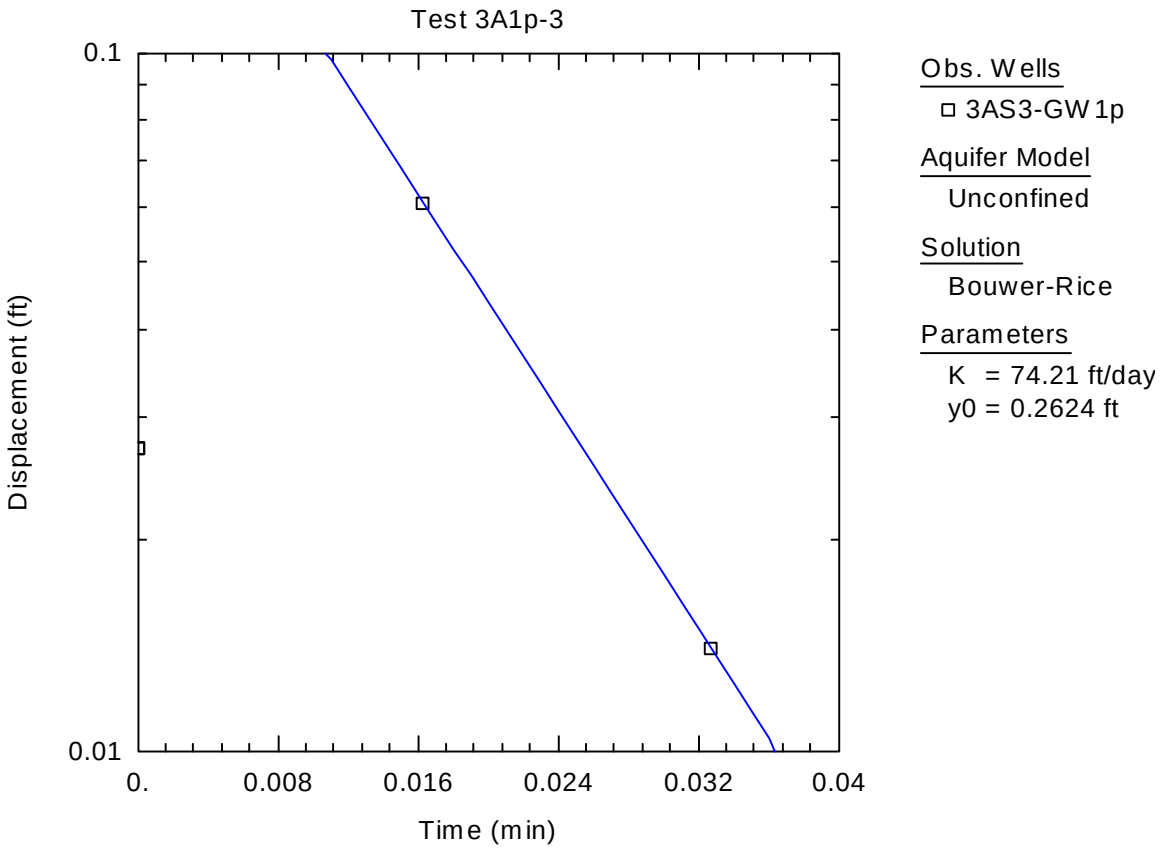



**Figure C-3.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW1p, Bouwer-Rice Solution

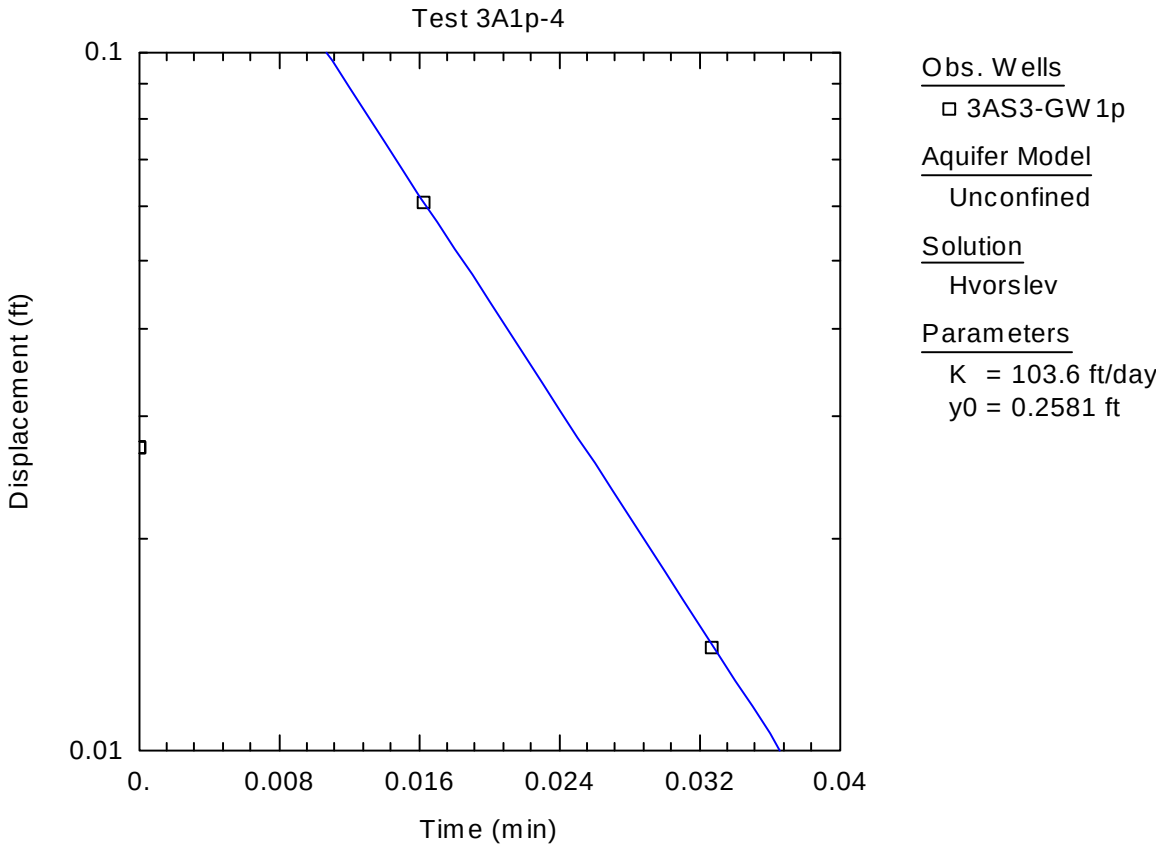



**Figure C-4.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW1p, Hvorslev Solution

**Table C-2.** Raw Data Obtained from Slug Test of 3AS3-GW1p

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:03:01 | | | |
| Report from file: | C:\WINSITU\3AGW1P.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW1P | | | |
| Test defined on: | 2/23/00 | 15:48:14 | | | |
| Test started on: | 2/23/00 | 15:51:09 | | | |
| Test stopped on: | 2/23/00 | 15:53:44 | | | |
| Test extracted on: | 2/25/00 | 10:58:16 | | | |
| Data gathered using logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667 minutes. | | | | |
| TOTAL DATA SAMPLES | 59 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 6.689 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.61 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |

**Table C-2.** Raw Data Obtained from Slug Test of 3AS3-GW1p (Continued)

| Report from file: | C:\WINSITU\3AGW1P.BIN | | | | |
|---|---|---|---|---|---|
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 15:51 | 0 | 0.027 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.0163 | 0.061 | 0.009 | 30.336 | |
| 2/23/00 15:51 | 0.0327 | 0.014 | 0.009 | 30.336 | |
| 2/23/00 15:51 | 0.049 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.0653 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.0817 | -0.008 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.098 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.1143 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.1307 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.147 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.1633 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.1797 | -0.012 | 0.009 | 30.336 | |
| 2/23/00 15:51 | 0.196 | -0.012 | 0.007 | 30.334 | |
| 2/23/00 15:51 | 0.2123 | -0.012 | 0.011 | 30.334 | |
| 2/23/00 15:51 | 0.2287 | -0.008 | 0.011 | 30.334 | |
| 2/23/00 15:51 | 0.245 | -0.012 | 0.011 | 30.334 | |
| 2/23/00 15:51 | 0.2613 | -0.008 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.2777 | -0.008 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.294 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.3103 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.3267 | -0.008 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.3433 | -0.012 | 0.009 | 30.33 | |
| 2/23/00 15:51 | 0.361 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.3797 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.3995 | -0.008 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.4205 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.4427 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.4662 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.491 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.5173 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:51 | 0.5453 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.575 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:51 | 0.6063 | -0.012 | 0.011 | 30.334 | |
| 2/23/00 15:51 | 0.6395 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:51 | 0.6747 | -0.012 | 0.013 | 30.334 | |
| 2/23/00 15:51 | 0.712 | -0.012 | 0.011 | 30.334 | |
| 2/23/00 15:51 | 0.7515 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:51 | 0.7933 | -0.012 | 0.011 | 30.334 | |
| 2/23/00 15:51 | 0.8377 | -0.012 | 0.011 | 30.334 | |
| Report from file: | C:\WINSITU\3AGW1P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 15:52 | 0.8847 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:52 | 0.9345 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:52 | 0.9872 | -0.012 | 0.009 | 30.334 | |
| 2/23/00 15:52 | 1.043 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:52 | 1.1022 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:52 | 1.1648 | -0.012 | 0.013 | 30.332 | |

**Table C-2.** Raw Data Obtained from Slug Test of 3AS3-GW1p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 15:52 | 1.2312 | -0.012 | 0.013 | 30.332 | |
| 2/23/00 15:52 | 1.3015 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:52 | 1.376 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:52 | 1.455 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:52 | 1.5387 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:52 | 1.6272 | -0.012 | 0.009 | 30.33 | |
| 2/23/00 15:52 | 1.721 | -0.012 | 0.009 | 30.332 | |
| 2/23/00 15:52 | 1.8203 | -0.012 | 0.011 | 30.33 | |
| 2/23/00 15:53 | 1.9257 | -0.012 | 0.011 | 30.328 | |
| 2/23/00 15:53 | 2.0372 | -0.012 | 0.011 | 30.33 | |
| 2/23/00 15:53 | 2.1553 | -0.012 | 0.011 | 30.332 | |
| 2/23/00 15:53 | 2.2805 | -0.012 | 0.009 | 30.33 | |
| 2/23/00 15:53 | 2.413 | -0.012 | 0.009 | 30.33 | |
| 2/23/00 15:53 | 2.5535 | -0.012 | 0.009 | 30.328 | |

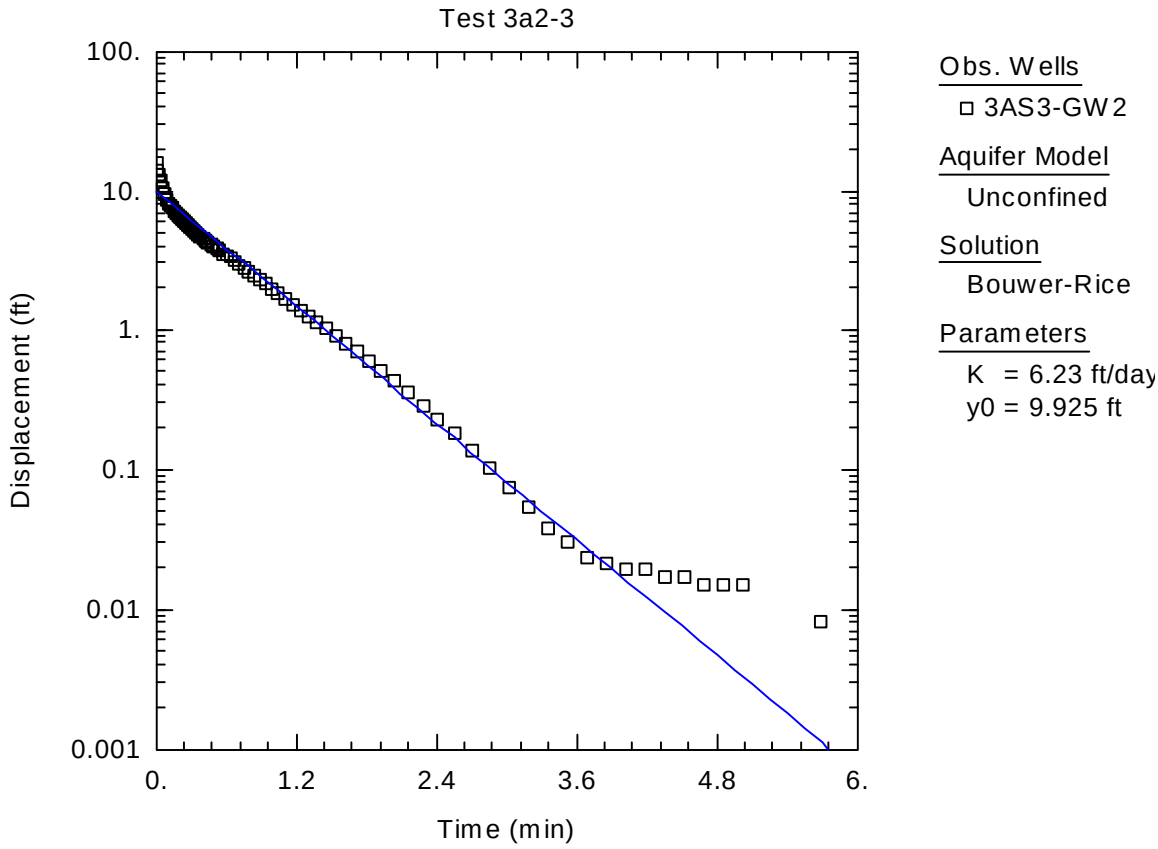



**Figure C-5.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW2, Bouwer-Rice Solution

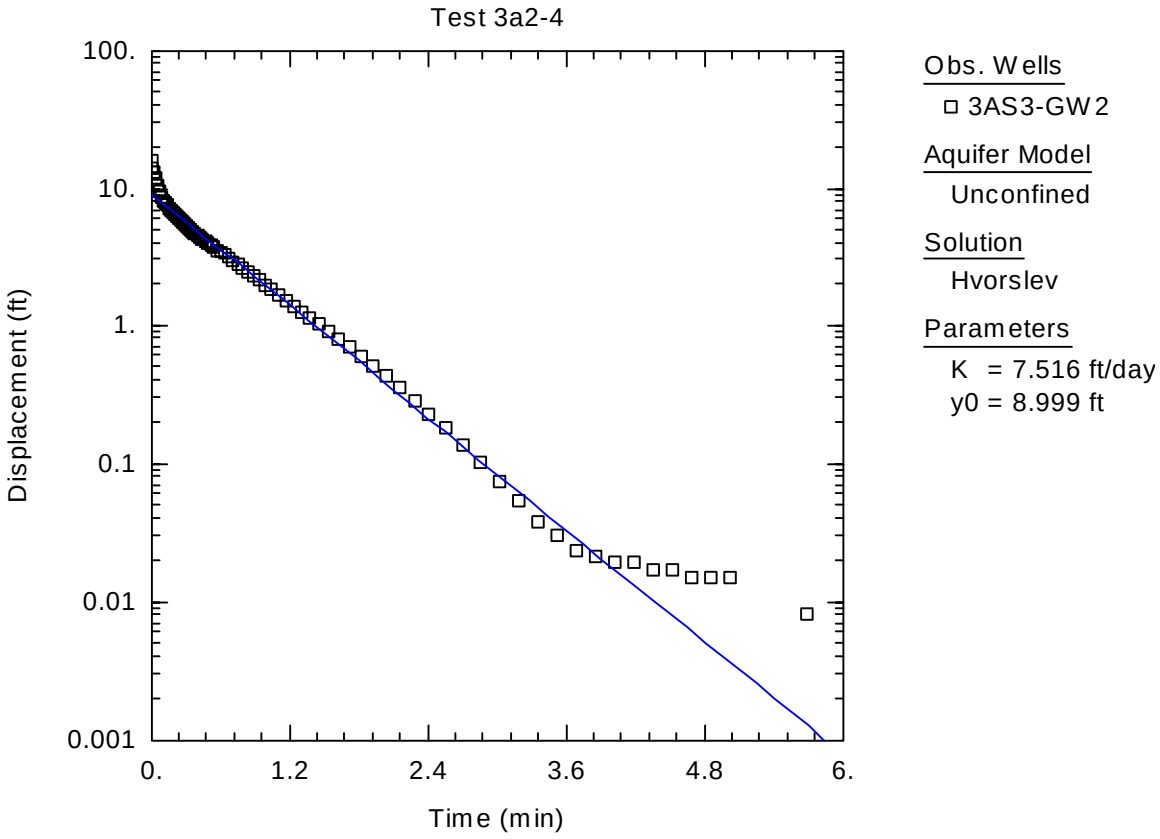



**Figure C-6.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW2, Hvorslev Solution

**Table C-3.** Raw Data Obtained from Slug Test of 3AS3-GW2

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:03:44 | | | |
| Report from file: | C:\WINSITU\3AGW2.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW2 | | | |
| Test defined on: | 2/23/00 | 16:32:54 | | | |
| Test started on: | 2/23/00 | 16:37:58 | | | |
| Test stopped on: | 2/23/00 | 16:46:01 | | | |
| Test extracted on: | 2/23/00 | 16:49:24 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667minutes. | | | | |
| TOTAL DATA SAMPLES | 92 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 6.537 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.458 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3AGW2.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 16:37 | 0 | 0.082 | 15.779 | 30.328 | |

**Table C-3.** Raw Data Obtained from Slug Test of 3AS3-GW2 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 16:37 | 0.0165 | 0.082 | 14.147 | 30.326 | |
| 2/23/00 16:37 | 0.033 | 0.082 | 13.217 | 30.326 | |
| 2/23/00 16:38 | 0.0495 | 0.082 | 11.748 | 30.328 | |
| 2/23/00 16:38 | 0.066 | 0.078 | 10.418 | 30.326 | |
| 2/23/00 16:38 | 0.0825 | 0.073 | 9.466 | 30.326 | |
| 2/23/00 16:38 | 0.099 | 0.065 | 8.787 | 30.324 | |
| 2/23/00 16:38 | 0.1155 | 0.06 | 8.253 | 30.324 | |
| 2/23/00 16:38 | 0.132 | 0.056 | 7.83 | 30.326 | |
| 2/23/00 16:38 | 0.1485 | 0.052 | 7.508 | 30.328 | |
| 2/23/00 16:38 | 0.165 | 0.048 | 7.205 | 30.324 | |
| 2/23/00 16:38 | 0.1815 | 0.043 | 6.928 | 30.326 | |
| 2/23/00 16:38 | 0.198 | 0.039 | 6.696 | 30.326 | |
| 2/23/00 16:38 | 0.2145 | 0.039 | 6.482 | 30.324 | |
| 2/23/00 16:38 | 0.231 | 0.035 | 6.258 | 30.326 | |
| 2/23/00 16:38 | 0.2475 | 0.03 | 6.061 | 30.326 | |
| 2/23/00 16:38 | 0.264 | 0.026 | 5.882 | 30.326 | |
| 2/23/00 16:38 | 0.2805 | 0.026 | 5.7 | 30.328 | |
| 2/23/00 16:38 | 0.297 | 0.026 | 5.536 | 30.328 | |
| 2/23/00 16:38 | 0.3135 | 0.022 | 5.349 | 30.326 | |
| 2/23/00 16:38 | 0.33 | 0.017 | 5.205 | 30.328 | |
| 2/23/00 16:38 | 0.3467 | 0.017 | 5.059 | 30.326 | |
| 2/23/00 16:38 | 0.3643 | 0.017 | 4.918 | 30.326 | |
| 2/23/00 16:38 | 0.383 | 0.013 | 4.784 | 30.326 | |
| 2/23/00 16:38 | 0.4028 | 0.013 | 4.634 | 30.326 | |
| 2/23/00 16:38 | 0.4238 | 0.009 | 4.473 | 30.326 | |
| 2/23/00 16:38 | 0.446 | 0.009 | 4.329 | 30.324 | |
| 2/23/00 16:38 | 0.4695 | 0.004 | 4.183 | 30.324 | |
| 2/23/00 16:38 | 0.4943 | 0.004 | 4.034 | 30.324 | |
| 2/23/00 16:38 | 0.5207 | 0.004 | 3.882 | 30.324 | |
| 2/23/00 16:38 | 0.5487 | 0 | 3.727 | 30.324 | |
| 2/23/00 16:38 | 0.5783 | 0 | 3.568 | 30.326 | |
| 2/23/00 16:38 | 0.6097 | 0 | 3.407 | 30.326 | |
| 2/23/00 16:38 | 0.6428 | 0 | 3.318 | 30.326 | |
| 2/23/00 16:38 | 0.678 | 0 | 3.075 | 30.326 | |
| 2/23/00 16:38 | 0.7153 | -0.004 | 2.908 | 30.326 | |
| 2/23/00 16:38 | 0.7548 | -0.004 | 2.742 | 30.326 | |
| 2/23/00 16:38 | 0.7967 | -0.004 | 2.577 | 30.326 | |
| 2/23/00 16:38 | 0.841 | -0.004 | 2.413 | 30.326 | |
| 2/23/00 16:38 | 0.888 | -0.004 | 2.25 | 30.328 | |
| Report from file: | C:\WINSITU\3AGW2.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 16:38 | 0.9378 | -0.004 | 2.088 | 30.326 | |
| 2/23/00 16:38 | 0.9905 | -0.008 | 1.931 | 30.326 | |
| 2/23/00 16:39 | 1.0463 | -0.008 | 1.781 | 30.324 | |
| 2/23/00 16:39 | 1.1055 | -0.008 | 1.633 | 30.326 | |
| 2/23/00 16:39 | 1.1682 | -0.008 | 1.495 | 30.326 | |
| 2/23/00 16:39 | 1.2345 | -0.008 | 1.364 | 30.324 | |
| 2/23/00 16:39 | 1.3048 | -0.008 | 1.243 | 30.324 | |
| 2/23/00 16:39 | 1.3793 | -0.008 | 1.125 | 30.328 | |
| 2/23/00 16:39 | 1.4583 | -0.008 | 1.009 | 30.326 | |
| 2/23/00 16:39 | 1.542 | -0.008 | 0.895 | 30.326 | |
| 2/23/00 16:39 | 1.6305 | -0.008 | 0.787 | 30.326 | |

**Table C-3.** Raw Data Obtained from Slug Test of 3AS3-GW2 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 16:39 | 1.7243 | -0.004 | 0.686 | 30.326 | |
| 2/23/00 16:39 | 1.8237 | -0.004 | 0.593 | 30.328 | |
| 2/23/00 16:39 | 1.929 | -0.004 | 0.505 | 30.326 | |
| 2/23/00 16:40 | 2.0405 | -0.004 | 0.423 | 30.326 | |
| 2/23/00 16:40 | 2.1587 | -0.004 | 0.35 | 30.326 | |
| 2/23/00 16:40 | 2.2838 | -0.004 | 0.284 | 30.328 | |
| 2/23/00 16:40 | 2.4163 | -0.008 | 0.223 | 30.324 | |
| 2/23/00 16:40 | 2.5568 | -0.008 | 0.178 | 30.324 | |
| 2/23/00 16:40 | 2.7057 | -0.008 | 0.135 | 30.326 | |
| 2/23/00 16:40 | 2.8632 | -0.008 | 0.101 | 30.324 | |
| 2/23/00 16:40 | 3.0298 | -0.004 | 0.073 | 30.324 | |
| 2/23/00 16:41 | 3.1965 | -0.004 | 0.053 | 30.324 | |
| 2/23/00 16:41 | 3.3632 | -0.004 | 0.038 | 30.322 | |
| 2/23/00 16:41 | 3.5298 | -0.004 | 0.03 | 30.322 | |
| 2/23/00 16:41 | 3.6965 | 0 | 0.023 | 30.322 | |
| 2/23/00 16:41 | 3.8632 | 0 | 0.021 | 30.326 | |
| 2/23/00 16:41 | 4.0298 | 0 | 0.019 | 30.322 | |
| 2/23/00 16:42 | 4.1965 | -0.004 | 0.019 | 30.324 | |
| 2/23/00 16:42 | 4.3632 | 0 | 0.017 | 30.324 | |
| 2/23/00 16:42 | 4.5298 | 0 | 0.017 | 30.324 | |
| 2/23/00 16:42 | 4.6965 | 0 | 0.015 | 30.324 | |
| 2/23/00 16:42 | 4.8632 | 0 | 0.015 | 30.322 | |
| 2/23/00 16:42 | 5.0298 | 0 | 0.015 | 30.322 | |
| 2/23/00 16:43 | 5.1965 | 0 | 0.01 | 30.322 | |
| 2/23/00 16:43 | 5.3632 | 0 | 0.01 | 30.322 | |
| 2/23/00 16:43 | 5.5298 | 0 | 0.01 | 30.322 | |
| 2/23/00 16:43 | 5.6965 | -0.004 | 0.008 | 30.32 | |
| 2/23/00 16:43 | 5.8632 | 0 | 0.008 | 30.322 | |
| 2/23/00 16:43 | 6.0298 | 0 | 0.012 | 30.32 | |
| 2/23/00 16:44 | 6.1965 | 0 | 0.008 | 30.32 | |
| 2/23/00 16:44 | 6.3632 | -0.008 | 0.012 | 30.32 | |
| 2/23/00 16:44 | 6.5298 | 0 | 0.012 | 30.322 | |
| 2/23/00 16:44 | 6.6965 | 0 | 0.008 | 30.322 | |
| 2/23/00 16:44 | 6.8632 | 0.004 | 0.012 | 30.32 | |
| 2/23/00 16:44 | 7.0298 | 0.004 | 0.012 | 30.322 | |
| 2/23/00 16:45 | 7.1965 | 0.004 | 0.015 | 30.322 | |
| 2/23/00 16:45 | 7.3632 | 0.004 | 0.015 | 30.32 | |
| Report from file: | C:\WINSITU\3AGW2.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 16:45 | 7.5298 | 0.004 | 0.015 | 30.322 | |
| 2/23/00 16:45 | 7.6965 | 0.004 | 0.015 | 30.322 | |
| 2/23/00 16:45 | 7.8632 | 0.009 | 0.015 | 30.322 | |
| 2/23/00 16:45 | 8.0298 | 0.009 | 0.015 | 30.322 | |

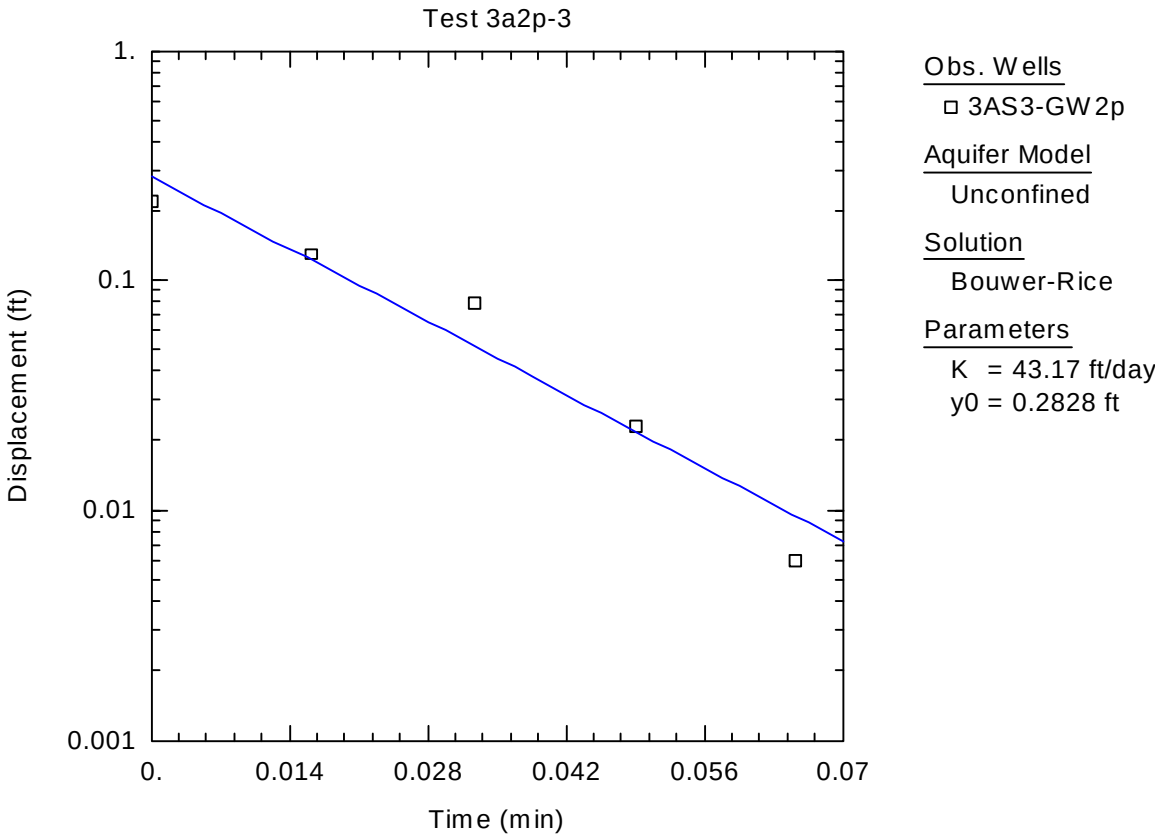



**Figure C-7.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW2p, Bouwer-Rice Solution

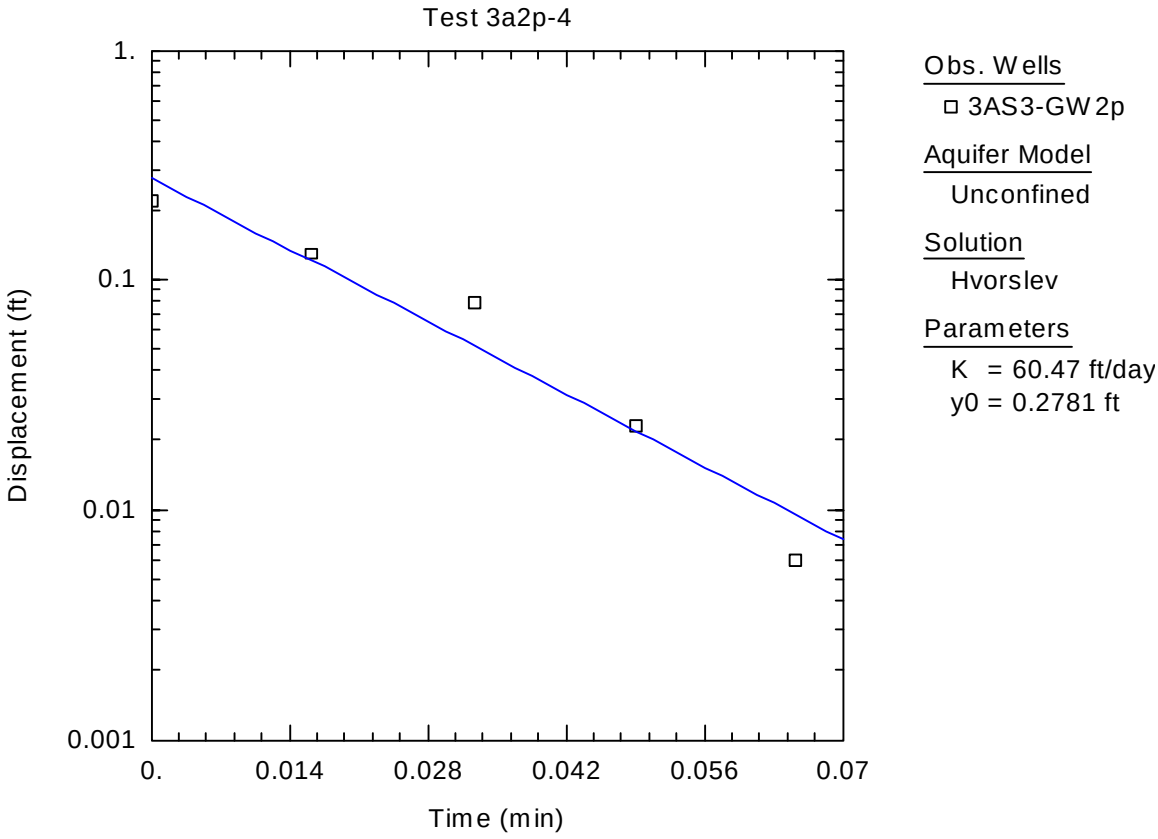



**Figure C-8.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW2p, Hvorslev Solution

**Table C-4.** Raw Data Obtained from Slug Test of 3AS3-GW2p

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:04:34 | | | |
| Report from file: | C:\WINSITU\3AGW2P.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW2P | | | |
| Test defined on: | 2/23/00 | 17:01:40 | | | |
| Test started on: | 2/23/00 | 17:04:31 | | | |
| Test stopped on: | 2/23/00 | 17:08:02 | | | |
| Test extracted on: | 2/25/00 | 10:59:34 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667 minutes. | | | | |
| TOTAL DATA SAMPLES | 64 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 6.517 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.44 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3AGW2P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 17:04 | 0 | 0.221 | 0 | 30.32 | |
| 2/23/00 17:04 | 0.0163 | 0.13 | 0 | 30.32 | |

**Table C-4.** Raw Data Obtained from Slug Test of 3AS3-GW2p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 17:04 | 0.0327 | 0.079 | 0 | 30.32 | |
| 2/23/00 17:04 | 0.049 | 0.023 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.0653 | 0.006 | 0 | 30.32 | |
| 2/23/00 17:04 | 0.0817 | -0.003 | -0.002 | 30.318 | |
| 2/23/00 17:04 | 0.098 | -0.007 | -0.002 | 30.318 | |
| 2/23/00 17:04 | 0.1143 | -0.003 | 0 | 30.32 | |
| 2/23/00 17:04 | 0.1307 | -0.007 | -0.002 | 30.318 | |
| 2/23/00 17:04 | 0.147 | -0.007 | -0.002 | 30.318 | |
| 2/23/00 17:04 | 0.1633 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.1797 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.196 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.2123 | -0.007 | -0.002 | 30.318 | |
| 2/23/00 17:04 | 0.2287 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.245 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.2613 | -0.012 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.2777 | -0.007 | -0.002 | 30.324 | |
| 2/23/00 17:04 | 0.294 | -0.007 | -0.002 | 30.318 | |
| 2/23/00 17:04 | 0.3103 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.3267 | -0.012 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.3433 | -0.012 | -0.006 | 30.32 | |
| 2/23/00 17:04 | 0.361 | -0.012 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.3797 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:04 | 0.3995 | -0.012 | -0.006 | 30.32 | |
| 2/23/00 17:04 | 0.4205 | -0.012 | -0.006 | 30.32 | |
| 2/23/00 17:04 | 0.4427 | -0.007 | -0.006 | 30.32 | |
| 2/23/00 17:04 | 0.4662 | -0.007 | -0.006 | 30.32 | |
| 2/23/00 17:05 | 0.491 | -0.012 | -0.006 | 30.318 | |
| 2/23/00 17:05 | 0.5173 | -0.007 | -0.006 | 30.32 | |
| 2/23/00 17:05 | 0.5453 | -0.012 | -0.002 | 30.32 | |
| 2/23/00 17:05 | 0.575 | -0.012 | -0.006 | 30.322 | |
| 2/23/00 17:05 | 0.6063 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 0.6395 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 0.6747 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 0.712 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 0.7515 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 0.7933 | -0.012 | -0.002 | 30.318 | |
| Report from file: | C:\WINSITU\3AGW2P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/23/00 17:05 | 0.8377 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 0.8847 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 0.9345 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 0.9872 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 1.043 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 1.1022 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 1.1648 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:05 | 1.2312 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 1.3015 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 1.376 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:05 | 1.455 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:06 | 1.5387 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:06 | 1.6272 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:06 | 1.721 | -0.007 | 0 | 30.32 | |

**Table C-4.** Raw Data Obtained from Slug Test of 3AS3-GW2p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/23/00 17:06 | 1.8203 | -0.012 | 0 | 30.318 | |
| 2/23/00 17:06 | 1.9257 | -0.012 | 0 | 30.32 | |
| 2/23/00 17:06 | 2.0372 | -0.012 | -0.002 | 30.316 | |
| 2/23/00 17:06 | 2.1553 | -0.007 | -0.002 | 30.316 | |
| 2/23/00 17:06 | 2.2805 | -0.012 | -0.002 | 30.318 | |
| 2/23/00 17:06 | 2.413 | -0.007 | -0.002 | 30.32 | |
| 2/23/00 17:07 | 2.5535 | -0.012 | -0.002 | 30.318 | |
| 2/23/00 17:07 | 2.7023 | -0.012 | -0.002 | 30.318 | |
| 2/23/00 17:07 | 2.8598 | -0.012 | -0.002 | 30.316 | |
| 2/23/00 17:07 | 3.0265 | -0.007 | -0.004 | 30.316 | |
| 2/23/00 17:07 | 3.1932 | -0.012 | -0.002 | 30.316 | |
| 2/23/00 17:07 | 3.3598 | -0.012 | -0.002 | 30.316 | |

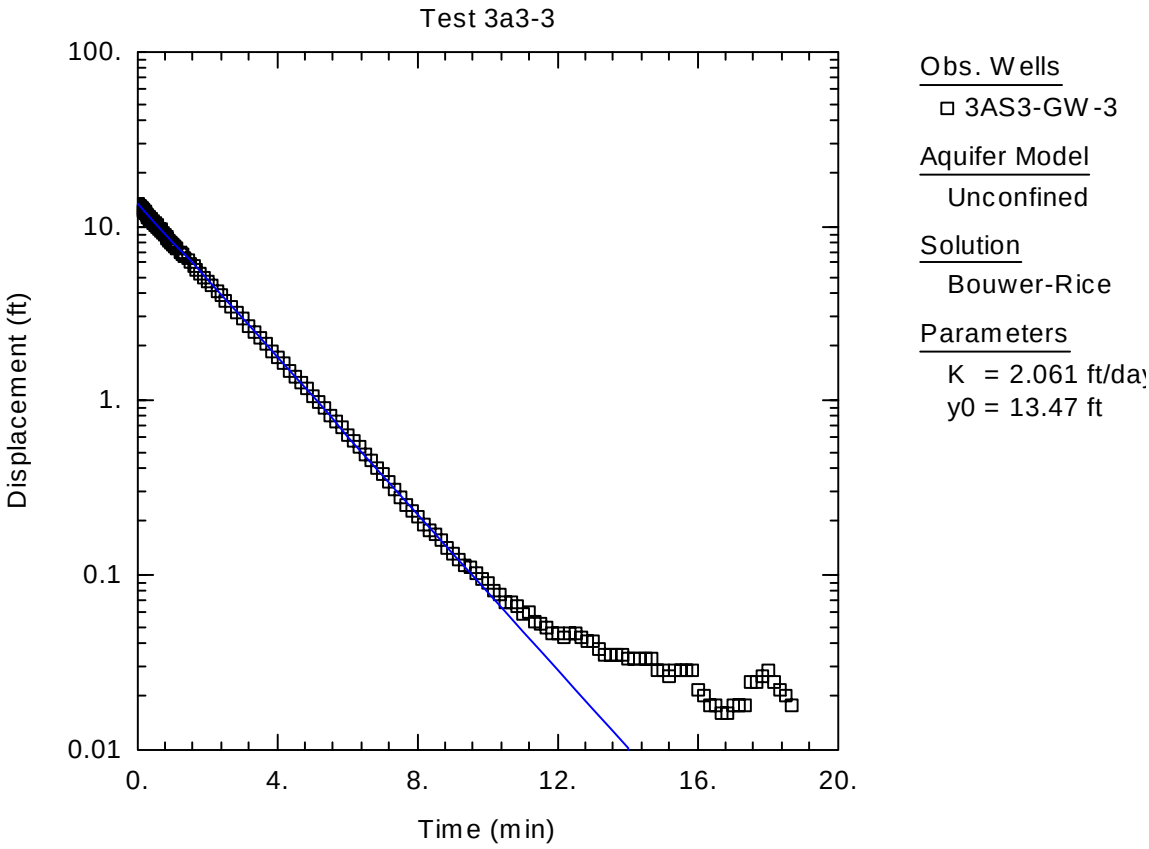



**Figure C-9.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW3, Bouwer-Rice Solution

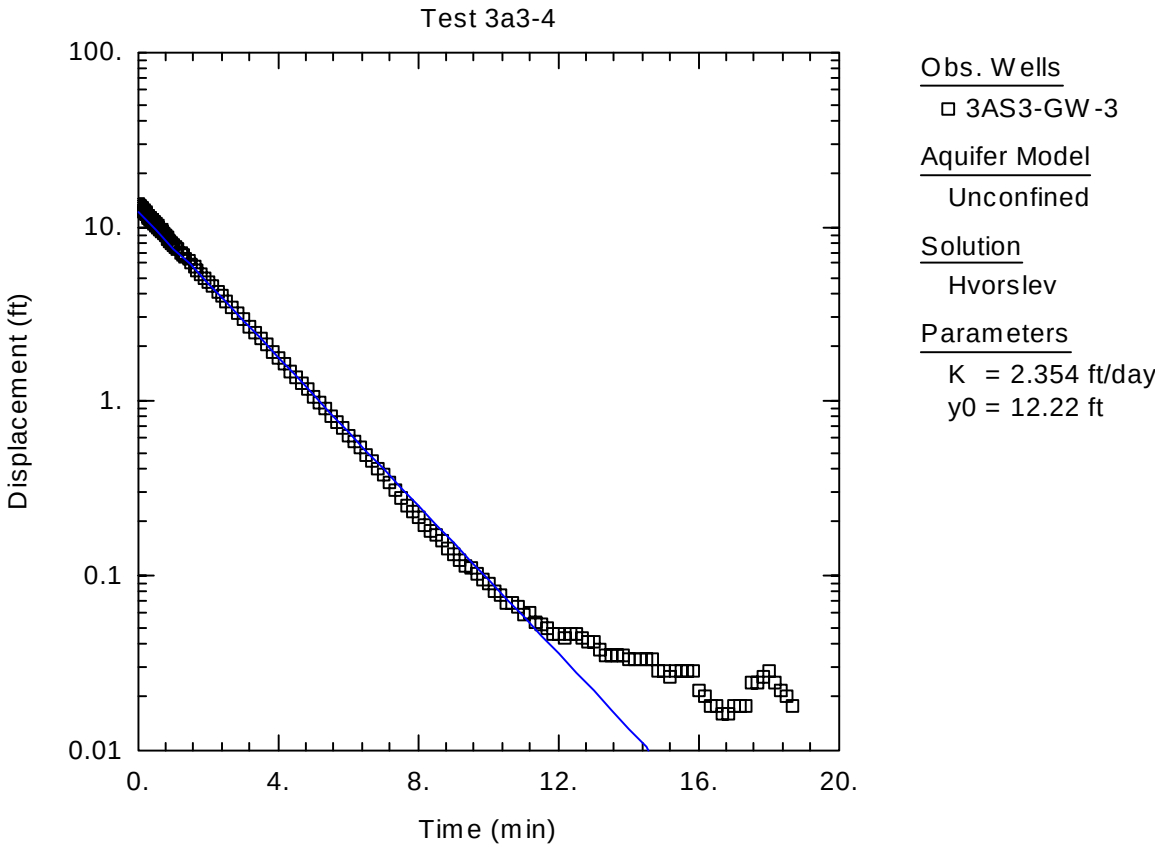



**Figure C-10.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW3, Hvorslev Solution

**Table C-5.** Raw Data Obtained from Slug Test of 3AS3-GW3

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:05:20 | | | |
| Report from file: | C:\WINSITU\3AGW3.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW3 | | | |
| Test defined on: | 2/24/00 | 13:23:43 | | | |
| Test started on: | 2/24/00 | 13:29:13 | | | |
| Test stopped on: | 2/24/00 | 13:47:59 | | | |
| Test extracted on: | 2/25/00 | 11:03:03 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667minutes. | | | | |
| TOTAL DATA SAMPLES | 156 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 6.848 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.954 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3AGW3.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 13:29 | 0 | 0.01 | 13.552 | 30.334 | |
| 2/24/00 13:29 | 0.0163 | 0.01 | 13.402 | 30.332 | |

**Table C-5.** Raw Data Obtained from Slug Test of 3AS3-GW3 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 13:29 | 0.0327 | -0.003 | 13.31 | 30.334 | |
| 2/24/00 13:29 | 0.049 | 0.006 | 13.196 | 30.332 | |
| 2/24/00 13:29 | 0.0653 | -0.003 | 13.072 | 30.334 | |
| 2/24/00 13:29 | 0.0817 | 0.006 | 12.954 | 30.33 | |
| 2/24/00 13:29 | 0.098 | -0.003 | 12.838 | 30.334 | |
| 2/24/00 13:29 | 0.1143 | -0.003 | 12.729 | 30.334 | |
| 2/24/00 13:29 | 0.1307 | 0.006 | 12.615 | 30.334 | |
| 2/24/00 13:29 | 0.147 | -0.003 | 12.51 | 30.332 | |
| 2/24/00 13:29 | 0.1633 | -0.003 | 12.398 | 30.332 | |
| 2/24/00 13:29 | 0.1797 | -0.003 | 12.293 | 30.332 | |
| 2/24/00 13:29 | 0.196 | -0.003 | 12.182 | 30.332 | |
| 2/24/00 13:29 | 0.2123 | -0.003 | 12.081 | 30.332 | |
| 2/24/00 13:29 | 0.2287 | -0.007 | 11.974 | 30.332 | |
| 2/24/00 13:29 | 0.245 | -0.003 | 11.869 | 30.332 | |
| 2/24/00 13:29 | 0.2613 | -0.007 | 11.764 | 30.332 | |
| 2/24/00 13:29 | 0.2777 | -0.003 | 11.663 | 30.334 | |
| 2/24/00 13:29 | 0.294 | -0.003 | 11.56 | 30.332 | |
| 2/24/00 13:29 | 0.3103 | -0.007 | 11.459 | 30.334 | |
| 2/24/00 13:29 | 0.3267 | -0.007 | 11.36 | 30.332 | |
| 2/24/00 13:29 | 0.3433 | -0.012 | 11.253 | 30.334 | |
| 2/24/00 13:29 | 0.361 | -0.007 | 11.157 | 30.332 | |
| 2/24/00 13:29 | 0.3797 | -0.012 | 11.052 | 30.33 | |
| 2/24/00 13:29 | 0.3995 | -0.007 | 10.94 | 30.332 | |
| 2/24/00 13:29 | 0.4205 | -0.007 | 10.824 | 30.332 | |
| 2/24/00 13:29 | 0.4427 | -0.012 | 10.706 | 30.332 | |
| 2/24/00 13:29 | 0.4662 | -0.007 | 10.577 | 30.334 | |
| 2/24/00 13:29 | 0.491 | -0.007 | 10.447 | 30.332 | |
| 2/24/00 13:29 | 0.5173 | -0.003 | 10.311 | 30.332 | |
| 2/24/00 13:29 | 0.5453 | -0.003 | 10.168 | 30.332 | |
| 2/24/00 13:29 | 0.575 | -0.007 | 10.022 | 30.332 | |
| 2/24/00 13:29 | 0.6063 | -0.007 | 9.925 | 30.332 | |
| 2/24/00 13:29 | 0.6395 | -0.007 | 9.68 | 30.334 | |
| 2/24/00 13:29 | 0.6747 | -0.007 | 9.505 | 30.334 | |
| 2/24/00 13:29 | 0.712 | -0.007 | 9.322 | 30.334 | |
| 2/24/00 13:29 | 0.7515 | -0.007 | 9.133 | 30.334 | |
| 2/24/00 13:30 | 0.7933 | -0.007 | 8.938 | 30.332 | |
| 2/24/00 13:30 | 0.8377 | -0.007 | 8.732 | 30.332 | |
| Report from file: | C:\WINSITU\3AGW3.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 13:30 | 0.8847 | -0.007 | 8.521 | 30.332 | |
| 2/24/00 13:30 | 0.9345 | -0.007 | 8.3 | 30.332 | |
| 2/24/00 13:30 | 0.9872 | -0.007 | 8.079 | 30.33 | |
| 2/24/00 13:30 | 1.043 | -0.003 | 7.852 | 30.332 | |
| 2/24/00 13:30 | 1.1022 | -0.003 | 7.613 | 30.332 | |
| 2/24/00 13:30 | 1.1648 | -0.003 | 7.371 | 30.33 | |
| 2/24/00 13:30 | 1.2312 | -0.003 | 7.121 | 30.332 | |
| 2/24/00 13:30 | 1.3015 | -0.003 | 6.87 | 30.332 | |
| 2/24/00 13:30 | 1.376 | -0.007 | 6.612 | 30.332 | |
| 2/24/00 13:30 | 1.455 | -0.003 | 6.346 | 30.328 | |
| 2/24/00 13:30 | 1.5387 | -0.003 | 6.08 | 30.33 | |
| 2/24/00 13:30 | 1.6272 | 0.001 | 5.811 | 30.33 | |
| 2/24/00 13:30 | 1.721 | -0.003 | 5.54 | 30.33 | |

**Table C-5.** Raw Data Obtained from Slug Test of 3AS3-GW3 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 13:31 | 1.8203 | 0.001 | 5.267 | 30.332 | |
| 2/24/00 13:31 | 1.9257 | -0.003 | 4.992 | 30.33 | |
| 2/24/00 13:31 | 2.0372 | 0.001 | 4.715 | 30.33 | |
| 2/24/00 13:31 | 2.1553 | -0.003 | 4.442 | 30.328 | |
| 2/24/00 13:31 | 2.2805 | 0.001 | 4.169 | 30.328 | |
| 2/24/00 13:31 | 2.413 | 0.001 | 3.9 | 30.328 | |
| 2/24/00 13:31 | 2.5535 | 0.001 | 3.636 | 30.328 | |
| 2/24/00 13:31 | 2.7023 | 0.001 | 3.376 | 30.328 | |
| 2/24/00 13:32 | 2.8598 | -0.003 | 3.116 | 30.326 | |
| 2/24/00 13:32 | 3.0265 | 0.01 | 2.866 | 30.328 | |
| 2/24/00 13:32 | 3.1932 | 0.001 | 2.623 | 30.326 | |
| 2/24/00 13:32 | 3.3598 | 0.001 | 2.415 | 30.328 | |
| 2/24/00 13:32 | 3.5265 | -0.003 | 2.221 | 30.328 | |
| 2/24/00 13:32 | 3.6932 | 0.001 | 2.047 | 30.324 | |
| 2/24/00 13:33 | 3.8598 | 0.001 | 1.879 | 30.324 | |
| 2/24/00 13:33 | 4.0265 | 0.001 | 1.728 | 30.324 | |
| 2/24/00 13:33 | 4.1932 | 0.001 | 1.591 | 30.322 | |
| 2/24/00 13:33 | 4.3598 | 0.006 | 1.462 | 30.326 | |
| 2/24/00 13:33 | 4.5265 | 0.006 | 1.345 | 30.326 | |
| 2/24/00 13:33 | 4.6932 | 0.001 | 1.236 | 30.324 | |
| 2/24/00 13:34 | 4.8598 | 0.006 | 1.137 | 30.326 | |
| 2/24/00 13:34 | 5.0265 | 0.006 | 1.044 | 30.324 | |
| 2/24/00 13:34 | 5.1932 | 0.006 | 0.962 | 30.322 | |
| 2/24/00 13:34 | 5.3598 | 0.006 | 0.883 | 30.324 | |
| 2/24/00 13:34 | 5.5265 | 0.006 | 0.812 | 30.324 | |
| 2/24/00 13:34 | 5.6932 | 0.006 | 0.745 | 30.322 | |
| 2/24/00 13:35 | 5.8598 | 0.006 | 0.685 | 30.32 | |
| 2/24/00 13:35 | 6.0265 | 0.006 | 0.627 | 30.324 | |
| 2/24/00 13:35 | 6.1932 | 0.01 | 0.577 | 30.322 | |
| 2/24/00 13:35 | 6.3598 | 0.01 | 0.53 | 30.318 | |
| 2/24/00 13:35 | 6.5265 | 0.01 | 0.483 | 30.32 | |
| 2/24/00 13:35 | 6.6932 | 0.01 | 0.446 | 30.322 | |
| 2/24/00 13:36 | 6.8598 | 0.01 | 0.405 | 30.318 | |
| 2/24/00 13:36 | 7.0265 | 0.006 | 0.371 | 30.32 | |
| 2/24/00 13:36 | 7.1932 | 0.006 | 0.336 | 30.32 | |
| Report from file: | C:\WINSITU\3AGW3.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 13:36 | 7.3598 | 0.006 | 0.304 | 30.318 | |
| 2/24/00 13:36 | 7.5265 | 0.006 | 0.276 | 30.318 | |
| 2/24/00 13:36 | 7.6932 | 0.01 | 0.25 | 30.318 | |
| 2/24/00 13:37 | 7.8598 | 0.006 | 0.231 | 30.32 | |
| 2/24/00 13:37 | 8.0265 | 0.01 | 0.211 | 30.318 | |
| 2/24/00 13:37 | 8.1932 | 0.014 | 0.194 | 30.316 | |
| 2/24/00 13:37 | 8.3598 | 0.01 | 0.179 | 30.318 | |
| 2/24/00 13:37 | 8.5265 | 0.014 | 0.168 | 30.318 | |
| 2/24/00 13:37 | 8.6932 | 0.01 | 0.155 | 30.316 | |
| 2/24/00 13:38 | 8.8598 | 0.014 | 0.14 | 30.318 | |
| 2/24/00 13:38 | 9.0265 | 0.014 | 0.132 | 30.316 | |
| 2/24/00 13:38 | 9.1932 | 0.014 | 0.121 | 30.316 | |
| 2/24/00 13:38 | 9.3598 | 0.014 | 0.112 | 30.316 | |
| 2/24/00 13:38 | 9.5265 | 0.014 | 0.108 | 30.314 | |
| 2/24/00 13:38 | 9.6932 | 0.014 | 0.102 | 30.314 | |

**Table C-5.** Raw Data Obtained from Slug Test of 3AS3-GW3 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 13:39 | 9.8598 | 0.018 | 0.093 | 30.314 | |
| 2/24/00 13:39 | 10.0265 | 0.014 | 0.089 | 30.314 | |
| 2/24/00 13:39 | 10.1932 | 0.014 | 0.08 | 30.314 | |
| 2/24/00 13:39 | 10.3598 | 0.014 | 0.076 | 30.314 | |
| 2/24/00 13:39 | 10.5265 | 0.018 | 0.069 | 30.312 | |
| 2/24/00 13:39 | 10.6932 | 0.018 | 0.069 | 30.314 | |
| 2/24/00 13:40 | 10.8598 | 0.014 | 0.065 | 30.314 | |
| 2/24/00 13:40 | 11.0265 | 0.018 | 0.059 | 30.314 | |
| 2/24/00 13:40 | 11.1932 | 0.018 | 0.061 | 30.312 | |
| 2/24/00 13:40 | 11.3598 | 0.018 | 0.054 | 30.312 | |
| 2/24/00 13:40 | 11.5265 | 0.014 | 0.052 | 30.314 | |
| 2/24/00 13:40 | 11.6932 | 0.014 | 0.05 | 30.31 | |
| 2/24/00 13:41 | 11.8598 | 0.014 | 0.046 | 30.31 | |
| 2/24/00 13:41 | 12.0265 | 0.018 | 0.046 | 30.312 | |
| 2/24/00 13:41 | 12.1932 | 0.014 | 0.044 | 30.312 | |
| 2/24/00 13:41 | 12.3598 | 0.018 | 0.046 | 30.308 | |
| 2/24/00 13:41 | 12.5265 | 0.014 | 0.046 | 30.31 | |
| 2/24/00 13:41 | 12.6932 | 0.018 | 0.044 | 30.308 | |
| 2/24/00 13:42 | 12.8598 | 0.018 | 0.041 | 30.31 | |
| 2/24/00 13:42 | 13.0265 | 0.018 | 0.041 | 30.308 | |
| 2/24/00 13:42 | 13.1932 | 0.023 | 0.037 | 30.304 | |
| 2/24/00 13:42 | 13.3598 | 0.023 | 0.035 | 30.304 | |
| 2/24/00 13:42 | 13.5265 | 0.018 | 0.035 | 30.314 | |
| 2/24/00 13:42 | 13.6932 | 0.018 | 0.035 | 30.316 | |
| 2/24/00 13:43 | 13.8598 | 0.018 | 0.035 | 30.314 | |
| 2/24/00 13:43 | 14.0265 | 0.018 | 0.033 | 30.312 | |
| 2/24/00 13:43 | 14.1932 | 0.018 | 0.033 | 30.308 | |
| 2/24/00 13:43 | 14.3598 | 0.018 | 0.033 | 30.308 | |
| 2/24/00 13:43 | 14.5265 | 0.023 | 0.033 | 30.306 | |
| 2/24/00 13:43 | 14.6932 | 0.018 | 0.033 | 30.306 | |
| 2/24/00 13:44 | 14.8598 | 0.018 | 0.028 | 30.306 | |
| 2/24/00 13:44 | 15.0265 | 0.023 | 0.028 | 30.306 | |
| 2/24/00 13:44 | 15.1932 | 0.018 | 0.026 | 30.306 | |
| Report from file: | C:\WINSITU\3AGW3.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 13:44 | 15.3598 | 0.023 | 0.028 | 30.306 | |
| 2/24/00 13:44 | 15.5265 | 0.023 | 0.028 | 30.304 | |
| 2/24/00 13:44 | 15.6932 | 0.023 | 0.028 | 30.302 | |
| 2/24/00 13:45 | 15.8598 | 0.023 | 0.028 | 30.302 | |
| 2/24/00 13:45 | 16.0265 | 0.018 | 0.022 | 30.3 | |
| 2/24/00 13:45 | 16.1932 | 0.014 | 0.02 | 30.302 | |
| 2/24/00 13:45 | 16.3598 | 0.018 | 0.018 | 30.302 | |
| 2/24/00 13:45 | 16.5265 | 0.018 | 0.018 | 30.3 | |
| 2/24/00 13:45 | 16.6932 | 0.018 | 0.016 | 30.298 | |
| 2/24/00 13:46 | 16.8598 | 0.018 | 0.016 | 30.3 | |
| 2/24/00 13:46 | 17.0265 | 0.018 | 0.018 | 30.3 | |
| 2/24/00 13:46 | 17.1932 | 0.018 | 0.018 | 30.302 | |
| 2/24/00 13:46 | 17.3598 | 0.023 | 0.018 | 30.3 | |
| 2/24/00 13:46 | 17.5265 | 0.027 | 0.024 | 30.3 | |
| 2/24/00 13:46 | 17.6932 | 0.027 | 0.024 | 30.3 | |
| 2/24/00 13:47 | 17.8598 | 0.027 | 0.026 | 30.3 | |
| 2/24/00 13:47 | 18.0265 | 0.027 | 0.028 | 30.298 | |

**Table C-5.** Raw Data Obtained from Slug Test of 3AS3-GW3 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 13:47 | 18.1932 | 0.023 | 0.024 | 30.298 | |
| 2/24/00 13:47 | 18.3598 | 0.027 | 0.022 | 30.296 | |
| 2/24/00 13:47 | 18.5265 | 0.023 | 0.02 | 30.296 | |
| 2/24/00 13:47 | 18.6932 | 0.023 | 0.018 | 30.298 | |

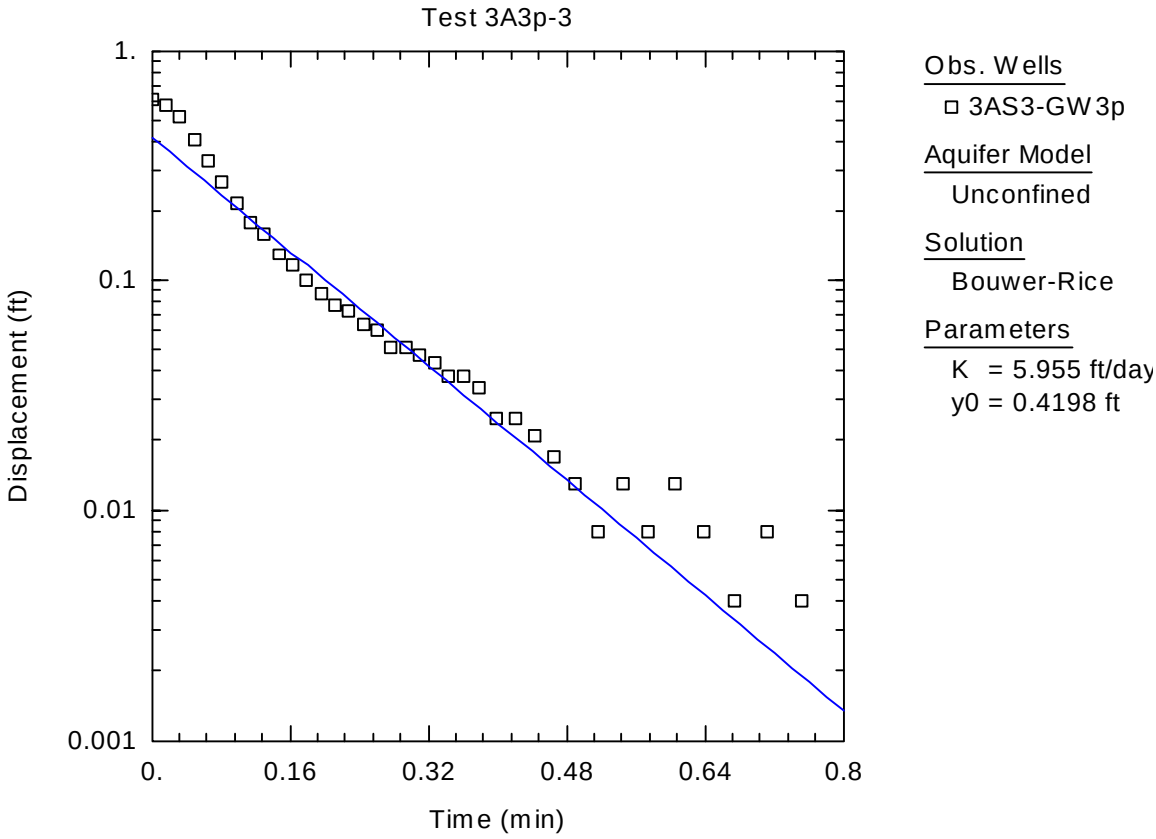



**Figure C-11.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW3p, Bouwer-Rice Solution

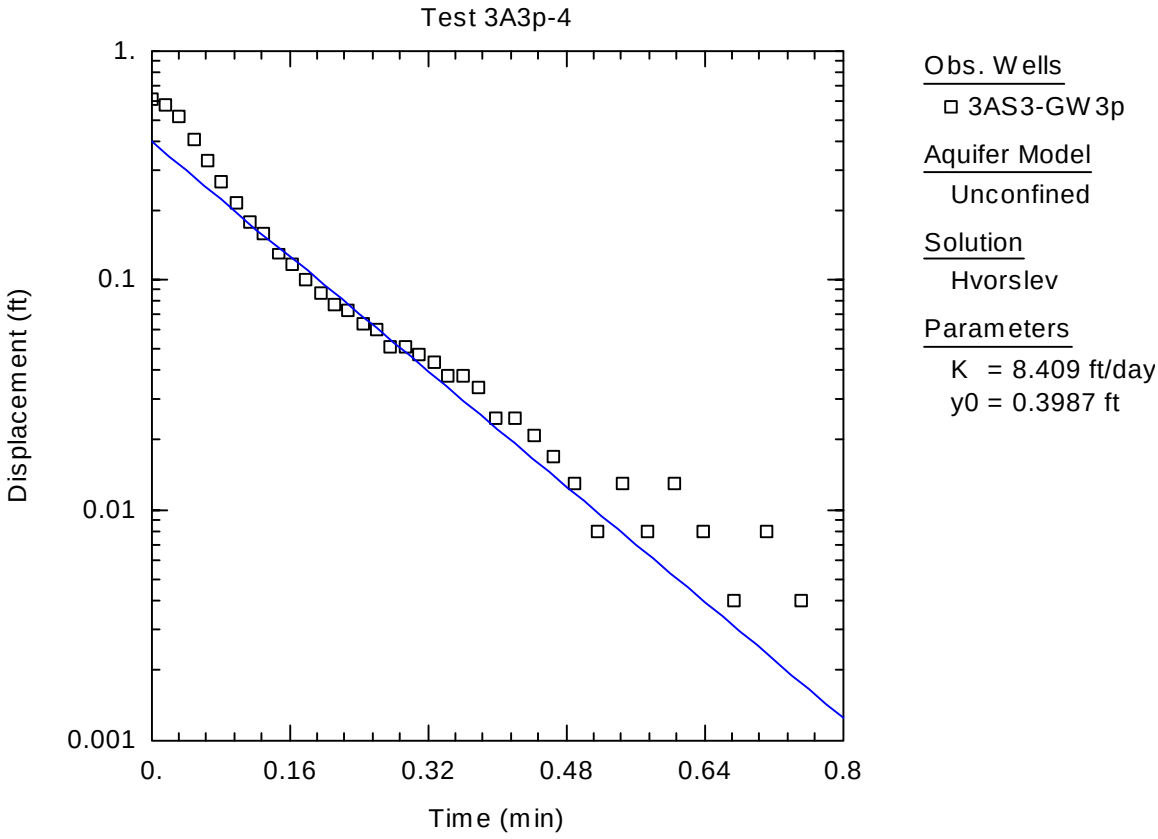



**Figure C-12.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW3p, Hvorslev Solution

**Table C-6.** Raw Data Obtained from Slug Test of 3AS3-GW3p

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| | | | | | |
| Report generated: | 2/25/00 | 10:05:58 | | | |
| Report from file: | C:\WINSITU\3AGW3P.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW3P | | | |
| Test defined on: | 2/24/00 | 13:54:55 | | | |
| Test started on: | 2/24/00 | 13:59:45 | | | |
| Test stopped on: | 2/24/00 | 14:03:42 | | | |
| Test extracted on: | 2/25/00 | 11:03:54 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667 minutes. | | | | |
| TOTAL DATA SAMPLES | 67 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 6.821 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.939 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3AGW3P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 13:59 | 0 | 0.615 | 0.005 | 30.288 | |

**Table C-6.** Raw Data Obtained from Slug Test of 3AS3-GW3p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 13:59 | 0.0163 | 0.576 | 0.005 | 30.288 | |
| 2/24/00 13:59 | 0.0327 | 0.52 | 0.005 | 30.288 | |
| 2/24/00 13:59 | 0.049 | 0.413 | 0.003 | 30.288 | |
| 2/24/00 13:59 | 0.0653 | 0.331 | 0.003 | 30.288 | |
| 2/24/00 13:59 | 0.0817 | 0.271 | 0.005 | 30.288 | |
| 2/24/00 13:59 | 0.098 | 0.219 | 0.003 | 30.288 | |
| 2/24/00 13:59 | 0.1143 | 0.18 | 0.003 | 30.29 | |
| 2/24/00 13:59 | 0.1307 | 0.159 | 0.005 | 30.29 | |
| 2/24/00 13:59 | 0.147 | 0.129 | 0.003 | 30.29 | |
| 2/24/00 13:59 | 0.1633 | 0.116 | 0.003 | 30.285 | |
| 2/24/00 13:59 | 0.1797 | 0.099 | 0.005 | 30.29 | |
| 2/24/00 13:59 | 0.196 | 0.086 | 0.005 | 30.285 | |
| 2/24/00 13:59 | 0.2123 | 0.077 | 0.005 | 30.288 | |
| 2/24/00 13:59 | 0.2287 | 0.073 | 0.003 | 30.288 | |
| 2/24/00 13:59 | 0.245 | 0.064 | 0.003 | 30.288 | |
| 2/24/00 14:00 | 0.2613 | 0.06 | 0.003 | 30.288 | |
| 2/24/00 14:00 | 0.2777 | 0.051 | 0.005 | 30.288 | |
| 2/24/00 14:00 | 0.294 | 0.051 | 0.005 | 30.288 | |
| 2/24/00 14:00 | 0.3103 | 0.047 | 0.003 | 30.288 | |
| 2/24/00 14:00 | 0.3267 | 0.043 | 0.003 | 30.288 | |
| 2/24/00 14:00 | 0.3433 | 0.038 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.361 | 0.038 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.3797 | 0.034 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.3995 | 0.025 | 0.007 | 30.285 | |
| 2/24/00 14:00 | 0.4205 | 0.025 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.4427 | 0.021 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.4662 | 0.017 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.491 | 0.013 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.5173 | 0.008 | 0.003 | 30.288 | |
| 2/24/00 14:00 | 0.5453 | 0.013 | 0.003 | 30.283 | |
| 2/24/00 14:00 | 0.575 | 0.008 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.6063 | 0.013 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.6395 | 0.008 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.6747 | 0.004 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 0.712 | 0.008 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.7515 | 0.004 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.7933 | 0 | 0.005 | 30.285 | |
| Report from file: | C:\WINSITU\3AGW3P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 14:00 | 0.8377 | 0 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.8847 | 0 | 0.007 | 30.285 | |
| 2/24/00 14:00 | 0.9345 | 0 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 0.9872 | 0 | 0.005 | 30.288 | |
| 2/24/00 14:00 | 1.043 | 0 | 0.005 | 30.285 | |
| 2/24/00 14:00 | 1.1022 | 0 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 1.1648 | -0.005 | 0.003 | 30.285 | |
| 2/24/00 14:00 | 1.2312 | -0.005 | 0.003 | 30.285 | |
| 2/24/00 14:01 | 1.3015 | -0.005 | 0.003 | 30.288 | |
| 2/24/00 14:01 | 1.376 | 0 | 0.007 | 30.285 | |
| 2/24/00 14:01 | 1.455 | -0.005 | 0.005 | 30.283 | |
| 2/24/00 14:01 | 1.5387 | -0.005 | 0.003 | 30.285 | |
| 2/24/00 14:01 | 1.6272 | -0.005 | 0.003 | 30.285 | |

**Table C-6.** Raw Data Obtained from Slug Test of 3AS3-GW3p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 14:01 | 1.721 | -0.005 | 0.001 | 30.283 | |
| 2/24/00 14:01 | 1.8203 | 0 | 0.003 | 30.285 | |
| 2/24/00 14:01 | 1.9257 | 0 | 0.003 | 30.285 | |
| 2/24/00 14:01 | 2.0372 | 0 | 0.009 | 30.283 | |
| 2/24/00 14:01 | 2.1553 | -0.005 | 0.005 | 30.285 | |
| 2/24/00 14:02 | 2.2805 | -0.005 | 0.003 | 30.283 | |
| 2/24/00 14:02 | 2.413 | -0.005 | -0.001 | 30.285 | |
| 2/24/00 14:02 | 2.5535 | -0.009 | -0.001 | 30.285 | |
| 2/24/00 14:02 | 2.7023 | -0.009 | -0.008 | 30.288 | |
| 2/24/00 14:02 | 2.8598 | -0.005 | -0.006 | 30.283 | |
| 2/24/00 14:02 | 3.0265 | 0 | -0.006 | 30.283 | |
| 2/24/00 14:02 | 3.1932 | 0 | 0.001 | 30.283 | |
| 2/24/00 14:03 | 3.3598 | -0.005 | 0.003 | 30.283 | |
| 2/24/00 14:03 | 3.5265 | 0 | 0.003 | 30.285 | |
| 2/24/00 14:03 | 3.6932 | 0 | 0.003 | 30.283 | |
| 2/24/00 14:03 | 3.8598 | -0.005 | 0.005 | 30.283 | |

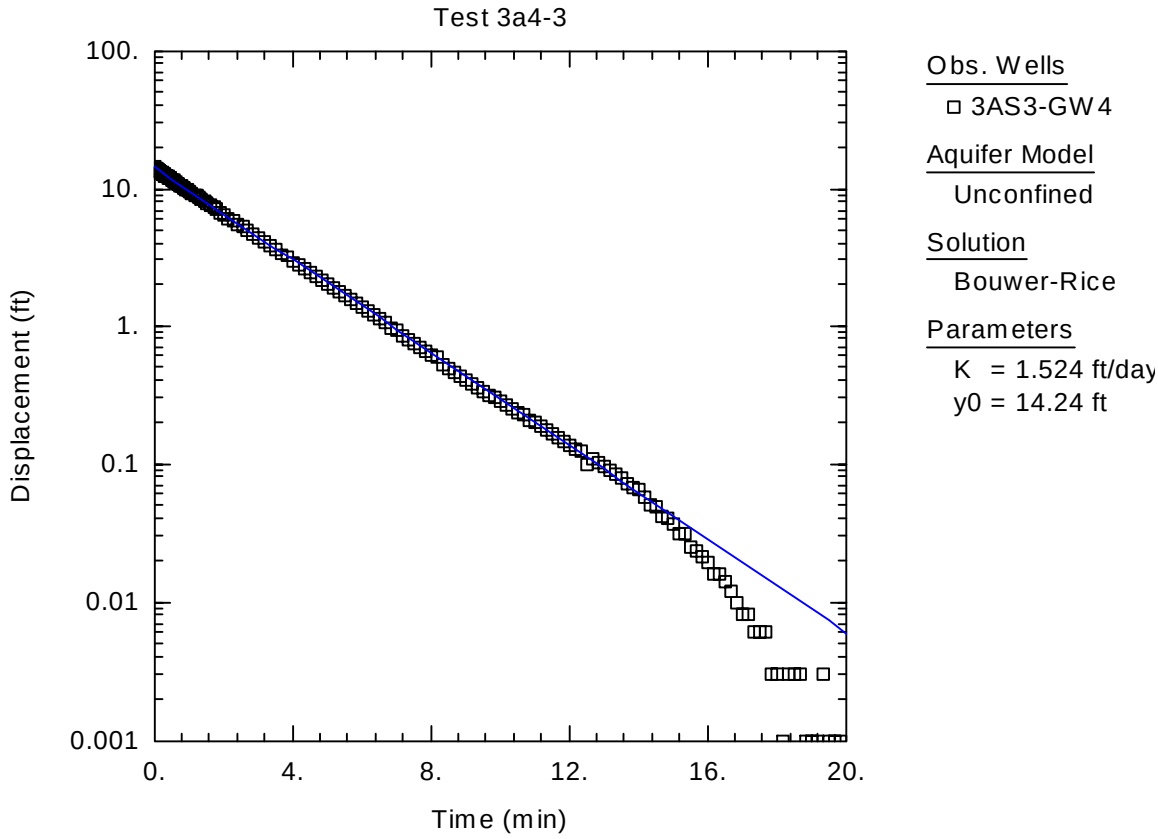



**Figure C-13.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW4, Bouwer-Rice Solution

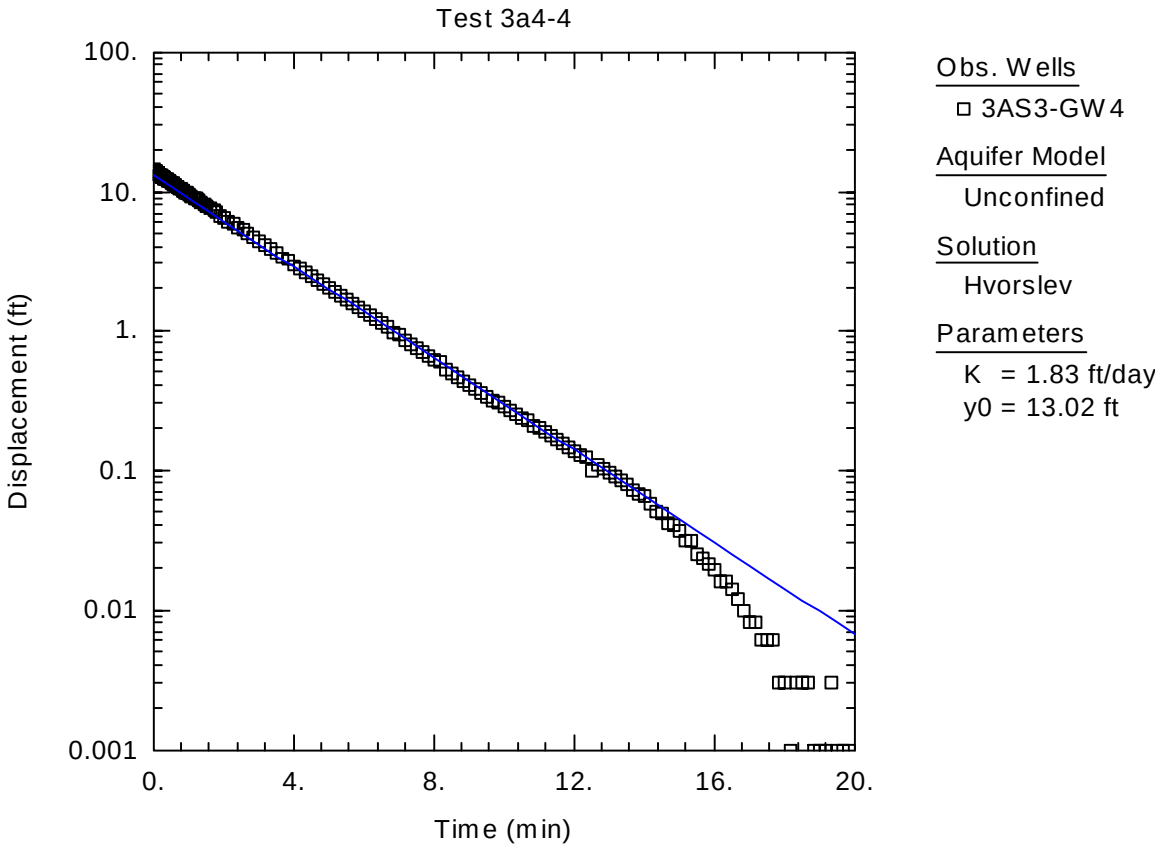



**Figure C-14.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW4, Hvorslev Solution

**Table C-7.** Raw Data Obtained from Slug Test of 3AS3-GW4

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:06:56 | | | |
| Report from file: | C:\WINSITU\3AGW4.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW4 | | | |
| Test defined on: | 2/24/00 | 12:01:22 | | | |
| Test started on: | 2/24/00 | 12:07:11 | | | |
| Test stopped on: | 2/24/00 | 12:27:12 | | | |
| Test extracted on: | 2/25/00 | 11:01:00 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667 minutes. | | | | |
| TOTAL DATA SAMPLES | 163 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet H2O | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 5.852 | Feet H2O | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.787 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3AGW4.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| 2/24/00 12:07 | 0 | 0.004 | 14.255 | 30.377 | |
| 2/24/00 12:07 | 0.0165 | -0.001 | 14.174 | 30.379 | |

**Table C-7.** Raw Data Obtained from Slug Test of 3AS3-GW4 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:07 | 0.033 | -0.001 | 14.058 | 30.379 | |
| 2/24/00 12:07 | 0.0495 | 0.004 | 13.968 | 30.377 | |
| 2/24/00 12:07 | 0.066 | -0.001 | 13.876 | 30.379 | |
| 2/24/00 12:07 | 0.0825 | 0.004 | 13.781 | 30.381 | |
| 2/24/00 12:07 | 0.099 | 0.004 | 13.694 | 30.379 | |
| 2/24/00 12:07 | 0.1155 | -0.001 | 13.604 | 30.379 | |
| 2/24/00 12:07 | 0.132 | -0.001 | 13.511 | 30.379 | |
| 2/24/00 12:07 | 0.1485 | 0.004 | 13.428 | 30.379 | |
| 2/24/00 12:07 | 0.165 | -0.001 | 13.336 | 30.379 | |
| 2/24/00 12:07 | 0.1815 | -0.001 | 13.258 | 30.379 | |
| 2/24/00 12:07 | 0.198 | -0.001 | 13.175 | 30.379 | |
| 2/24/00 12:07 | 0.2145 | -0.001 | 13.068 | 30.379 | |
| 2/24/00 12:07 | 0.231 | 0.004 | 13.001 | 30.379 | |
| 2/24/00 12:07 | 0.2475 | -0.001 | 12.909 | 30.379 | |
| 2/24/00 12:07 | 0.264 | -0.001 | 12.832 | 30.377 | |
| 2/24/00 12:07 | 0.2805 | -0.001 | 12.746 | 30.377 | |
| 2/24/00 12:07 | 0.297 | -0.001 | 12.667 | 30.377 | |
| 2/24/00 12:07 | 0.3135 | -0.001 | 12.585 | 30.377 | |
| 2/24/00 12:07 | 0.33 | -0.001 | 12.504 | 30.377 | |
| 2/24/00 12:07 | 0.3467 | -0.001 | 12.42 | 30.377 | |
| 2/24/00 12:07 | 0.3643 | -0.001 | 12.336 | 30.377 | |
| 2/24/00 12:07 | 0.383 | -0.001 | 12.253 | 30.379 | |
| 2/24/00 12:07 | 0.4028 | 0.004 | 12.165 | 30.379 | |
| 2/24/00 12:07 | 0.4238 | -0.001 | 12.073 | 30.377 | |
| 2/24/00 12:07 | 0.446 | -0.001 | 11.97 | 30.377 | |
| 2/24/00 12:07 | 0.4695 | -0.001 | 11.863 | 30.375 | |
| 2/24/00 12:07 | 0.4943 | -0.001 | 11.755 | 30.377 | |
| 2/24/00 12:07 | 0.5207 | -0.001 | 11.642 | 30.377 | |
| 2/24/00 12:07 | 0.5487 | -0.001 | 11.517 | 30.377 | |
| 2/24/00 12:07 | 0.5783 | -0.001 | 11.395 | 30.377 | |
| 2/24/00 12:07 | 0.6097 | 0.004 | 11.264 | 30.375 | |
| 2/24/00 12:07 | 0.6428 | -0.001 | 11.185 | 30.377 | |
| 2/24/00 12:07 | 0.678 | 0.004 | 10.966 | 30.379 | |
| 2/24/00 12:07 | 0.7153 | -0.001 | 10.807 | 30.375 | |
| 2/24/00 12:07 | 0.7548 | -0.001 | 10.642 | 30.377 | |
| 2/24/00 12:07 | 0.7967 | -0.001 | 10.473 | 30.377 | |
| Report from file: | C:\WINSITU\3AGW4.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 12:08 | 0.841 | -0.001 | 10.286 | 30.379 | |
| 2/24/00 12:08 | 0.888 | 0.004 | 10.11 | 30.377 | |
| 2/24/00 12:08 | 0.9378 | 0.004 | 9.917 | 30.377 | |
| 2/24/00 12:08 | 0.9905 | -0.001 | 9.713 | 30.375 | |
| 2/24/00 12:08 | 1.0463 | 0.004 | 9.513 | 30.379 | |
| 2/24/00 12:08 | 1.1055 | 0.004 | 9.295 | 30.377 | |
| 2/24/00 12:08 | 1.1682 | 0.004 | 9.069 | 30.377 | |
| 2/24/00 12:08 | 1.2345 | -0.001 | 8.844 | 30.379 | |
| 2/24/00 12:08 | 1.3048 | -0.001 | 8.599 | 30.377 | |
| 2/24/00 12:08 | 1.3793 | -0.001 | 8.356 | 30.377 | |
| 2/24/00 12:08 | 1.4583 | 0.004 | 8.105 | 30.377 | |
| 2/24/00 12:08 | 1.542 | -0.001 | 7.85 | 30.375 | |
| 2/24/00 12:08 | 1.6305 | -0.001 | 7.579 | 30.373 | |

**Table C-7.** Raw Data Obtained from Slug Test of 3AS3-GW4 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:08 | 1.7243 | 0.004 | 7.311 | 30.377 | |
| 2/24/00 12:09 | 1.8237 | -0.001 | 7.038 | 30.375 | |
| 2/24/00 12:09 | 1.929 | -0.001 | 6.752 | 30.377 | |
| 2/24/00 12:09 | 2.0405 | 0.004 | 6.503 | 30.375 | |
| 2/24/00 12:09 | 2.1587 | 0.004 | 6.179 | 30.379 | |
| 2/24/00 12:09 | 2.2838 | -0.001 | 5.885 | 30.377 | |
| 2/24/00 12:09 | 2.4163 | -0.001 | 5.579 | 30.375 | |
| 2/24/00 12:09 | 2.5568 | -0.001 | 5.292 | 30.375 | |
| 2/24/00 12:09 | 2.7057 | -0.001 | 4.997 | 30.375 | |
| 2/24/00 12:10 | 2.8632 | 0.004 | 4.69 | 30.377 | |
| 2/24/00 12:10 | 3.0298 | -0.001 | 4.374 | 30.377 | |
| 2/24/00 12:10 | 3.1965 | 0.004 | 4.101 | 30.377 | |
| 2/24/00 12:10 | 3.3632 | -0.001 | 3.839 | 30.375 | |
| 2/24/00 12:10 | 3.5298 | -0.001 | 3.594 | 30.375 | |
| 2/24/00 12:10 | 3.6965 | 0.004 | 3.364 | 30.375 | |
| 2/24/00 12:11 | 3.8632 | 0.004 | 3.168 | 30.375 | |
| 2/24/00 12:11 | 4.0298 | 0.004 | 2.949 | 30.375 | |
| 2/24/00 12:11 | 4.1965 | 0.004 | 2.764 | 30.377 | |
| 2/24/00 12:11 | 4.3632 | 0.004 | 2.583 | 30.377 | |
| 2/24/00 12:11 | 4.5298 | 0.004 | 2.42 | 30.375 | |
| 2/24/00 12:11 | 4.6965 | 0.004 | 2.267 | 30.375 | |
| 2/24/00 12:12 | 4.8632 | 0.004 | 2.138 | 30.375 | |
| 2/24/00 12:12 | 5.0298 | 0.004 | 1.989 | 30.375 | |
| 2/24/00 12:12 | 5.1965 | 0.004 | 1.86 | 30.375 | |
| 2/24/00 12:12 | 5.3632 | 0.004 | 1.744 | 30.375 | |
| 2/24/00 12:12 | 5.5298 | 0.008 | 1.634 | 30.375 | |
| 2/24/00 12:12 | 5.6965 | 0.004 | 1.531 | 30.375 | |
| 2/24/00 12:13 | 5.8632 | 0.008 | 1.434 | 30.375 | |
| 2/24/00 12:13 | 6.0298 | 0.004 | 1.342 | 30.375 | |
| 2/24/00 12:13 | 6.1965 | 0.004 | 1.256 | 30.375 | |
| 2/24/00 12:13 | 6.3632 | 0.004 | 1.181 | 30.375 | |
| 2/24/00 12:13 | 6.5298 | 0.004 | 1.103 | 30.375 | |
| 2/24/00 12:13 | 6.6965 | 0.008 | 1.034 | 30.375 | |
| 2/24/00 12:14 | 6.8632 | 0.008 | 0.968 | 30.373 | |
| 2/24/00 12:14 | 7.0298 | 0.008 | 0.909 | 30.373 | |
| Report from file: | C:\WINSITU\3AGW4.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 12:14 | 7.1965 | -0.001 | 0.851 | 30.373 | |
| 2/24/00 12:14 | 7.3632 | 0.008 | 0.793 | 30.375 | |
| 2/24/00 12:14 | 7.5298 | 0.008 | 0.746 | 30.373 | |
| 2/24/00 12:14 | 7.6965 | 0.008 | 0.694 | 30.375 | |
| 2/24/00 12:15 | 7.8632 | 0.004 | 0.649 | 30.375 | |
| 2/24/00 12:15 | 8.0298 | 0.008 | 0.606 | 30.373 | |
| 2/24/00 12:15 | 8.1965 | 0.012 | 0.582 | 30.373 | |
| 2/24/00 12:15 | 8.3632 | 0.008 | 0.52 | 30.373 | |
| 2/24/00 12:15 | 8.5298 | 0.008 | 0.494 | 30.373 | |
| 2/24/00 12:15 | 8.6965 | 0.008 | 0.462 | 30.373 | |
| 2/24/00 12:16 | 8.8632 | 0.008 | 0.434 | 30.373 | |
| 2/24/00 12:16 | 9.0298 | 0.008 | 0.406 | 30.373 | |
| 2/24/00 12:16 | 9.1965 | 0.008 | 0.38 | 30.373 | |
| 2/24/00 12:16 | 9.3632 | 0.008 | 0.354 | 30.373 | |

**Table C-7.** Raw Data Obtained from Slug Test of 3AS3-GW4 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:16 | 9.5298 | 0.012 | 0.337 | 30.373 | |
| 2/24/00 12:16 | 9.6965 | 0.012 | 0.313 | 30.373 | |
| 2/24/00 12:17 | 9.8632 | 0.008 | 0.298 | 30.371 | |
| 2/24/00 12:17 | 10.0298 | 0.012 | 0.279 | 30.373 | |
| 2/24/00 12:17 | 10.1965 | 0.008 | 0.262 | 30.373 | |
| 2/24/00 12:17 | 10.3632 | 0.012 | 0.247 | 30.373 | |
| 2/24/00 12:17 | 10.5298 | 0.012 | 0.236 | 30.371 | |
| 2/24/00 12:17 | 10.6965 | 0.012 | 0.223 | 30.371 | |
| 2/24/00 12:18 | 10.8632 | 0.012 | 0.206 | 30.373 | |
| 2/24/00 12:18 | 11.0298 | 0.012 | 0.197 | 30.373 | |
| 2/24/00 12:18 | 11.1965 | 0.012 | 0.186 | 30.371 | |
| 2/24/00 12:18 | 11.3632 | 0.012 | 0.176 | 30.371 | |
| 2/24/00 12:18 | 11.5298 | 0.012 | 0.165 | 30.373 | |
| 2/24/00 12:18 | 11.6965 | 0.012 | 0.154 | 30.373 | |
| 2/24/00 12:19 | 11.8632 | 0.012 | 0.146 | 30.371 | |
| 2/24/00 12:19 | 12.0298 | 0.012 | 0.137 | 30.373 | |
| 2/24/00 12:19 | 12.1965 | 0.012 | 0.128 | 30.371 | |
| 2/24/00 12:19 | 12.3632 | 0.012 | 0.122 | 30.371 | |
| 2/24/00 12:19 | 12.5298 | 0.017 | 0.1 | 30.371 | |
| 2/24/00 12:19 | 12.6965 | 0.012 | 0.109 | 30.371 | |
| 2/24/00 12:20 | 12.8632 | 0.012 | 0.102 | 30.369 | |
| 2/24/00 12:20 | 13.0298 | 0.012 | 0.094 | 30.369 | |
| 2/24/00 12:20 | 13.1965 | 0.017 | 0.09 | 30.369 | |
| 2/24/00 12:20 | 13.3632 | 0.012 | 0.085 | 30.367 | |
| 2/24/00 12:20 | 13.5298 | 0.017 | 0.079 | 30.369 | |
| 2/24/00 12:20 | 13.6965 | 0.017 | 0.072 | 30.369 | |
| 2/24/00 12:21 | 13.8632 | 0.017 | 0.068 | 30.369 | |
| 2/24/00 12:21 | 14.0298 | 0.017 | 0.064 | 30.369 | |
| 2/24/00 12:21 | 14.1965 | 0.017 | 0.057 | 30.369 | |
| 2/24/00 12:21 | 14.3632 | 0.017 | 0.051 | 30.371 | |
| 2/24/00 12:21 | 14.5298 | 0.017 | 0.049 | 30.369 | |
| 2/24/00 12:21 | 14.6965 | 0.017 | 0.042 | 30.371 | |
| 2/24/00 12:22 | 14.8632 | 0.017 | 0.04 | 30.369 | |
| 2/24/00 12:22 | 15.0298 | 0.017 | 0.036 | 30.371 | |
| Report from file: | C:\WINSITU\3AGW4.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 12:22 | 15.1965 | 0.017 | 0.031 | 30.371 | |
| 2/24/00 12:22 | 15.3632 | 0.017 | 0.031 | 30.369 | |
| 2/24/00 12:22 | 15.5298 | 0.017 | 0.025 | 30.371 | |
| 2/24/00 12:22 | 15.6965 | 0.017 | 0.023 | 30.369 | |
| 2/24/00 12:23 | 15.8632 | 0.021 | 0.021 | 30.371 | |
| 2/24/00 12:23 | 16.0298 | 0.017 | 0.019 | 30.369 | |
| 2/24/00 12:23 | 16.1965 | 0.017 | 0.016 | 30.369 | |
| 2/24/00 12:23 | 16.3632 | 0.017 | 0.016 | 30.369 | |
| 2/24/00 12:23 | 16.5298 | 0.021 | 0.014 | 30.369 | |
| 2/24/00 12:23 | 16.6965 | 0.017 | 0.012 | 30.369 | |
| 2/24/00 12:24 | 16.8632 | 0.017 | 0.01 | 30.369 | |
| 2/24/00 12:24 | 17.0298 | 0.017 | 0.008 | 30.369 | |
| 2/24/00 12:24 | 17.1965 | 0.021 | 0.008 | 30.369 | |
| 2/24/00 12:24 | 17.3632 | 0.021 | 0.006 | 30.369 | |
| 2/24/00 12:24 | 17.5298 | 0.017 | 0.006 | 30.369 | |

**Table C-7.** Raw Data Obtained from Slug Test of 3AS3-GW4 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:24 | 17.6965 | 0.017 | 0.006 | 30.369 | |
| 2/24/00 12:25 | 17.8632 | 0.012 | 0.003 | 30.369 | |
| 2/24/00 12:25 | 18.0298 | 0.021 | 0.003 | 30.369 | |
| 2/24/00 12:25 | 18.1965 | 0.021 | 0.001 | 30.369 | |
| 2/24/00 12:25 | 18.3632 | 0.021 | 0.003 | 30.369 | |
| 2/24/00 12:25 | 18.5298 | 0.017 | 0.003 | 30.369 | |
| 2/24/00 12:25 | 18.6965 | 0.021 | 0.003 | 30.367 | |
| 2/24/00 12:26 | 18.8632 | 0.025 | 0.001 | 30.369 | |
| 2/24/00 12:26 | 19.0298 | 0.021 | 0.001 | 30.369 | |
| 2/24/00 12:26 | 19.1965 | 0.021 | 0.001 | 30.367 | |
| 2/24/00 12:26 | 19.3632 | 0.021 | 0.003 | 30.365 | |
| 2/24/00 12:26 | 19.5298 | 0.025 | 0.001 | 30.369 | |
| 2/24/00 12:26 | 19.6965 | 0.021 | 0.001 | 30.369 | |
| 2/24/00 12:27 | 19.8632 | 0.025 | 0.001 | 30.367 | |

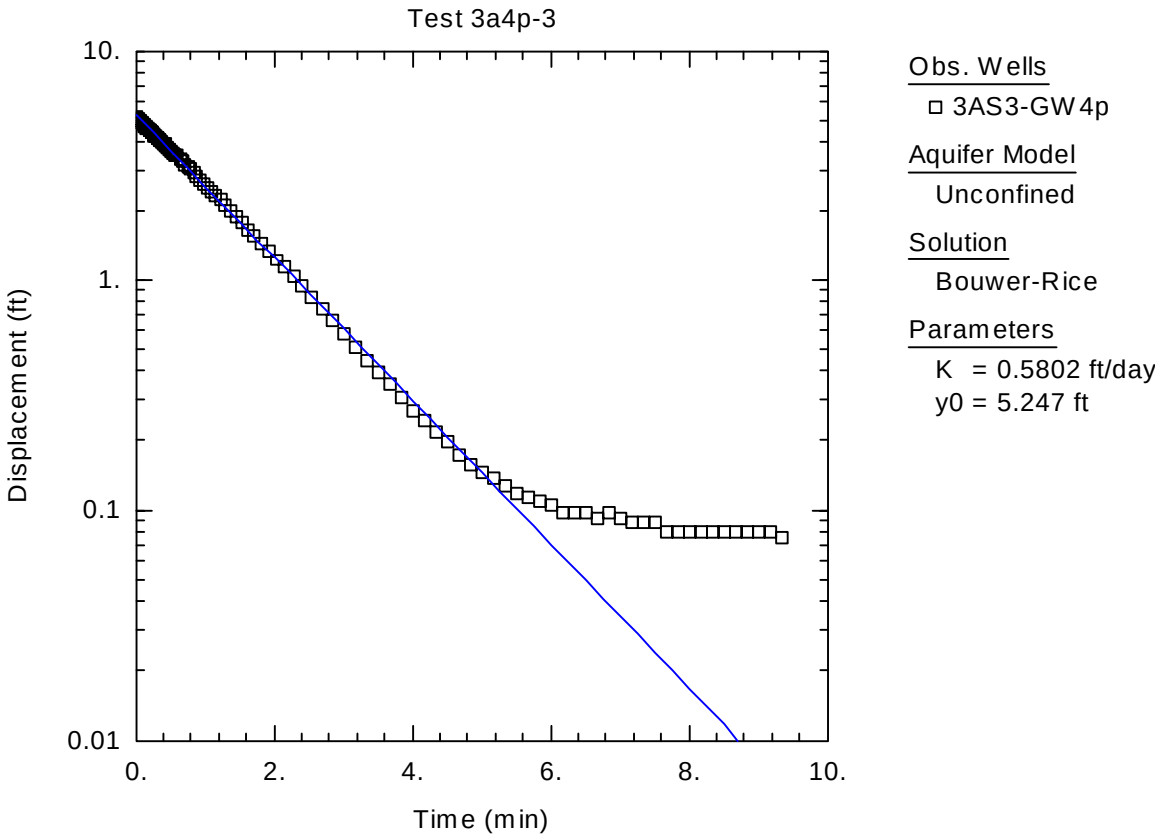



**Figure C-15.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW4p, Bouwer-Rice Solution

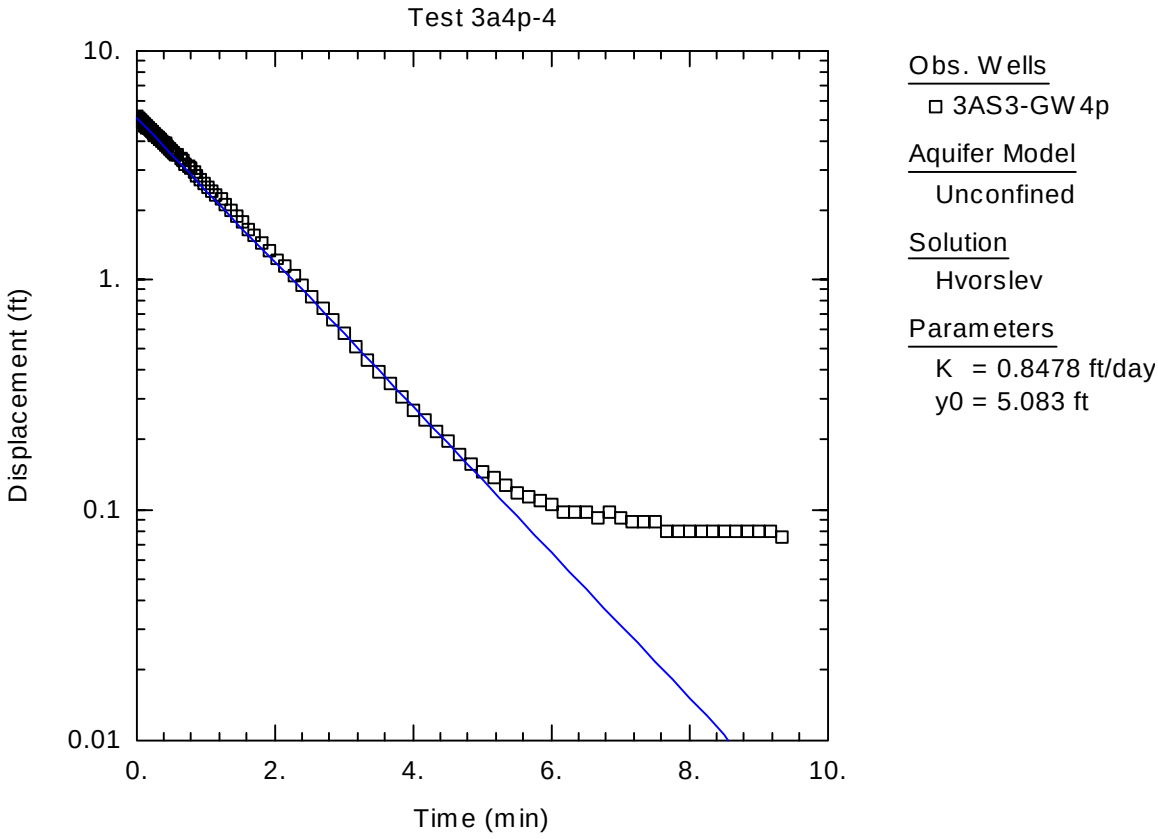



**Figure C-16.** Graphical Representation of Raw Data Obtained from Slug Test of 3AS3-GW4p, Hvorslev Solution

**Table C-8.** Raw Data Obtained from Slug Test of 3AS3-GW4p

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:07:30 | | | |
| Report from file: | C:\WINSITU\3AGW4P.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45211 | | | | |
| Firmware Version | 7.05 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3AGW4P | | | |
| Test defined on: | 2/24/00 | 12:33:07 | | | |
| Test started on: | 2/24/00 | 12:36:42 | | | |
| Test stopped on: | 2/24/00 | 12:46:56 | | | |
| Test extracted on: | 2/25/00 | 11:02:14 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667minutes. | | | | |
| TOTAL DATA SAMPLES | 105 | | | | |
| Channel number [1] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 5.916 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.779 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3AGW4P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| 2/24/00 12:36 | 0 | 5.139 | -0.011 | 30.361 | |
| 2/24/00 12:36 | 0.0163 | 5.1 | -0.011 | 30.361 | |
| 2/24/00 12:36 | 0.0327 | 5.049 | -0.014 | 30.361 | |

**Table C-8.** Raw Data Obtained from Slug Test of 3AS3-GW4p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:36 | 0.049 | 4.993 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.0653 | 4.932 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.0817 | 4.881 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.098 | 4.829 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.1143 | 4.782 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.1307 | 4.726 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.147 | 4.679 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.1633 | 4.631 | -0.014 | 30.359 | |
| 2/24/00 12:36 | 0.1797 | 4.58 | -0.014 | 30.359 | |
| 2/24/00 12:36 | 0.196 | 4.532 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.2123 | 4.481 | -0.014 | 30.359 | |
| 2/24/00 12:36 | 0.2287 | 4.433 | -0.014 | 30.359 | |
| 2/24/00 12:36 | 0.245 | 4.382 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.2613 | 4.339 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.2777 | 4.287 | -0.014 | 30.361 | |
| 2/24/00 12:36 | 0.294 | 4.244 | -0.014 | 30.361 | |
| 2/24/00 12:37 | 0.3103 | 4.197 | -0.014 | 30.361 | |
| 2/24/00 12:37 | 0.3267 | 4.154 | -0.014 | 30.361 | |
| 2/24/00 12:37 | 0.3433 | 4.098 | -0.014 | 30.361 | |
| 2/24/00 12:37 | 0.361 | 4.059 | -0.011 | 30.361 | |
| 2/24/00 12:37 | 0.3797 | 4.012 | -0.014 | 30.359 | |
| 2/24/00 12:37 | 0.3995 | 3.96 | -0.011 | 30.361 | |
| 2/24/00 12:37 | 0.4205 | 3.913 | -0.014 | 30.359 | |
| 2/24/00 12:37 | 0.4427 | 3.853 | -0.014 | 30.361 | |
| 2/24/00 12:37 | 0.4662 | 3.792 | -0.014 | 30.359 | |
| 2/24/00 12:37 | 0.491 | 3.737 | -0.011 | 30.361 | |
| 2/24/00 12:37 | 0.5173 | 3.668 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 0.5453 | 3.612 | -0.014 | 30.359 | |
| 2/24/00 12:37 | 0.575 | 3.539 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 0.6063 | 3.5 | -0.011 | 30.361 | |
| 2/24/00 12:37 | 0.6395 | 3.388 | -0.009 | 30.361 | |
| 2/24/00 12:37 | 0.6747 | 3.306 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 0.712 | 3.22 | -0.009 | 30.361 | |
| 2/24/00 12:37 | 0.7515 | 3.134 | -0.009 | 30.361 | |
| 2/24/00 12:37 | 0.7933 | 3.044 | -0.011 | 30.363 | |
| Report from file: | C:\WINSITU\3AGW4P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| -------- -------- | ---------- | ---------- | ---------- | ---------- | |
| 2/24/00 12:37 | 0.8377 | 2.954 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 0.8847 | 2.859 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 0.9345 | 2.76 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 0.9872 | 2.657 | -0.011 | 30.359 | |
| 2/24/00 12:37 | 1.043 | 2.553 | -0.011 | 30.361 | |
| 2/24/00 12:37 | 1.1022 | 2.45 | -0.009 | 30.361 | |
| 2/24/00 12:37 | 1.1648 | 2.347 | -0.011 | 30.361 | |
| 2/24/00 12:37 | 1.2312 | 2.239 | -0.011 | 30.361 | |
| 2/24/00 12:38 | 1.3015 | 2.128 | -0.011 | 30.361 | |
| 2/24/00 12:38 | 1.376 | 2.016 | -0.011 | 30.361 | |
| 2/24/00 12:38 | 1.455 | 1.904 | -0.009 | 30.361 | |
| 2/24/00 12:38 | 1.5387 | 1.792 | -0.009 | 30.359 | |
| 2/24/00 12:38 | 1.6272 | 1.676 | -0.009 | 30.361 | |
| 2/24/00 12:38 | 1.721 | 1.564 | -0.009 | 30.361 | |

**Table C-8.** Raw Data Obtained from Slug Test of 3AS3-GW4p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:38 | 1.8203 | 1.456 | -0.009 | 30.359 | |
| 2/24/00 12:38 | 1.9257 | 1.34 | -0.009 | 30.361 | |
| 2/24/00 12:38 | 2.0372 | 1.233 | -0.009 | 30.361 | |
| 2/24/00 12:38 | 2.1553 | 1.129 | -0.009 | 30.361 | |
| 2/24/00 12:38 | 2.2805 | 1.026 | -0.009 | 30.361 | |
| 2/24/00 12:39 | 2.413 | 0.927 | -0.009 | 30.361 | |
| 2/24/00 12:39 | 2.5535 | 0.833 | -0.011 | 30.359 | |
| 2/24/00 12:39 | 2.7023 | 0.742 | -0.009 | 30.361 | |
| 2/24/00 12:39 | 2.8598 | 0.66 | -0.009 | 30.359 | |
| 2/24/00 12:39 | 3.0265 | 0.579 | -0.009 | 30.359 | |
| 2/24/00 12:39 | 3.1932 | 0.51 | -0.009 | 30.359 | |
| 2/24/00 12:40 | 3.3598 | 0.445 | -0.009 | 30.359 | |
| 2/24/00 12:40 | 3.5265 | 0.398 | -0.014 | 30.359 | |
| 2/24/00 12:40 | 3.6932 | 0.351 | -0.009 | 30.361 | |
| 2/24/00 12:40 | 3.8598 | 0.308 | -0.011 | 30.359 | |
| 2/24/00 12:40 | 4.0265 | 0.269 | -0.011 | 30.359 | |
| 2/24/00 12:40 | 4.1932 | 0.243 | -0.009 | 30.359 | |
| 2/24/00 12:41 | 4.3598 | 0.217 | -0.009 | 30.361 | |
| 2/24/00 12:41 | 4.5265 | 0.196 | -0.011 | 30.359 | |
| 2/24/00 12:41 | 4.6932 | 0.174 | -0.011 | 30.359 | |
| 2/24/00 12:41 | 4.8598 | 0.157 | -0.011 | 30.361 | |
| 2/24/00 12:41 | 5.0265 | 0.144 | -0.011 | 30.359 | |
| 2/24/00 12:41 | 5.1932 | 0.136 | -0.009 | 30.361 | |
| 2/24/00 12:42 | 5.3598 | 0.127 | -0.009 | 30.359 | |
| 2/24/00 12:42 | 5.5265 | 0.118 | -0.009 | 30.359 | |
| 2/24/00 12:42 | 5.6932 | 0.114 | -0.009 | 30.361 | |
| 2/24/00 12:42 | 5.8598 | 0.11 | -0.007 | 30.359 | |
| 2/24/00 12:42 | 6.0265 | 0.105 | -0.009 | 30.359 | |
| 2/24/00 12:42 | 6.1932 | 0.097 | -0.009 | 30.361 | |
| 2/24/00 12:43 | 6.3598 | 0.097 | -0.011 | 30.361 | |
| 2/24/00 12:43 | 6.5265 | 0.097 | -0.011 | 30.361 | |
| 2/24/00 12:43 | 6.6932 | 0.092 | -0.011 | 30.357 | |
| 2/24/00 12:43 | 6.8598 | 0.097 | -0.016 | 30.353 | |
| 2/24/00 12:43 | 7.0265 | 0.092 | -0.014 | 30.355 | |
| Report from file: | C:\WINSITU\3AGW4P.BIN | | | | |
| | | | Chan[1] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/24/00 12:43 | 7.1932 | 0.088 | -0.011 | 30.369 | |
| 2/24/00 12:44 | 7.3598 | 0.088 | -0.011 | 30.367 | |
| 2/24/00 12:44 | 7.5265 | 0.088 | -0.014 | 30.363 | |
| 2/24/00 12:44 | 7.6932 | 0.08 | -0.014 | 30.363 | |
| 2/24/00 12:44 | 7.8598 | 0.08 | -0.011 | 30.361 | |
| 2/24/00 12:44 | 8.0265 | 0.08 | -0.011 | 30.361 | |
| 2/24/00 12:44 | 8.1932 | 0.08 | -0.011 | 30.361 | |
| 2/24/00 12:45 | 8.3598 | 0.08 | -0.011 | 30.361 | |
| 2/24/00 12:45 | 8.5265 | 0.08 | -0.011 | 30.361 | |
| 2/24/00 12:45 | 8.6932 | 0.08 | -0.011 | 30.359 | |
| 2/24/00 12:45 | 8.8598 | 0.08 | -0.011 | 30.359 | |
| 2/24/00 12:45 | 9.0265 | 0.08 | -0.011 | 30.357 | |
| 2/24/00 12:45 | 9.1932 | 0.08 | -0.011 | 30.359 | |
| 2/24/00 12:46 | 9.3598 | 0.075 | -0.011 | 30.357 | |
| 2/24/00 12:46 | 9.5265 | 0.08 | -0.011 | 30.357 | |
| 2/24/00 12:46 | 9.6932 | 0.08 | -0.014 | 30.357 | |

**Table C-8.** Raw Data Obtained from Slug Test of 3AS3-GW4p (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/24/00 12:46 | 9.8598 | 0.08 | -0.014 | 30.357 | |
| 2/24/00 12:46 | 10.0265 | 0.075 | -0.014 | 30.357 | |
| 2/24/00 12:46 | 10.1932 | 0.08 | -0.014 | 30.357 | |

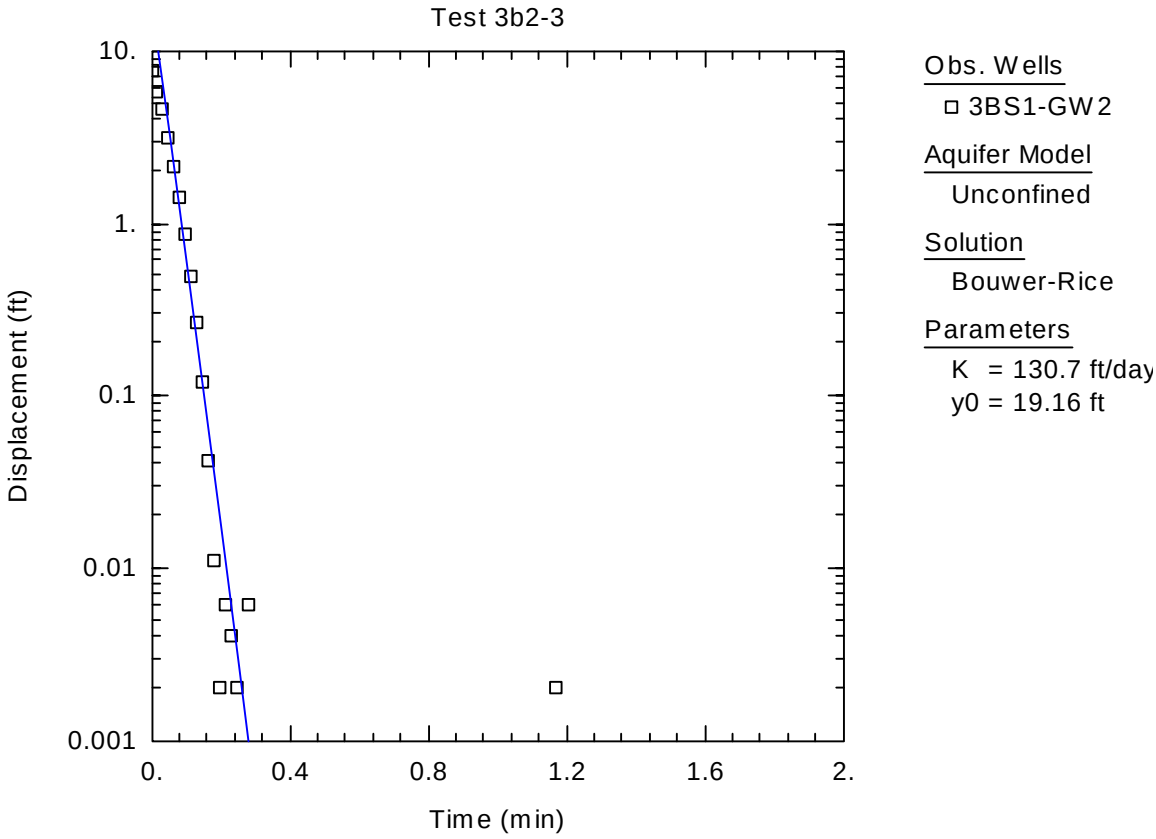



**Figure C-17.** Graphical Representation of Raw Data Obtained from Slug Test of 3BS1-GW2, Bouwer-Rice Solution

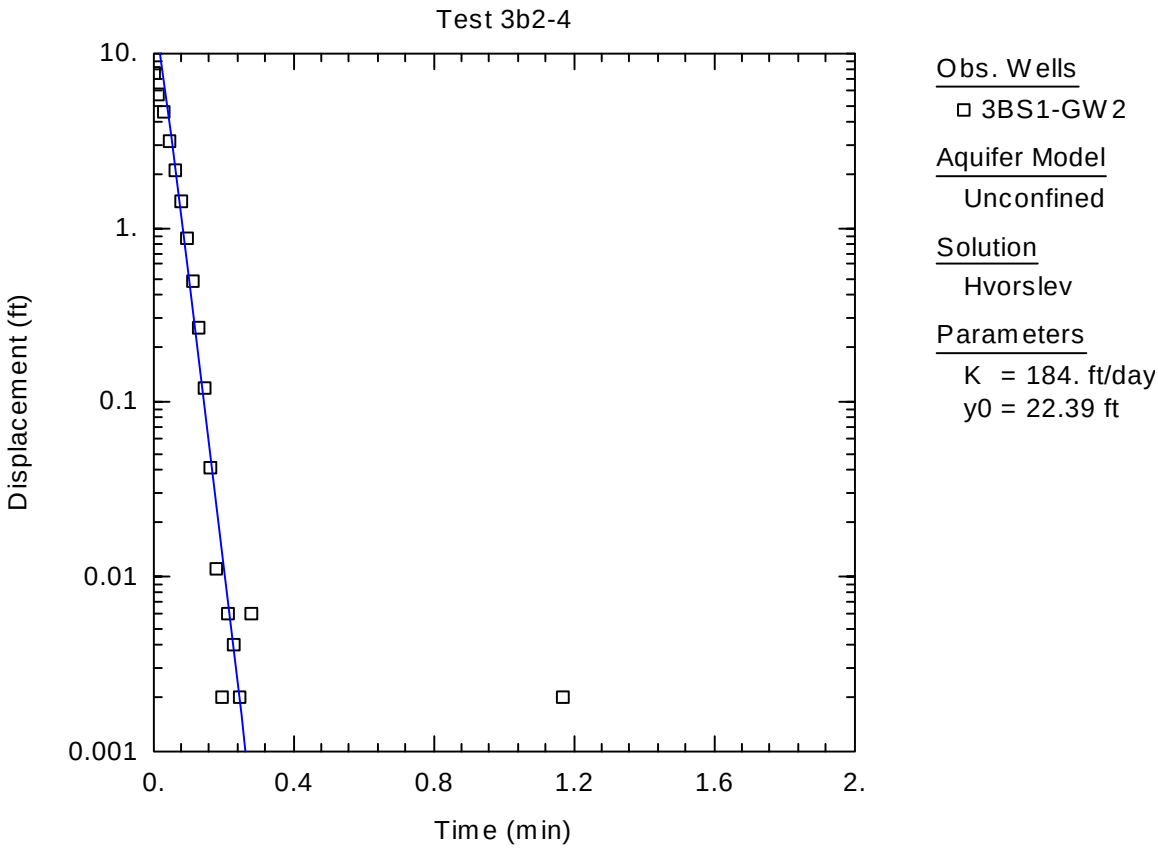



**Figure C-18.** Graphical Representation of Raw Data Obtained from Slug Test of 3BS1-GW2, Hvorslev Solution

**Table C-9.** Raw Data Obtained from Slug Test of 3BS1-GW2

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:12:56 | | | |
| Report from file: | C:\WINSITU\3BGW2.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45316 | | | | |
| Firmware Version | 7.06 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3BGW2 | | | |
| Test defined on: | 2/22/00 | 14:12:52 | | | |
| Test started on: | 2/22/00 | 14:16:34 | | | |
| Test stopped on: | 2/22/00 | 14:20:55 | | | |
| Test extracted on: | 2/22/00 | 14:27:09 | | | |
| Data gathered using Logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667minutes. | | | | |
| TOTAL DATA SAMPLES | 69 | | | | |
| Channel number [2] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 26.555 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 6.706 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |

**Table C-9.** Raw Data Obtained from Slug Test of 3BS1-GW2 (Continued)

| Report from file: | C:\WINSITU\3BGW2.BIN | | | | |
|---|---|---|---|---|---|
| | | | Chan[2] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/22/00 14:16 | 0 | 7.719 | 0.009 | 30.188 | |
| 2/22/00 14:16 | 0.0165 | 5.833 | -0.004 | 30.186 | |
| 2/22/00 14:16 | 0.033 | 4.572 | -0.008 | 30.186 | |
| 2/22/00 14:16 | 0.0495 | 3.147 | -0.008 | 30.186 | |
| 2/22/00 14:16 | 0.066 | 2.153 | -0.008 | 30.188 | |
| 2/22/00 14:16 | 0.0825 | 1.403 | -0.008 | 30.188 | |
| 2/22/00 14:16 | 0.099 | 0.861 | -0.008 | 30.188 | |
| 2/22/00 14:16 | 0.1155 | 0.484 | -0.008 | 30.186 | |
| 2/22/00 14:16 | 0.132 | 0.263 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.1485 | 0.118 | -0.012 | 30.186 | |
| 2/22/00 14:16 | 0.165 | 0.041 | -0.012 | 30.186 | |
| 2/22/00 14:16 | 0.1815 | 0.011 | -0.012 | 30.186 | |
| 2/22/00 14:16 | 0.198 | 0.002 | -0.008 | 30.19 | |
| 2/22/00 14:16 | 0.2145 | 0.006 | -0.008 | 30.19 | |
| 2/22/00 14:16 | 0.231 | 0.004 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.2475 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.264 | 0 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.2805 | 0.006 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.297 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.3135 | 0.004 | -0.017 | 30.186 | |
| 2/22/00 14:16 | 0.33 | 0.004 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.3467 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.3643 | 0.006 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.383 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.4028 | 0.006 | -0.012 | 30.188 | |
| 2/22/00 14:16 | 0.4238 | 0.004 | -0.012 | 30.19 | |
| 2/22/00 14:17 | 0.446 | 0.004 | -0.012 | 30.188 | |
| 2/22/00 14:17 | 0.4695 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:17 | 0.4943 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:17 | 0.5207 | 0 | -0.012 | 30.192 | |
| 2/22/00 14:17 | 0.5487 | 0.009 | -0.008 | 30.188 | |
| 2/22/00 14:17 | 0.5783 | 0 | -0.012 | 30.19 | |
| 2/22/00 14:17 | 0.6097 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:17 | 0.6428 | 0.006 | -0.008 | 30.19 | |
| 2/22/00 14:17 | 0.678 | 0.002 | -0.012 | 30.188 | |
| 2/22/00 14:17 | 0.7153 | 0.006 | -0.012 | 30.188 | |
| 2/22/00 14:17 | 0.7548 | 0.004 | -0.017 | 30.19 | |
| 2/22/00 14:17 | 0.7967 | 0.004 | -0.012 | 30.19 | |
| 2/22/00 14:17 | 0.841 | 0 | -0.012 | 30.19 | |
| 2/22/00 14:17 | 0.888 | -0.002 | -0.017 | 30.192 | |
| 2/22/00 14:17 | 0.9378 | -0.002 | -0.017 | 30.194 | |
| Report from file: | C:\WINSITU\3BGW2.BIN | | | | |
| | | | Chan[2] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/22/00 14:17 | 0.9905 | 0 | -0.012 | 30.19 | |
| 2/22/00 14:17 | 1.0463 | -0.004 | -0.017 | 30.194 | |
| 2/22/00 14:17 | 1.1055 | 0 | -0.017 | 30.192 | |
| 2/22/00 14:17 | 1.1682 | 0.002 | -0.012 | 30.192 | |

**Table C-9.** Raw Data Obtained from Slug Test of 3BS1-GW2 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/22/00 14:17 | 1.2345 | 0.002 | -0.012 | 30.192 | |
| 2/22/00 14:17 | 1.3048 | 0.002 | -0.008 | 30.19 | |
| 2/22/00 14:17 | 1.3793 | 0.004 | -0.012 | 30.19 | |
| 2/22/00 14:18 | 1.4583 | 0.002 | -0.008 | 30.19 | |
| 2/22/00 14:18 | 1.542 | 0.004 | -0.008 | 30.188 | |
| 2/22/00 14:18 | 1.6305 | 0.004 | -0.008 | 30.19 | |
| 2/22/00 14:18 | 1.7243 | 0.004 | -0.008 | 30.19 | |
| 2/22/00 14:18 | 1.8237 | 0.004 | -0.008 | 30.19 | |
| 2/22/00 14:18 | 1.929 | 0.004 | -0.008 | 30.188 | |
| 2/22/00 14:18 | 2.0405 | 0.004 | -0.012 | 30.19 | |
| 2/22/00 14:18 | 2.1587 | 0.004 | -0.008 | 30.19 | |
| 2/22/00 14:18 | 2.2838 | 0.004 | -0.008 | 30.188 | |
| 2/22/00 14:18 | 2.4163 | 0.002 | -0.008 | 30.194 | |
| 2/22/00 14:19 | 2.5568 | 0.006 | -0.012 | 30.2 | |
| 2/22/00 14:19 | 2.7057 | 0.004 | -0.008 | 30.204 | |
| 2/22/00 14:19 | 2.8632 | 0.004 | -0.008 | 30.21 | |
| 2/22/00 14:19 | 3.0298 | 0.006 | -0.004 | 30.206 | |
| 2/22/00 14:19 | 3.1965 | 0 | -0.004 | 30.212 | |
| 2/22/00 14:19 | 3.3632 | 0.006 | -0.008 | 30.212 | |
| 2/22/00 14:20 | 3.5298 | 0.004 | -0.004 | 30.212 | |
| 2/22/00 14:20 | 3.6965 | 0.002 | -0.008 | 30.212 | |
| 2/22/00 14:20 | 3.8632 | 0.004 | -0.004 | 30.212 | |
| 2/22/00 14:20 | 4.0298 | 0.004 | -0.004 | 30.214 | |
| 2/22/00 14:20 | 4.1965 | 0.004 | -0.004 | 30.21 | |

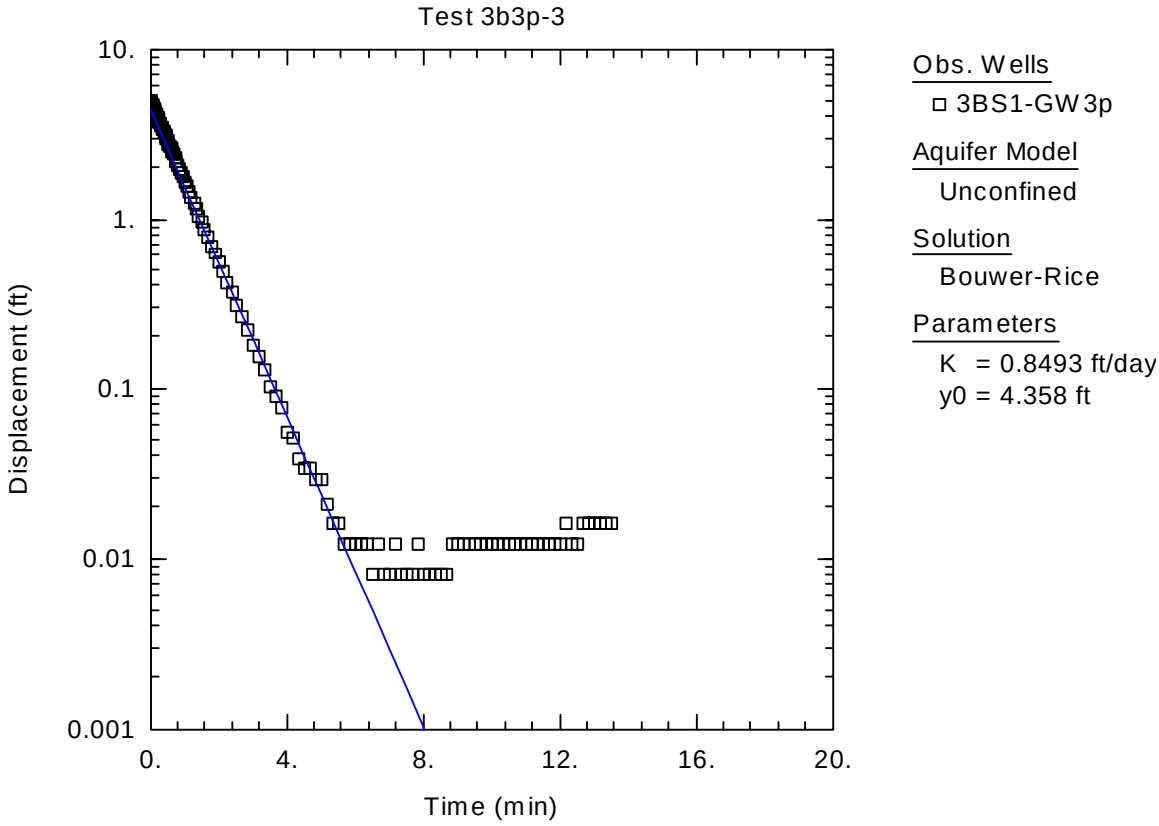



**Figure C-19.** Graphical Representation of Raw Data Obtained from Slug Test of 3BS1-GW3p, Bouwer-Rice Solution

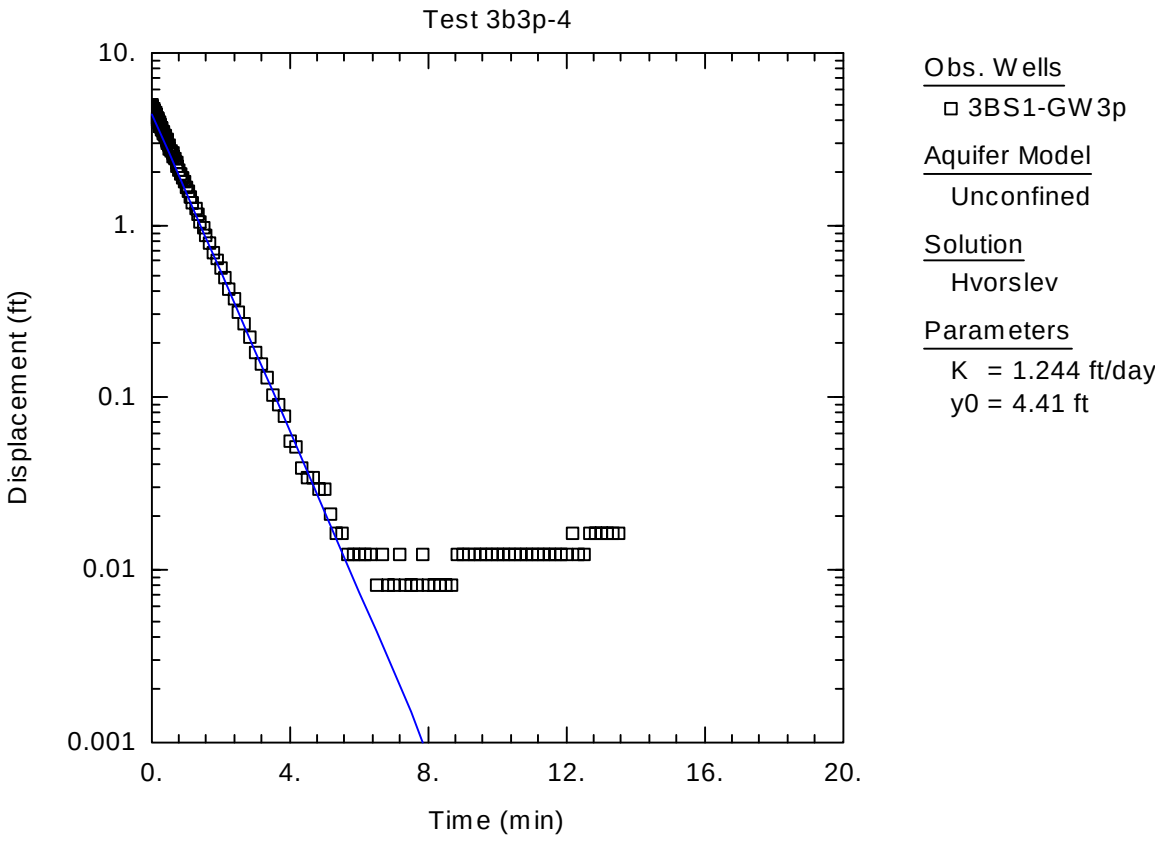



**Figure C-20.** Graphical Representation of Raw Data Obtained from Slug Test of 3BS1-GW3p, Hvorslev Solution

**Table C-10.** Raw Data Obtained from Slug Test of 3BS1-GW3p

| | | | | |
|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | |
| Report generated: | 2/25/00 | 10:14:16 | | |
| Report from file: | C:\WINSITU\3BGW3P.BIN | | | |
| DataMgr Version | 2.31.0.0 | | | |
| Serial number: | 45211 | | | |
| Firmware Version | 7.05 | | | |
| Unit name: | HERMIT 3000 | | | |
| Test name: | | 3BGW3P | | |
| Test defined on: | 2/23/00 | 11:33:17 | | |
| Test started on: | 2/23/00 | 11:36:06 | | |
| Test stopped on: | 2/23/00 | 11:49:42 | | |
| Test extracted on: | 2/23/00 | 11:55:32 | | |
| Data gathered using logarithmic testing | | | | |
| Maximum time between data points: | 0.1667 minutes. | | | |
| TOTAL DATA SAMPLES | 131 | | | |
| Channel number [1] | | | | |
| Measurement type: | Pressure/Level | | | |
| Channel name: | 1544DB | | | |
| Linearity: | 0.0437 | | | |
| Scale: | | 29.8371 | | |
| Offset: | | -0.0139 | | |
| Warmup: | | 50 | | |
| Specific gravity: | 1 | | | |
| Mode: | TOC | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | |
| Referenced on: | channel definition. | | | |
| Pressure head at reference: | 6.657 | Feet $H_2O$ | | |
| Channel number [0] | | | | |
| Measurement type: | Barometric Pressure | | | |
| Channel name: | Barometric | | | |
| Linearity: | 0 | | | |
| Scale: | | 0 | | |
| Offset: | | 0 | | |
| Warmup: | | 50 | | |
| Report from file: | C:\WINSITU\3BGW3P.BIN | | | |
| | | | Chan[1] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Inches Hg | |
| 2/23/00 11:36 | 0 | 4.908 | 30.434 | |
| Report from file: | C:\WINSITU\3BGW3P.BIN | | | |
| | | | Chan[1] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Inches Hg | |
| 2/23/00 11:36 | 0.0112 | 4.904 | 30.434 | |
| 2/23/00 11:36 | 0.0223 | 4.861 | 30.434 | |
| 2/23/00 11:36 | 0.0335 | 4.801 | 30.434 | |
| 2/23/00 11:36 | 0.0447 | 4.745 | 30.434 | |
| 2/23/00 11:36 | 0.0558 | 4.689 | 30.434 | |
| 2/23/00 11:36 | 0.067 | 4.628 | 30.436 | |
| 2/23/00 11:36 | 0.0782 | 4.577 | 30.432 | |
| 2/23/00 11:36 | 0.0893 | 4.521 | 30.432 | |
| 2/23/00 11:36 | 0.1005 | 4.469 | 30.434 | |
| 2/23/00 11:36 | 0.1117 | 4.413 | 30.434 | |
| 2/23/00 11:36 | 0.1228 | 4.366 | 30.432 | |

**Table C-10.** Raw Data Obtained from Slug Test of 3BS1-GW3p (Continued)

| | | | | |
|---|---|---|---|---|
| 2/23/00 11:36 | 0.134 | 4.31 | 30.434 | |
| 2/23/00 11:36 | 0.1452 | 4.258 | 30.434 | |
| 2/23/00 11:36 | 0.1563 | 4.207 | 30.434 | |
| 2/23/00 11:36 | 0.1675 | 4.16 | 30.432 | |
| 2/23/00 11:36 | 0.1787 | 4.108 | 30.436 | |
| 2/23/00 11:36 | 0.1898 | 4.056 | 30.434 | |
| 2/23/00 11:36 | 0.201 | 4.009 | 30.434 | |
| 2/23/00 11:36 | 0.2122 | 3.962 | 30.434 | |
| 2/23/00 11:36 | 0.2233 | 3.91 | 30.434 | |
| 2/23/00 11:36 | 0.235 | 3.863 | 30.432 | |
| 2/23/00 11:36 | 0.2475 | 3.815 | 30.432 | |
| 2/23/00 11:36 | 0.2607 | 3.764 | 30.434 | |
| 2/23/00 11:36 | 0.2747 | 3.708 | 30.434 | |
| 2/23/00 11:36 | 0.2895 | 3.656 | 30.434 | |
| 2/23/00 11:36 | 0.3052 | 3.596 | 30.432 | |
| 2/23/00 11:36 | 0.3218 | 3.536 | 30.432 | |
| 2/23/00 11:36 | 0.3395 | 3.471 | 30.432 | |
| 2/23/00 11:36 | 0.3582 | 3.402 | 30.432 | |
| 2/23/00 11:36 | 0.378 | 3.334 | 30.432 | |
| 2/23/00 11:36 | 0.399 | 3.265 | 30.432 | |
| 2/23/00 11:36 | 0.4212 | 3.187 | 30.434 | |
| 2/23/00 11:36 | 0.4447 | 3.118 | 30.432 | |
| 2/23/00 11:36 | 0.4695 | 3.041 | 30.434 | |
| 2/23/00 11:36 | 0.4958 | 2.994 | 30.432 | |
| 2/23/00 11:36 | 0.5238 | 2.86 | 30.434 | |
| 2/23/00 11:36 | 0.5535 | 2.766 | 30.434 | |
| 2/23/00 11:36 | 0.5848 | 2.68 | 30.434 | |
| 2/23/00 11:36 | 0.618 | 2.581 | 30.434 | |
| 2/23/00 11:36 | 0.6532 | 2.482 | 30.434 | |
| 2/23/00 11:36 | 0.6905 | 2.387 | 30.432 | |
| 2/23/00 11:36 | 0.73 | 2.288 | 30.436 | |
| 2/23/00 11:36 | 0.7718 | 2.185 | 30.434 | |
| 2/23/00 11:36 | 0.8162 | 2.077 | 30.434 | |
| 2/23/00 11:36 | 0.8632 | 1.974 | 30.434 | |
| 2/23/00 11:37 | 0.913 | 1.871 | 30.434 | |
| 2/23/00 11:37 | 0.9657 | 1.759 | 30.434 | |
| 2/23/00 11:37 | 1.0215 | 1.656 | 30.432 | |
| Report from file: | C:\WINSITU\3BGW3P.BIN | | | |
| | | | Chan[1] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Inches Hg | |
| 2/23/00 11:37 | 1.0807 | 1.548 | 30.434 | |
| 2/23/00 11:37 | 1.1433 | 1.445 | 30.434 | |
| 2/23/00 11:37 | 1.2097 | 1.346 | 30.434 | |
| 2/23/00 11:37 | 1.28 | 1.243 | 30.434 | |
| 2/23/00 11:37 | 1.3545 | 1.144 | 30.432 | |
| 2/23/00 11:37 | 1.4335 | 1.049 | 30.434 | |
| 2/23/00 11:37 | 1.5172 | 0.954 | 30.434 | |
| 2/23/00 11:37 | 1.6057 | 0.864 | 30.434 | |
| 2/23/00 11:37 | 1.6995 | 0.778 | 30.434 | |
| 2/23/00 11:37 | 1.7988 | 0.696 | 30.434 | |
| 2/23/00 11:38 | 1.9042 | 0.619 | 30.434 | |
| 2/23/00 11:38 | 2.0157 | 0.546 | 30.434 | |
| 2/23/00 11:38 | 2.1338 | 0.481 | 30.432 | |

**Table C-10.** Raw Data Obtained from Slug Test of 3BS1-GW3p (Continued)

| | | | | |
|---|---|---|---|---|
| 2/23/00 11:38 | 2.259 | 0.417 | 30.432 | |
| 2/23/00 11:38 | 2.3915 | 0.361 | 30.434 | |
| 2/23/00 11:38 | 2.532 | 0.305 | 30.434 | |
| 2/23/00 11:38 | 2.6808 | 0.262 | 30.434 | |
| 2/23/00 11:38 | 2.8383 | 0.219 | 30.434 | |
| 2/23/00 11:39 | 3.005 | 0.18 | 30.432 | |
| 2/23/00 11:39 | 3.1717 | 0.154 | 30.432 | |
| 2/23/00 11:39 | 3.3383 | 0.128 | 30.432 | |
| 2/23/00 11:39 | 3.505 | 0.102 | 30.432 | |
| 2/23/00 11:39 | 3.6717 | 0.089 | 30.432 | |
| 2/23/00 11:39 | 3.8383 | 0.077 | 30.434 | |
| 2/23/00 11:40 | 4.005 | 0.055 | 30.416 | |
| 2/23/00 11:40 | 4.1717 | 0.051 | 30.414 | |
| 2/23/00 11:40 | 4.3383 | 0.038 | 30.416 | |
| 2/23/00 11:40 | 4.505 | 0.034 | 30.418 | |
| 2/23/00 11:40 | 4.6717 | 0.034 | 30.432 | |
| 2/23/00 11:40 | 4.8383 | 0.029 | 30.442 | |
| 2/23/00 11:41 | 5.005 | 0.029 | 30.438 | |
| 2/23/00 11:41 | 5.1717 | 0.021 | 30.434 | |
| 2/23/00 11:41 | 5.3383 | 0.016 | 30.436 | |
| 2/23/00 11:41 | 5.505 | 0.016 | 30.434 | |
| 2/23/00 11:41 | 5.6717 | 0.012 | 30.432 | |
| 2/23/00 11:41 | 5.8383 | 0.012 | 30.432 | |
| 2/23/00 11:42 | 6.005 | 0.012 | 30.43 | |
| 2/23/00 11:42 | 6.1717 | 0.012 | 30.43 | |
| 2/23/00 11:42 | 6.3383 | 0.012 | 30.43 | |
| 2/23/00 11:42 | 6.505 | 0.008 | 30.432 | |
| 2/23/00 11:42 | 6.6717 | 0.012 | 30.428 | |
| 2/23/00 11:42 | 6.8383 | 0.008 | 30.428 | |
| 2/23/00 11:43 | 7.005 | 0.008 | 30.43 | |
| 2/23/00 11:43 | 7.1717 | 0.012 | 30.43 | |
| 2/23/00 11:43 | 7.3383 | 0.008 | 30.43 | |
| 2/23/00 11:43 | 7.505 | 0.008 | 30.43 | |
| 2/23/00 11:43 | 7.6717 | 0.008 | 30.428 | |
| 2/23/00 11:43 | 7.8383 | 0.012 | 30.428 | |
| Report from file: | C:\WINSITU\3BGW3P.BIN | | | |
| | | | Chan[1] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Inches Hg | |
| 2/23/00 11:44 | 8.005 | 0.008 | 30.428 | |
| 2/23/00 11:44 | 8.1717 | 0.008 | 30.426 | |
| 2/23/00 11:44 | 8.3383 | 0.008 | 30.428 | |
| 2/23/00 11:44 | 8.505 | 0.008 | 30.426 | |
| 2/23/00 11:44 | 8.6717 | 0.008 | 30.428 | |
| 2/23/00 11:44 | 8.8383 | 0.012 | 30.426 | |
| 2/23/00 11:45 | 9.005 | 0.012 | 30.428 | |
| 2/23/00 11:45 | 9.1717 | 0.012 | 30.426 | |
| 2/23/00 11:45 | 9.3383 | 0.012 | 30.428 | |
| 2/23/00 11:45 | 9.505 | 0.012 | 30.428 | |
| 2/23/00 11:45 | 9.6717 | 0.012 | 30.428 | |
| 2/23/00 11:45 | 9.8383 | 0.012 | 30.428 | |
| 2/23/00 11:46 | 10.005 | 0.012 | 30.426 | |
| 2/23/00 11:46 | 10.1717 | 0.012 | 30.428 | |
| 2/23/00 11:46 | 10.3383 | 0.012 | 30.428 | |

**Table C-10.** Raw Data Obtained from Slug Test of 3BS1-GW3p (Continued)

| | | | | |
|---|---|---|---|---|
| 2/23/00 11:46 | 10.505 | 0.012 | 30.428 | |
| 2/23/00 11:46 | 10.6717 | 0.012 | 30.428 | |
| 2/23/00 11:46 | 10.8383 | 0.012 | 30.426 | |
| 2/23/00 11:47 | 11.005 | 0.012 | 30.426 | |
| 2/23/00 11:47 | 11.1717 | 0.012 | 30.428 | |
| 2/23/00 11:47 | 11.3383 | 0.012 | 30.428 | |
| 2/23/00 11:47 | 11.505 | 0.012 | 30.428 | |
| 2/23/00 11:47 | 11.6717 | 0.012 | 30.428 | |
| 2/23/00 11:47 | 11.8383 | 0.012 | 30.428 | |
| 2/23/00 11:48 | 12.005 | 0.012 | 30.428 | |
| 2/23/00 11:48 | 12.1717 | 0.016 | 30.426 | |
| 2/23/00 11:48 | 12.3383 | 0.012 | 30.428 | |
| 2/23/00 11:48 | 12.505 | 0.012 | 30.43 | |
| 2/23/00 11:48 | 12.6717 | 0.016 | 30.426 | |
| 2/23/00 11:48 | 12.8383 | 0.016 | 30.428 | |
| 2/23/00 11:49 | 13.005 | 0.016 | 30.43 | |
| 2/23/00 11:49 | 13.1717 | 0.016 | 30.43 | |
| 2/23/00 11:49 | 13.3383 | 0.016 | 30.428 | |
| 2/23/00 11:49 | 13.505 | 0.016 | 30.428 | |

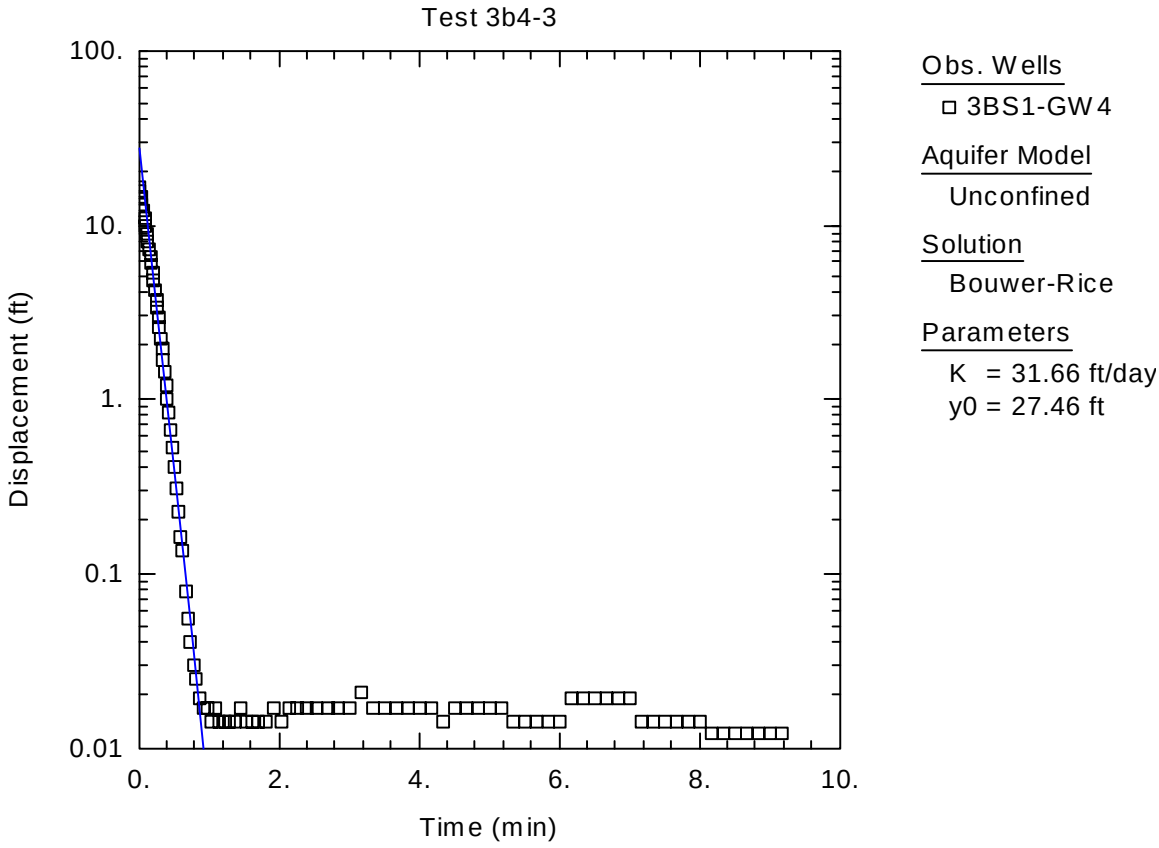



**Figure C-21.** Graphical Representation of Raw Data Obtained from Slug Test of 3BS1-GW4, Bouwer-Rice Solution

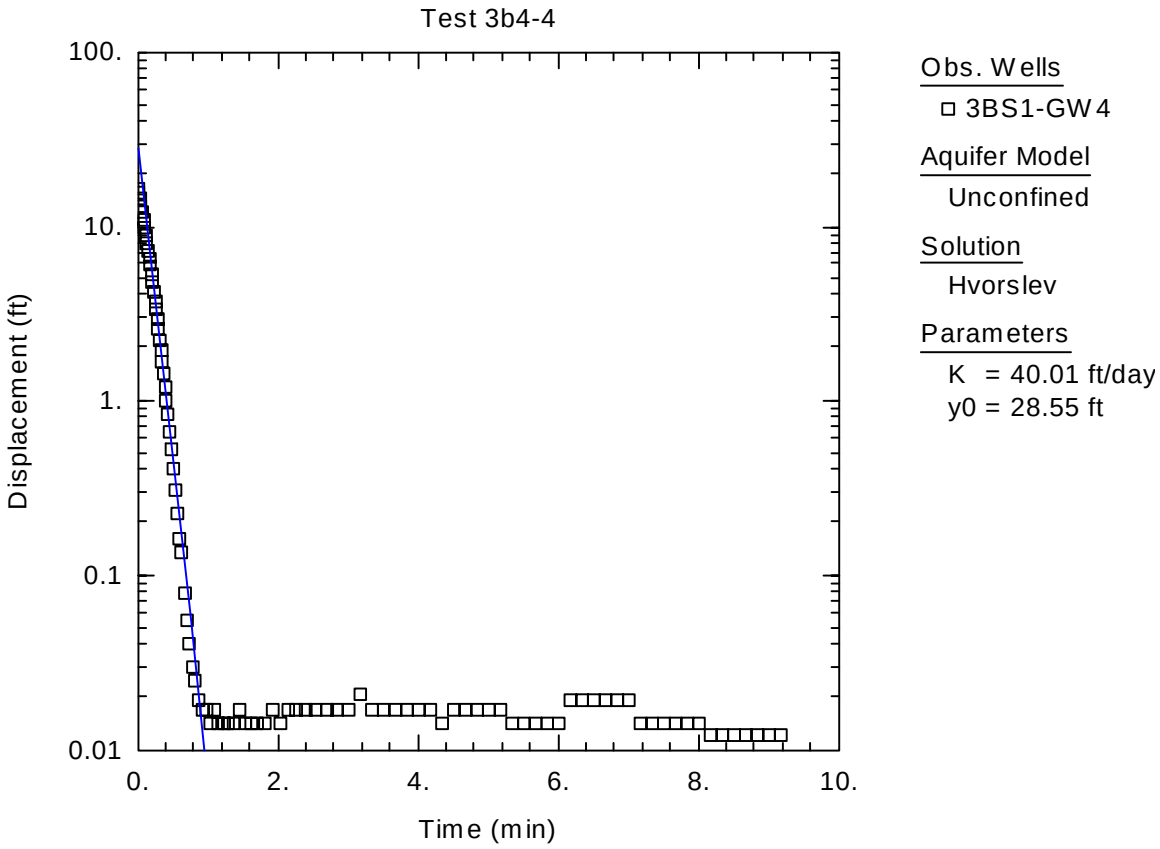



**Figure C-22.** Graphical Representation of Raw Data Obtained from Slug Test of 3BS1-GW4, Hvorslev Solution

**Table C-11.** Raw Data Obtained from Slug Test of 3BS1-GW4

| | | | | | |
|---|---|---|---|---|---|
| In-Situ Inc. | Hermit 3000 | | | | |
| Report generated: | 2/25/00 | 10:15:03 | | | |
| Report from file: | C:\WINSITU\3BGW4.BIN | | | | |
| DataMgr Version | 2.31.0.0 | | | | |
| Serial number: | 45316 | | | | |
| Firmware Version | 7.06 | | | | |
| Unit name: | HERMIT 3000 | | | | |
| Test name: | | 3BGW4 | | | |
| Test defined on: | 2/22/00 | 10:59:55 | | | |
| Test started on: | 2/22/00 | 11:07:45 | | | |
| Test stopped on: | 2/22/00 | 11:17:53 | | | |
| Test extracted on: | 2/22/00 | 11:22:55 | | | |
| Data gathered using logarithmic testing | | | | | |
| Maximum time between data points: | 0.1667 minutes. | | | | |
| TOTAL DATA SAMPLES | 103 | | | | |
| Channel number [2] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | 6676 | | | | |
| Linearity: | 0.0766 | | | | |
| Scale: | | 14.809 | | | |
| Offset: | | 0.0119 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 25.488 | Feet $H_2O$ | | | |
| Channel number [3] | | | | | |
| Measurement type: | Pressure/Level | | | | |
| Channel name: | Probe 1544DB | | | | |
| Linearity: | 0.0437 | | | | |
| Scale: | | 29.8371 | | | |
| Offset: | | -0.0139 | | | |
| Warmup: | | 50 | | | |
| Specific gravity: | 1 | | | | |
| Mode: | TOC | | | | |
| User-defined reference: | 0 | Feet $H_2O$ | | | |
| Referenced on: | channel definition. | | | | |
| Pressure head at reference: | 5.808 | Feet $H_2O$ | | | |
| Channel number [0] | | | | | |
| Measurement type: | Barometric Pressure | | | | |
| Channel name: | Barometric | | | | |
| Linearity: | 0 | | | | |
| Scale: | | 0 | | | |
| Offset: | | 0 | | | |
| Warmup: | | 50 | | | |
| Report from file: | C:\WINSITU\3BGW4.BIN | | | | |
| | | | Chan[2] | Chan[3] | Chan[0] |
| 2/22/00 11:07 | 0 | 16.599 | -0.003 | 30.226 | |
| 2/22/00 11:07 | 0.0168 | 15.7 | -0.003 | 30.228 | |
| 2/22/00 11:07 | 0.0337 | 14.432 | -0.003 | 30.226 | |

**Table C-11.** Raw Data Obtained from Slug Test of 3BS1-GW4 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/22/00 11:07 | 0.0505 | 13.157 | -0.003 | 30.226 | |
| 2/22/00 11:07 | 0.0673 | 11.978 | 0.002 | 30.228 | |
| 2/22/00 11:07 | 0.0842 | 10.885 | 0.002 | 30.231 | |
| 2/22/00 11:07 | 0.101 | 9.868 | -0.003 | 30.226 | |
| 2/22/00 11:07 | 0.1178 | 8.931 | -0.003 | 30.228 | |
| 2/22/00 11:07 | 0.1347 | 8.062 | -0.003 | 30.228 | |
| 2/22/00 11:07 | 0.1515 | 7.263 | -0.003 | 30.228 | |
| 2/22/00 11:07 | 0.1683 | 6.527 | -0.003 | 30.228 | |
| 2/22/00 11:07 | 0.202 | 5.234 | -0.003 | 30.231 | |
| 2/22/00 11:07 | 0.2188 | 4.669 | -0.003 | 30.231 | |
| 2/22/00 11:07 | 0.2357 | 4.151 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.2525 | 3.681 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.2693 | 3.253 | -0.007 | 30.231 | |
| 2/22/00 11:08 | 0.2862 | 2.864 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.303 | 2.516 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.3198 | 2.197 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.3367 | 1.914 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.3543 | 1.645 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.373 | 1.41 | 0.002 | 30.233 | |
| 2/22/00 11:08 | 0.3928 | 1.195 | -0.003 | 30.233 | |
| 2/22/00 11:08 | 0.4138 | 0.995 | -0.003 | 30.233 | |
| 2/22/00 11:08 | 0.436 | 0.817 | -0.003 | 30.233 | |
| 2/22/00 11:08 | 0.4595 | 0.658 | -0.003 | 30.233 | |
| 2/22/00 11:08 | 0.4843 | 0.52 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.5107 | 0.4 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.5387 | 0.303 | -0.007 | 30.231 | |
| 2/22/00 11:08 | 0.5683 | 0.223 | -0.003 | 30.231 | |
| 2/22/00 11:08 | 0.5997 | 0.161 | -0.003 | 30.233 | |
| 2/22/00 11:08 | 0.6328 | 0.135 | 0.002 | 30.235 | |
| 2/22/00 11:08 | 0.668 | 0.079 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 0.7053 | 0.055 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 0.7448 | 0.04 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 0.7867 | 0.03 | -0.003 | 30.233 | |
| 2/22/00 11:08 | 0.831 | 0.025 | -0.003 | 30.235 | |
| Report from file: | C:\WINSITU\3BGW4.BIN | | | | |
| | | | Chan[2] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/22/00 11:08 | 0.878 | 0.019 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 0.9278 | 0.017 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 0.9805 | 0.017 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 1.0363 | 0.014 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 1.0955 | 0.017 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 1.1582 | 0.014 | -0.003 | 30.235 | |
| 2/22/00 11:08 | 1.2245 | 0.014 | -0.003 | 30.237 | |
| 2/22/00 11:09 | 1.2948 | 0.014 | -0.003 | 30.235 | |
| 2/22/00 11:09 | 1.3693 | 0.014 | -0.003 | 30.237 | |
| 2/22/00 11:09 | 1.4483 | 0.017 | -0.003 | 30.237 | |
| 2/22/00 11:09 | 1.532 | 0.014 | -0.003 | 30.237 | |
| 2/22/00 11:09 | 1.6205 | 0.014 | -0.003 | 30.239 | |
| 2/22/00 11:09 | 1.7143 | 0.014 | -0.003 | 30.239 | |
| 2/22/00 11:09 | 1.8137 | 0.014 | -0.003 | 30.239 | |
| 2/22/00 11:09 | 1.919 | 0.017 | -0.003 | 30.237 | |

**Table C-11.** Raw Data Obtained from Slug Test of 3BS1-GW4 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 2/22/00 11:09 | 2.0305 | 0.014 | -0.003 | 30.239 | |
| 2/22/00 11:09 | 2.1487 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:10 | 2.2738 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:10 | 2.4063 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:10 | 2.5468 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:10 | 2.6957 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:10 | 2.8532 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:10 | 3.0198 | 0.017 | -0.003 | 30.241 | |
| 2/22/00 11:10 | 3.1865 | 0.021 | 0.002 | 30.241 | |
| 2/22/00 11:11 | 3.3532 | 0.017 | 0.002 | 30.241 | |
| 2/22/00 11:11 | 3.5198 | 0.017 | -0.003 | 30.239 | |
| 2/22/00 11:11 | 3.6865 | 0.017 | 0.002 | 30.241 | |
| 2/22/00 11:11 | 3.8532 | 0.017 | 0.002 | 30.243 | |
| 2/22/00 11:11 | 4.0198 | 0.017 | -0.003 | 30.241 | |
| 2/22/00 11:11 | 4.1865 | 0.017 | -0.003 | 30.241 | |
| 2/22/00 11:12 | 4.3532 | 0.014 | 0.002 | 30.241 | |
| 2/22/00 11:12 | 4.5198 | 0.017 | 0.002 | 30.243 | |
| 2/22/00 11:12 | 4.6865 | 0.017 | 0.002 | 30.243 | |
| 2/22/00 11:12 | 4.8532 | 0.017 | -0.003 | 30.243 | |
| 2/22/00 11:12 | 5.0198 | 0.017 | -0.003 | 30.243 | |
| 2/22/00 11:12 | 5.1865 | 0.017 | -0.003 | 30.243 | |
| 2/22/00 11:13 | 5.3532 | 0.014 | -0.003 | 30.241 | |
| 2/22/00 11:13 | 5.5198 | 0.014 | -0.003 | 30.241 | |
| 2/22/00 11:13 | 5.6865 | 0.014 | -0.003 | 30.245 | |
| 2/22/00 11:13 | 5.8532 | 0.014 | 0.002 | 30.245 | |
| 2/22/00 11:13 | 6.0198 | 0.014 | 0.002 | 30.243 | |
| 2/22/00 11:13 | 6.1865 | 0.019 | 0.002 | 30.243 | |
| 2/22/00 11:14 | 6.3532 | 0.019 | 0.002 | 30.243 | |
| 2/22/00 11:14 | 6.5198 | 0.019 | 0.002 | 30.241 | |
| 2/22/00 11:14 | 6.6865 | 0.019 | 0.002 | 30.243 | |
| 2/22/00 11:14 | 6.8532 | 0.019 | 0.002 | 30.243 | |
| 2/22/00 11:14 | 7.0198 | 0.019 | 0.002 | 30.226 | |
| 2/22/00 11:15 | 7.3532 | 0.014 | 0.002 | 30.237 | |
| Report from file: | C:\WINSITU\3BGW4.BIN | | | | |
| | | | Chan[2] | Chan[3] | Chan[0] |
| Date Time | ET (min) | Feet $H_2O$ | Feet $H_2O$ | Inches Hg | |
| 2/22/00 11:15 | 7.5198 | 0.014 | 0.002 | 30.247 | |
| 2/22/00 11:15 | 7.6865 | 0.014 | 0.002 | 30.255 | |
| 2/22/00 11:15 | 7.8532 | 0.014 | 0.002 | 30.259 | |
| 2/22/00 11:15 | 8.0198 | 0.014 | 0.002 | 30.265 | |
| 2/22/00 11:15 | 8.1865 | 0.012 | 0.002 | 30.269 | |
| 2/22/00 11:16 | 8.3532 | 0.012 | 0.006 | 30.271 | |
| 2/22/00 11:16 | 8.5198 | 0.012 | 0.006 | 30.275 | |
| 2/22/00 11:16 | 8.6865 | 0.012 | 0.006 | 30.275 | |
| 2/22/00 11:16 | 8.8532 | 0.012 | 0.002 | 30.279 | |
| 2/22/00 11:16 | 9.0198 | 0.012 | 0.01 | 30.281 | |
| 2/22/00 11:16 | 9.1865 | 0.012 | 0.01 | 30.283 | |
| 2/22/00 11:17 | 9.3532 | 0.014 | 0.006 | 30.285 | |
| 2/22/00 11:17 | 9.5198 | 0.017 | 0.01 | 30.283 | |
| 2/22/00 11:17 | 9.6865 | 0.014 | 0.015 | 30.269 | |
| 2/22/00 11:17 | 9.8532 | 0.014 | 0.006 | 30.257 | |
| 2/22/00 11:17 | 10.0198 | 0.019 | 0.01 | 30.247 | |