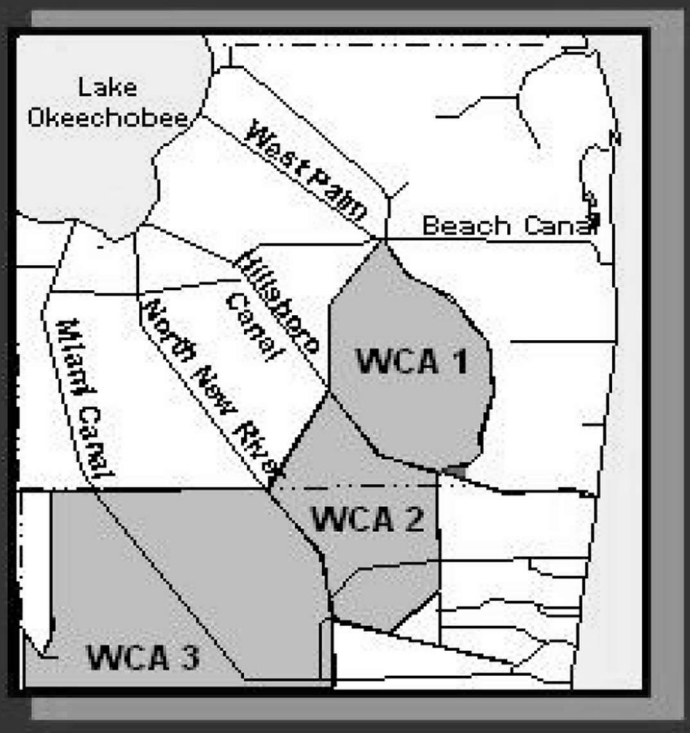
Hydrogeologic Investigation of the Floridan Aquifer System Western Hillsboro Basin Palm Beach County, Florida

Technical Publication WS-8

South Florida Water Management District



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EXECUTIVE SUMMARY

The purpose of this project was to provide hydrogeologic information on the Floridan Aquifer System (FAS) in the Western Hillsboro Basin, WS-8. This area has been identified as the site for a pilot aquifer storage and recovery system in both the *Central and Southern Florida Project Comprehensive Review Study* (USACE and SFWMD, 1999) and the *Lower East Coast Regional Water Supply Plan* (SFWMD, 2000). Hydrogeologic data obtained will also support future groundwater modeling efforts of the FAS, for which current data are limited. In particular, water level information from the upper portion of the lower FAS was found insufficient while attempting to calibrate past FAS models. Therefore, South Florida Water Management District (SFWMD) Contract C-9761 for $999,915 was executed in November 1998 to install two wells at the site, consisting of a tri-zone FAS monitor well and a dual-zone test-production well. These wells were to provide data to evaluate the subsurface at the site for water supply development and ASR potential.

This report primarily describes the drilling, construction, and testing of the 24-inch diameter Class V exploratory well identified as EXW-1 at the Western Hillsboro site. This report presents data obtained during drilling and testing operations and summarizes analyses conducted. Well EXW-1 is the designation assigned by the Florida Department of Environmental Protection (FDEP) under Permit Number UC-153872-001. The exploratory well (EXW-1) was constructed on a SFWMD-owned right-of-way proximal to the SFWMD's S-39 water control structure on the Hillsboro Canal in the southwestern quarter of Section 19, Township 47 South, Range 41 East.

The scope of the investigation consisted of constructing and testing a FDEP permitted exploratory well. The exploratory well (EXW-1) was drilled to a total depth of 1,225 feet below pad level (bpl). It was completed into a single distinct hydrogeologic zone within the upper Floridan aquifer between 1,015 and 1,225 feet bpl.

The main findings of the exploratory drilling and testing program at this site are as follows:

- Lithologic information and geophysical logs obtained from EXW-1 indicate that soft nonindurated detritial clays, silts, and poorly indurated mudstones of the Hawthorn Group predominate from 205 to 985 feet bpl. These low permeable sediments act as confining units separating the FAS from the Surficial Aquifer System.
- The top of the FAS was identified at a depth of approximately 985 feet bpl, as defined by the Southeastern Geological Society Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition (1986).
- Lithologic and geophysical logs, packer test results, and specific capacity results indicate moderate to good production capacity of the upper Floridan aquifer from 1,015 to 1,225 feet bpl.

- A productive horizon in the upper Floridan aquifer from 1,015 to 1,225 feet bpl yielded a transmissivity value of 60,620 gallons per day per foot, and a dimensionless storage coefficient of 9.8 x 10^{-5} based on a leaky aquifer model.
- Composite water quality sampling of EXW-1 indicates that chloride and total dissolved solids exceed potable drinking water standards, with chloride and total dissolved solid concentrations of 1,812 and 4,064 milligrams per liter, respectively.
- The fluid-type logs (e.g., flow, temperature) indicate good production from flow zones between 1,050 and 1,170 feet bpl and 1,190 to 1,210 feet bpl. Below 1,210 feet bpl, the productive capacity is limited suggesting lower permeable semiconfining units near the base of the proposed storage horizon.

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INTRODUCTION

Background

The purpose of this project was to provide hydrogeologic information on the Floridan Aquifer System (FAS) in the Western Hillsboro Basin. This area has been identified as the site for a pilot aquifer storage and recovery (ASR) system in both the *Central and Southern Florida Project Comprehensive Review Study* (Restudy) (USACE and SFWMD, 1999) and the *Lower East Coast Regional Water Supply Plan* (SFWMD, 2000). Hydrogeologic data obtained will also support future groundwater modeling efforts of the FAS for which current data are limited. In particular, water level information from the upper portion of the lower FAS was found insufficient while attempting to calibrate past FAS models. Therefore, South Florida Water Management District (SFWMD) Contract C-9761 in the amount of $999,915 was executed in November 1998 to install two wells at the site, consisting of a tri-zone FAS monitor well and a dual-zone, test production well. These wells were to provide data to evaluate the subsurface at the site for water supply development and ASR potential.

The drilling contractor, Diversified Drilling Corporation of Tampa, Florida, mobilized to the site in November 1998. Three distinct zones of higher permeability within the FAS were identified during the drilling and testing of a research oriented test pilot hole. A tri-zone monitor well was then constructed using various diameter concentric casings cemented in place, resulting in the FAS monitor intervals indicated in **Table 1**.

Table 1. FAS Monitor Intervals

Zone Identifier	Depth Interval (feet bpl[a])	Hydrogeologic Units
PBF-10R	1,015 - 1,225	Upper Floridan Aquifer
PBF-11	1,515 - 1,670	Middle Floridan Confining Unit
PBF-12	2,135 - 2,260	Lower Floridan Aquifer

a. bpl = below pad level

However, the results of drilling the tri-zone FAS monitor well (at a cost of approximately $650,000) indicated that the middle zone of the FAS did not yield as much water as anticipated. Therefore, the proposed dual-zone production well was redesigned as a single-zone exploratory well conforming to Florida Department of Environmental Protection's (FDEP) Class V injection well standards.

Scope

This report primarily describes the drilling, construction, and testing of the 24-inch diameter Class V exploratory well identified as EXW-1 at the Western Hillsboro site. Also, the data obtained during drilling and testing operations and analyses conducted on the data are presented in this report.

Project Description

The Western Hillsboro site is located approximate 15 miles west of the Atlantic Ocean and approximately 7 miles west of the western boundary of the city of Boca Raton in unincorporated Palm Beach County, Florida. The exploratory well, EXW-1, was constructed on a SFWMD-owned right-of-way proximal to the SFWMD's S-39 water control structure on the Hillsboro Canal in the southwestern quarter of Section 19, Township 47 South, Range 41 East (**Figure 1**).

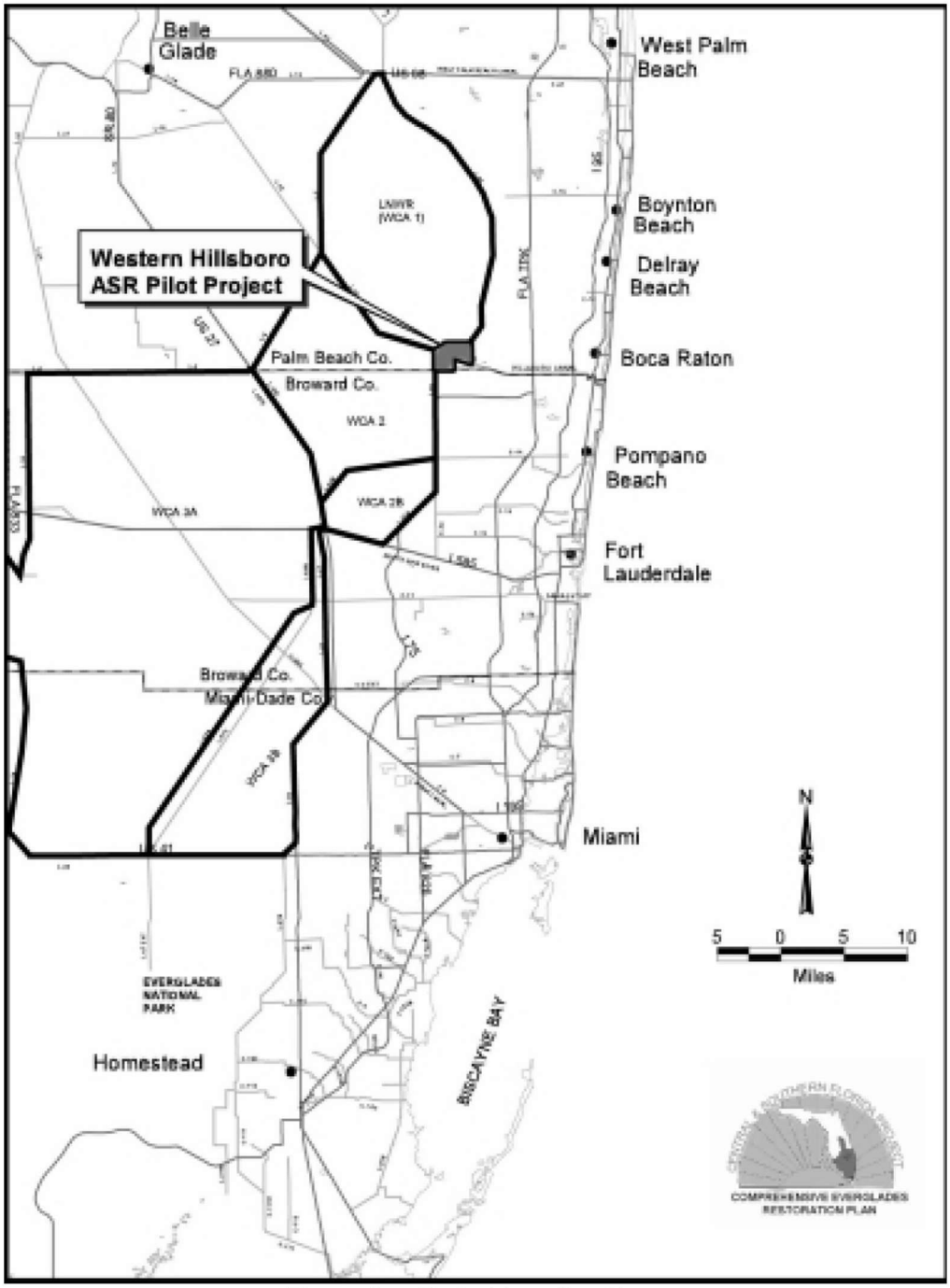

Figure 1. Project Location Map

On December 8, 1999, the FDEP's Underground Injection Control (UIC) group issued Permit Number UC 153872-001 to the SFWMD. This permit allowed for the construction of one Class V, Group 8, 24-inch outside diameter exploratory well at the Western Hillsboro site. A copy of the permit is provided in **Appendix A**.

Upon issuance of the UIC permit, the exploratory well was constructed to the same depth as the monitor zone identified as PBF-10R: 1,015 to 1,225 feet below pad level (bpl). Once completed, additional data gathering and analyses were conducted including a specific capacity and aquifer performance test (APT) to evaluate ASR potential and establish design considerations for a future pilot ASR facility at the site. The remaining portion of this report will focus on the hydrogeology, well drilling, construction, and testing of the FDEP-permitted exploratory well identified as EXW-1.

A change order to Contract C-9671 was executed on November 15, 1999, to drill and construct the 24-inch diameter exploratory well. On December 9, 1999, Diversified Drilling Corporation began construction of EXW-1. Drilling and testing of the exploratory well was completed on June 16, 2000, with the exception of the APT, which was conducted in November 2000.

EXPLORATORY DRILLING AND WELL CONSTRUCTION

Exploratory Well

Diversified Drilling Corporation began site preparation during mid-November, 1999. After minor clearing and rough grading of the site, the ground surface beneath the drill rig and settling tanks was lined with an impermeable high-density polyethylene (HDPE) liner, which was covered with 10-inches of granular fill to protect the liner. A two-foot thick temporary drilling pad was then constructed using crushed limestone. An earthen berm two-feet in height above pad level surrounded the perimeter of the rig and settling tanks. This earthen berm was constructed to contain drilling fluids and/or formation waters produced during well drilling, testing, and well construction activities (**Figure 2**). Four pad monitor wells were installed at the corners of the temporary drilling pad and water quality monitoring was performed on a weekly basis to ensure no releases of brackish water occurred during construction.

Lithologic (well cuttings), packer test, and borehole geophysical log data were used to determine the actual casing setting depths. The pilot hole was then reamed to specified diameters for the selected casing setting depths. Three concentric steel casings (42-, 36-, and 24-inch diameter) were used in the construction of the Floridan aquifer exploratory well (EXW-1).

Upon issuance of UIC Permit Number UC 153872-001 (**Appendix A**), Diversified Drilling Corporation initiated drilling activities for EXW-1. Drilling operations began on December 9, 1999, by advancing a 46-inch diameter borehole to a depth of 57 feet bpl. A caliper log was then conducted on the borehole to verify depths and to calculate cement volumes for subsequent cement grouting operations. A nominal 42-inch diameter, steel

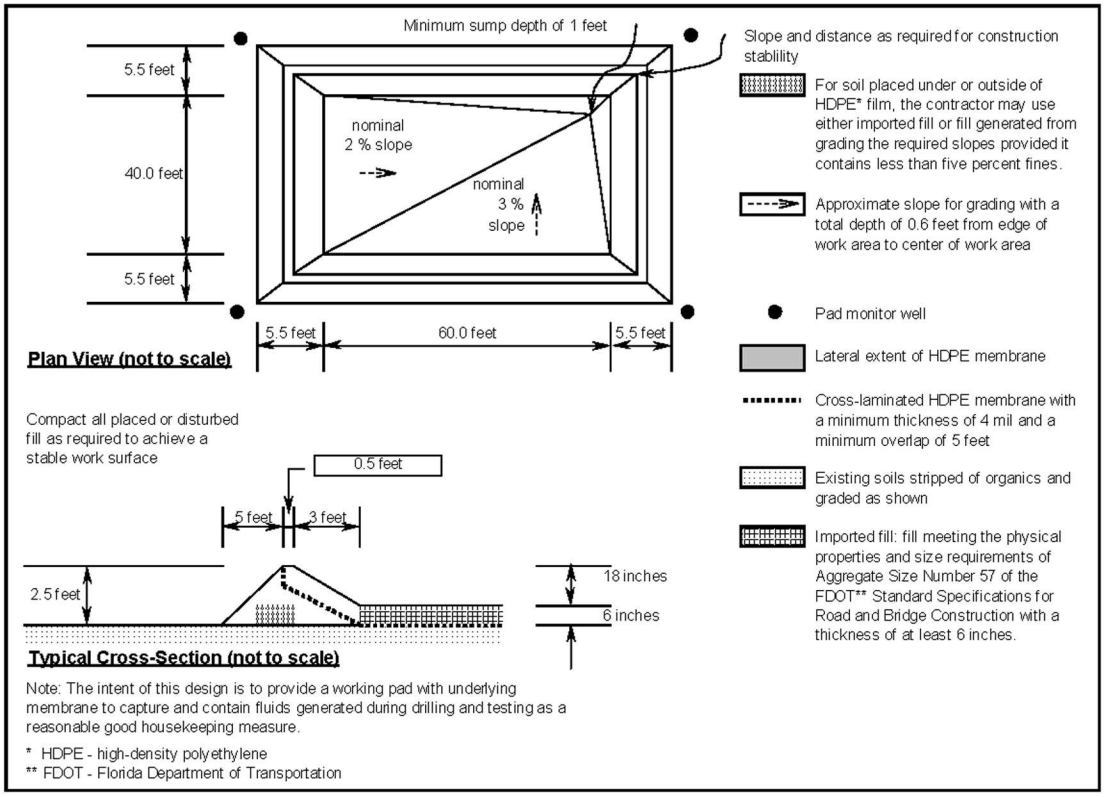

Figure 2. Well Pad Schematic

casing was installed in the nominal 46-inch diameter borehole. The steel casing was American Society of Testing Materials (ASTM) A53, Grade B, with a 0.375-inch wall thickness. The annulus was grouted to land surface using 153 cubic feet (ft^3) of ASTM Type II, Portland neat cement (15.6 pounds per gallon). A factory mill certificate for the 42-inch diameter pit casing is provided in **Appendix B**.

After installing the 42-inch diameter pit casing, a nominal 10-inch diameter pilot hole was advanced from 57 to 210 feet bpl using the mud-rotary method. MV Geophysical Inc. of Fort Myers, Florida, geophysically logged the pilot hole on December 10, 1999. The logging suite included 4-arm caliper, natural gamma, dual induction laterolog combination, and spontaneous potential (SP) logs. The individual log traces are presented in **Appendix C**, **Figure C-1**.

Using well cuttings, geophysical log data, and existing site data, the base of the Surficial Aquifer System (SAS) was identified at approximately 210 feet bpl. The pilot hole was reamed to 210 feet bpl using a nominal 42-inch diameter staged bit reamer. The nominal 42-inch borehole was geophysically logged (caliper) on December 11, 1999, to verify depths and to calculate cement volumes for subsequent grouting operations (**Appendix C, Figure C-2**). The 36-inch diameter steel casing (ASTM A53, Grade B, and 0.375-inch wall thickness) was installed in the nominal 42-inch diameter reamed borehole. Once installed, the 36-inch diameter steel pipe was pressure grouted using 505 ft^3 of Portland neat cement. An additional stage (10 ft^3) of Type III Portland Neat cement was placed using the tremie method, bringing cement levels to the surface. Installation of

the 36-inch diameter surface casing was completed on December 13, 1999. The purpose of the surface casing is to prevent unconsolidated surface sediments from collapsing into the drilled hole, to isolate the SAS from brackish water contamination, and to provide drill rig stability during continued drilling operations. A factory mill certificate for the 36-inch diameter surface casing is provided in **Appendix B**.

With the surface casing installed, the pilot hole was advanced using the closed circulation mud rotary drilling method through the unconsolidated to semi-consolidated Pliocene-Miocene aged sediments and Eocene aged carbonates. Drilling operations through these sediments were completed to a depth of 1,225 feet bpl on January 6, 2000, with a minor loss of circulation from 1,200 to 1,205 feet bpl. No further drilling mud losses were noted below 1,205 feet bpl. MV Geophysical Inc. conducted a suite of geophysical logs within the nominal 10-inch diameter pilot hole from 210 to 1,225 feet bpl. The logging suite consisted of the following logs: x-y caliper, natural gamma, spontaneous potential, dual induction-laterolog combination, and borehole compensated sonic log **(Appendix C, Figure C-3)**. A deviation survey for the nominal 10-inch diameter pilot hole is summarized in **Appendix B**.

Review of lithologic data (**Appendix E**) and geophysical logs from the subject borehole and from existing site data indicates that the top of the FAS occurs at a depth of approximately 985 feet bpl. However, the final 24-inch steel production casing was set at a depth of 1,015 feet bpl for the following reasons:

- At this depth, the overlying clays of the Hawthorn Group and carbonate mud stringers and fine quartz and phosphatic sands within the Basal Hawthorn Unit were isolated.
- The quartz and phosphate silt/sand component of the limestone unit between 985 and 1,015 feet bpl, identified by the drill cuttings and peaks on the natural gamma log, indicate that this interval is not productive and should be cased off to avoid potential operational difficulties should EXW-1 be repermitted in the future as an ASR well.
- The casing needed to be located in a competent, well-indurated rock unit to reduce undermining by erosion at its base as a result of natural and induced high velocity upward flow.
- At this depth, flow characteristics of the open hole interval could be evaluated for final selection of the potential ASR horizon. The fluid-type logs (e.g., flow, temperature) from a proximal monitor well indicate good production from flow zones between 1,050 and 1,205 feet bpl.

Therefore, on January 10, 2000, the nominal 10-inch diameter pilot hole was temporarily backfilled with 3/8-inch diameter crushed limestone gravel to approximately 1,000 feet bpl. The nominal 10-inch diameter pilot hole was reamed using a nominal 35-inch diameter staged bit reamer, completed to a depth of 1,015 feet bpl on January 28, 2000. The reamed borehole was conditioned and caliper logged (**Appendix C**, **Figure**

C-4) and the 24-inch diameter production casing was installed (ASTM A53, Grade B, and 0.5-inch wall thickness). The factory mill certificate for the 24-inch diameter production casing is provided in **Appendix B**. Once the casing was installed to a depth of 1,015 feet bpl, approximately 20,000 gallons of fluid was circulated through the annular space for one hour. The purpose of this postconditioning water flush was to displace the heavy drilling mud that was previously required for borehole stabilization. This water flush reduces the potential mixing of grout and drilling mud of similar densities during grouting operations, reducing the risk of mud channels (annular voids).

Pressure grouting operations began on the morning of January 30, 2000, by installing a 2 1/16-inch diameter tremie pipe to 971 feet bpl. A volume of 178 barrels (850 bags at 94 pounds per bag) of ASTM C-150 Type II neat cement was then pumped during pressure grouting operations.

A temperature/gamma survey was conducted eight hours after cementing operations ceased. These surveys were used to identify the top of the cement within the annulus as a result of pressure grouting. A significant shift in the temperature gradient log and corresponding deflection in the temperature differential log occurred at 850 feet bpl (**Appendix C, Figure C-5**), suggesting that the top of the first stage is located at that depth.

Shortly after completing the temperature/gamma survey, 2-inch diameter steel tremie pipe was run into the annulus between the nominal 35-inch diameter borehole and the 24-inch steel diameter casing. This was done to verify the top of the primary cement stage at 850 feet bpl as inferred by the temperature log. While lowering the tremie pipe into the annulus, an obstruction was encountered at a depth of 550 feet bpl. Repeated attempts to lower the tremie pipe below 550 feet bpl failed. Upon removal of the tremie pipe from the annulus, it was discovered that the tremie pipe was plugged with greenish-gray silty clay. This suggests that a clay ring encroached into the annular space during casing installation, or that sediments from the Hawthorn Group swelled causing a localized plug in the annulus or a combination of these two mechanisms.

Subsequent attempts to jet through the obstruction at a depth of 550 feet bpl and below, using high-pressure flow (2,500 pounds per square inch [psi]) and various diameter (2-, 1¼- and 1-inch diameter) steel tubing met with limited success. At this point, Diversified Drilling Corporation suggested the use of a positive-displacement down-hole pump to clear the obstruction within the annulus. This method was successful in washing and clearing the sediments from a portion of the annulus to a depth of 750 feet bpl. However, difficulties were encountered at a depth of 755 feet bpl when efforts were made to move the mud pump up the annulus. Sediments from the overlying formations or the unwashed sections (550 to 755 feet bpl) of the annulus apparently caved onto the down-hole mud pump, causing it to bind within the annulus. Several attempts were made to circulate drilling mud through the mud pump to lift the sediments and circulate the debris back to surface. These efforts were unsuccessful and the down-hole mud pump and 2-inch diameter steel tubing could not be moved in either direction. During the course of circulating drilling mud and pulling on the steel tubing, the tubing separated at approximately 550 feet bpl. Diversified Drilling Corporation determined that retrieval of

these items would not be possible due to the weight of overlying sediments presently atop the down-hole mud pump and instability of the annulus within the 550 and 750 feet bpl interval.

Diversified Drilling Corporation suggested that the pump and steel tubing be abandoned in place, since the probability of retrieving these items was relatively low and additional efforts to retrieve them increased the risk of additional clogging of the annulus. The SFWMD staff agreed with Diversified Drilling Corporation that additional retrieval efforts were unlikely to be successful and unreasonable because retrieval effort could cause more borehole collapse. In addition, it was the SFWMD's opinion that the uncemented annulus would be located within the relatively impermeable sediments of the Hawthorn Group, which would provide a natural seal. Specifically, the clay that squeezed into the annulus from 550 to 850 feet bpl should provide an adequate seal to prevent upward migration of water stored should this well be repermitted in the future as a functional ASR well. A letter was sent to FDEP concerning this matter and concurrence was gained shortly thereafter.

Cementing operations resumed on March 1, 2000. The second stage of grouting, via the tremie method, was performed by setting a 2 1/8-inch tremie pipe in the annulus at 535 feet bpl. A volume of 510 ft^3 of ASTM C-150 Type II neat cement was then pumped into the annulus. A temperature survey was conducted seven hours after the completion of cementing operations. This survey was used to identify the top of the cement within the annulus installed during the second grout stage. A significant shift in the temperature gradient log and corresponding deflection in the temperature differential log occurred at 240 feet bpl (**Appendix C**, **Figure C-6**). A hard tag was then conducted on March 2, 2000, using tremie pipe to verify the top of the second cement stage at 245 feet bpl. The tremie pipe was then set at 224 feet bpl to begin pumping the third stage of cement. A volume of 882 ft^3 of ASTM C-150 Type II neat cement was then pumped into the annulus to bring cement levels to surface, completing grouting operations for the 24-inch diameter production casing.

A pressure test, witnessed by a FDEP representative, on the 24-inch diameter production casing was successfully completed on March 9, 2000. The wellhead was sealed at the surface with a temporary header to facilitate the test. Next, the well was filled with water and pressurized to approximately 100-psi with a high pressure pump. During the course of the 60-minute pressure test, the total pressure within the 24-inch diameter casing decreased 0.1 psi, representing a 0.1 percent decline - well within the test tolerance limit of +/- 5 percent (**Table 2**).

However, during the pressure test, the on-site FDEP representative identified a discrepancy concerning the pressure gauge's certification dates. The date of calibration on the pressure gauge was January 11, 2000, whereas the certificate itself was dated January 13, 2000. A written statement from the testing facility was faxed to the FDEP on March 14, 2000, describing the reason for the date discrepancy. The testing facility's description was sufficient to resolve this issue.

Table 2. Official Pressure Test on 24-Inch Casing String for Well EXW-1[a]

Date	Time (hour)	Elapsed Time (minute)	Pressure Reading (psi)	Delta Pressure (psi)	Remarks
03/09/00	13:38	0	101.0	0.0	Start of Pressure Test
03/09/00	13:43	5	101.0	0.0	
03/09/00	13:48	10	100.9	0.1	
03/09/00	13:53	15	100.9	0.1	
03/09/00	13:58	20	100.9	0.1	
03/09/00	14:03	25	100.9	0.1	
03/09/00	14:08	30	100.9	0.1	
03/09/00	14:13	35	100.9	0.1	
03/09/00	14:18	40	100.9	0.1	
03/09/00	14:23	45	100.9	0.1	
03/09/00	14:28	50	100.9	0.1	
03/09/00	14:33	55	100.9	0.1	
03/09/00	14:38	60	100.9	0.1	End of Pressure Test - Total Pressure Change 0.1psi

a. Recorded by Ed Rectenwald, SFWMD, and witnessed by Paul F. Linton (Engineer of Record), SFWMD, and Heidi Vandor, FDEP.

A cement bond log was conducted on March 10, 2000, to evaluate the bond quality between the annular cement and the 24-inch diameter production casing string. The recorded amplitude curve for this logging run infers that the 24-inch diameter casing is supported (cement and/or squeezed clays) with no discernible voids within the annular space (**Appendix C**, **Figure C-7**).

The rig and site were then prepared for reverse-air drilling procedures via open circulation. On March 22, 2000, Diversified Drilling Corporation began to drill out the cement plug from the base of the final casing string with a nominal 22-inch diameter bit. They completed drilling through the cement plug (a result of pressure grouting) on March 28, 2000. Then, they tripped back in with a nominal 10-inch bit and began to drill-out the temporary backfill material (3/8-inch diameter crushed limestone) from the original pilot hole via the open circulation, reverse-air technique. The pilot hole was redrilled to its original total depth of 1,225 feet bpl on March 29, 2000.

The production interval (1,015 to 1,225 feet bpl) was then developed by reverse-air and natural flow techniques on March 30, 2000. The formation water was diverted through a series of 7,500-gallon settling tanks, then it was discharged into the Hillsboro Canal via a 12-inch diameter polyvinyl chloride (PVC) pipe equipped with a silt screen to minimize particulate matter being discharged. An in-line flowmeter was installed along the 12-inch discharge line to measure flow rates and total discharge volumes produced during well development of EXW-1. SFWMD personnel collected water quality data (three times daily) from the Hillsboro Canal during discharges produced from the exploratory well to comply with FDEP-issued National Pollutant Discharge Elimination System (NPDES) permit requirements. Sondes were used to collect temperature, pH, specific conductance, dissolved oxygen, and turbidity data during the discharges. These

sondes were deployed 100 meters upstream from the discharge, at the point of discharge, and 800 meters downstream from the discharge. Water quality data were recorded prior to, during, and after discharging formation waters into the canal.

Geophysical surveys were conducted on March 31, 2000, to determine in situ borehole conditions prior to conducting packer tests. The nominal 10-inch pilot hole (1,015 to 1,225 feet bpl) logging suite consisted of the following: x-y caliper, natural gamma, SP, dual induction/laterolog combination, temperature, fluid resistivity, flowmeter (static and dynamic runs), and a borehole video survey. The logs are presented in **Appendix C**, **Figure C-8**. The borehole video survey was unsuccessful due to high particulate content within the fluid column but reran once the well was successfully developed.

Using the information provided by the geophysical logs and well cuttings, straddle-packer test intervals were selected. The first of two tests began on April 5, 2000 to a depth of 1,160 - 1,225, the second packer test was conducted on April 10, 2000 to a depth of 1,015 to 1,225 feet bpl. The purpose of these tests was to characterize the water quality and production capacities of specific intervals within the larger open hole interval (1,015 to 1,225 feet bpl). The set of two packer tests was completed on April 10, 2000 (see the **Packer Tests** section of this report for a description of the methods and a summary of the results).

Following the completion of packer testing operations, the pilot hole was reamed from 1,015 to 1,225 feet bpl via the reverse method using a nominal 22-inch diameter drill bit on April 12, 2000. The open hole section (1,015 to 1,225 feet bpl) was then developed using both reverse air and natural flow techniques through April 26, 2000. Geophysical surveys were conducted in the nominal 22-inch diameter open hole section of EXW-1 on April 27, 2000. The geophysical logging suite consisted of the following logs: x-y caliper, natural gamma, temperature, fluid resistivity, and a flow meter including both static and dynamic runs (**Appendix C**, **Figure C-9**).

On May 25, 2000, Diversified Drilling Corporation began well development of EXW-1 before starting a high flow rate step-drawdown test. The well was developed using a turbine pump with pump rates varying from 2,500 to 3,500 gallons per minute (gpm). The step-drawdown test was initiated after well development ceased and water levels within EXW-1 were allowed to recover to ambient conditions and stabilize. The step-drawdown test was initiated by pumping EXW-1 at successive increments of 500 gpm, ranging between 1,000 gpm to 3,000 gpm. The step-drawdown test yielded a specific capacity of 25.5 gpm per foot of drawdown (gpm/ft-dd) at a pump rate of 3,500 gpm (see the **Step-Drawdown Tests** section of this report for further details). The specific capacity results indicate that the production capacity of EXW-1 would not be sufficient to meet the lower threshold limits of 40 to 50 gpm/ft-dd at an anticipated withdrawal/injection rate of 3,500 gpm or 5 million gallons per day (mgd).

Based on the insufficient specific yields measured during the first step-drawdown test, well acidization of EXW-1 was conducted by HydroChem Industrial Services. On June 2, 2000, HydroChem rigged up to the acid line on the wellhead of EXW-1 and

Diversified Drilling Corporation prepared to pump the necessary volume of water. The open borehole section of EXW-1 was then acidified with 5,000 gallons of sulfuric acid (36 percent) without incident. All pumping associated with well acidization was completed on June 2, 2000. At no time during well acidization were positive pressure increases recorded at the wellhead. The acid was developed out by flushing it with fresh water from June 3-4, 2000, and neutralized with soda ash prior to surface water discharge in compliance with NPDES permit requirements.

A second step-drawdown test was then conducted on June 16, 2000. During the second step-drawdown test, EXW-1 was pumped at successive increments of 800 gpm, ranging between 2,000 gpm and 5,200 gpm. The results from step-drawdown test indicate that the production capacity of EXW-1 doubled to 50 gpm/ft-dd as a result of the well acidization. See the **Step-Drawdown Tests** section of this report for a description of the methods and summary of results.

After the second test, well construction was completed by removing the turbine pump and installing the permanent wellhead on EXW-1. **Figure 3** presents a construction schematic of the completed EXW-1. A summary of well construction and testing activities associated with EXW-1 is included in **Table 3**.

After construction was completed, EXW-1 was surveyed relative to permanent reference points by a Florida registered land surveyor, and located on a site plan map by latitude and longitude, and recorded in the public record (**Appendix D**). EXW-1 was left idle until a planned 72-hour APT could be conducted at the site.

HYDROGEOLOGIC FRAMEWORK

Two major aquifer systems underlie this site: the Surficial Aquifer System (SAS), the intermediate confining unit, and the Floridan Aquifer System (FAS) with the FAS being the focus of this test well program. These aquifer systems are composed of multiple, discrete aquifers separated by low permeable "confining" units that occur throughout the Tertiary/Quaternary aged sequence. **Figure 4** shows a hydrogeologic section underlying the Western Hillsboro site.

Surficial Aquifer System

The SAS extends from land surface (top of the water table) to a depth of 205 feet bpl. It consists of Holocene and Pliocene-Pleistocene aged sediments. The undifferentiated Holocene sediments occur from land surface to a depth of 10 feet bpl, and consist of unconsolidated orange to light gray, very fine to coarse grained quartz sands and shell fragments within a calcilutite matrix. The sediments from 10 feet to 110 feet in depth are composed primarily of yellowish gray, moderately indurated calcareous sandstone with intermittent shell beds 5 to 10 feet thick. A change in lithology to a yellowish-gray, moderately to well indurated biogenic limestone occurs below 110 feet bpl and continues to a depth of 205 feet bpl; this may be the Tamiami Formation. Low permeable, arenaceous calcilutite at 205 feet bpl forms the base of the SAS at this site. A significant

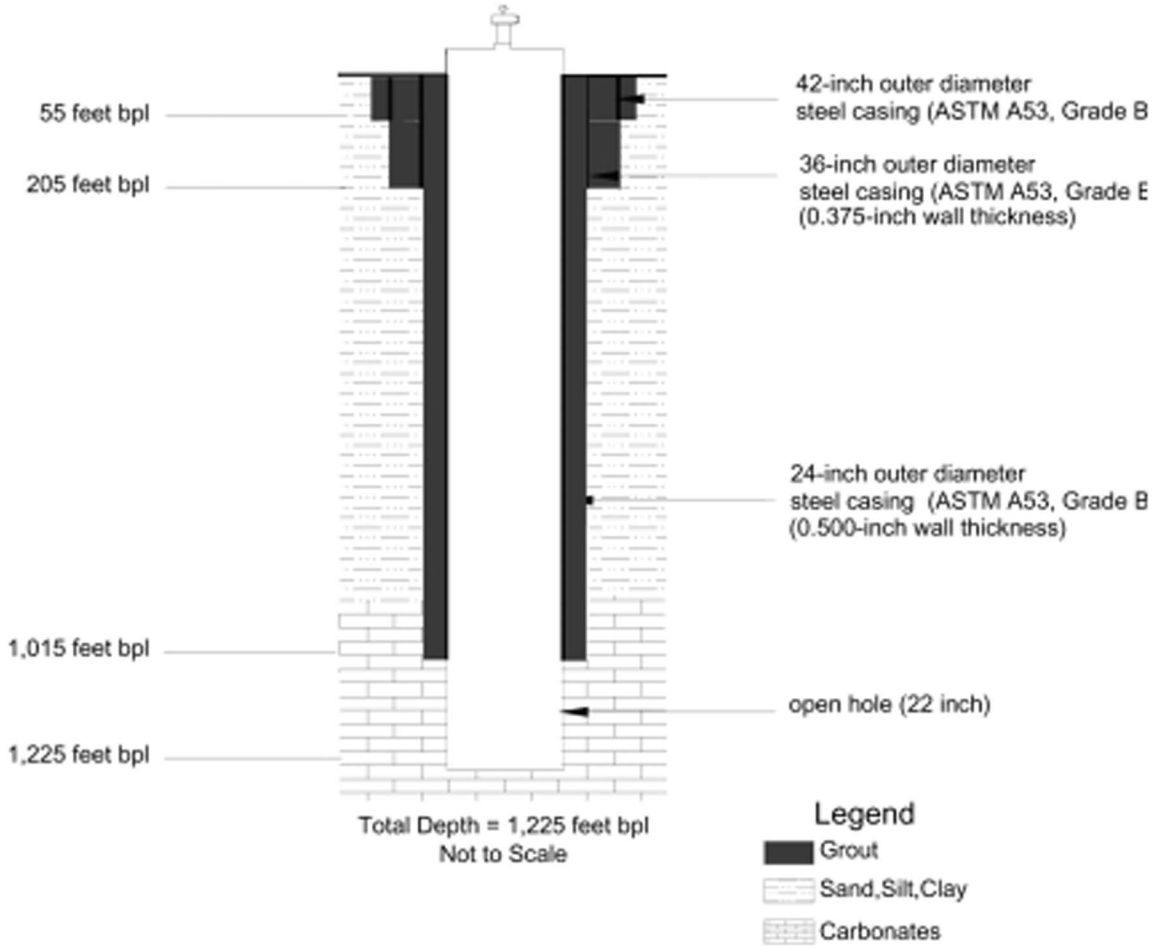

Figure 3. Well Completion Diagram for EXW-1

increase in the natural gamma ray activity below a depth 205 feet bpl suggests an increase in clay content and phosphate percentages with emissions above 30 American Petroleum Institute (API) units.

Intermediate Confining Unit

Below the SAS lies the intermediate confining unit, which extends from 205 to 985 feet bpl at this location. The Peace River and Arcadia Formations of the Miocene-Pliocene aged Hawthorn Group (Scott, 1988) act as confining units separating the FAS from the SAS. Lithologic information obtained from drill cuttings from EXW-1 indicates that soft nonindurated detritial clays, silts, and poorly indurated mudstones of the Hawthorn Group predominate from 205 to 985 feet bpl.

The signature of the compensated sonic log indicates a soft nonindurated high porosity clayey silt unit (interpreted to be the Peace River Formation) that extends from immediately below the 36-inch surface casing at 205 to 485 feet bpl with average travel times of approximately 120 microseconds per foot (µsec/ft). Compressional wave travel times of approximately 120 µsec/ft are typical of clay and silt units. The photoelectric log from PBF-10 (proximal monitor well) also supports a clayey-silt to fine sand composition

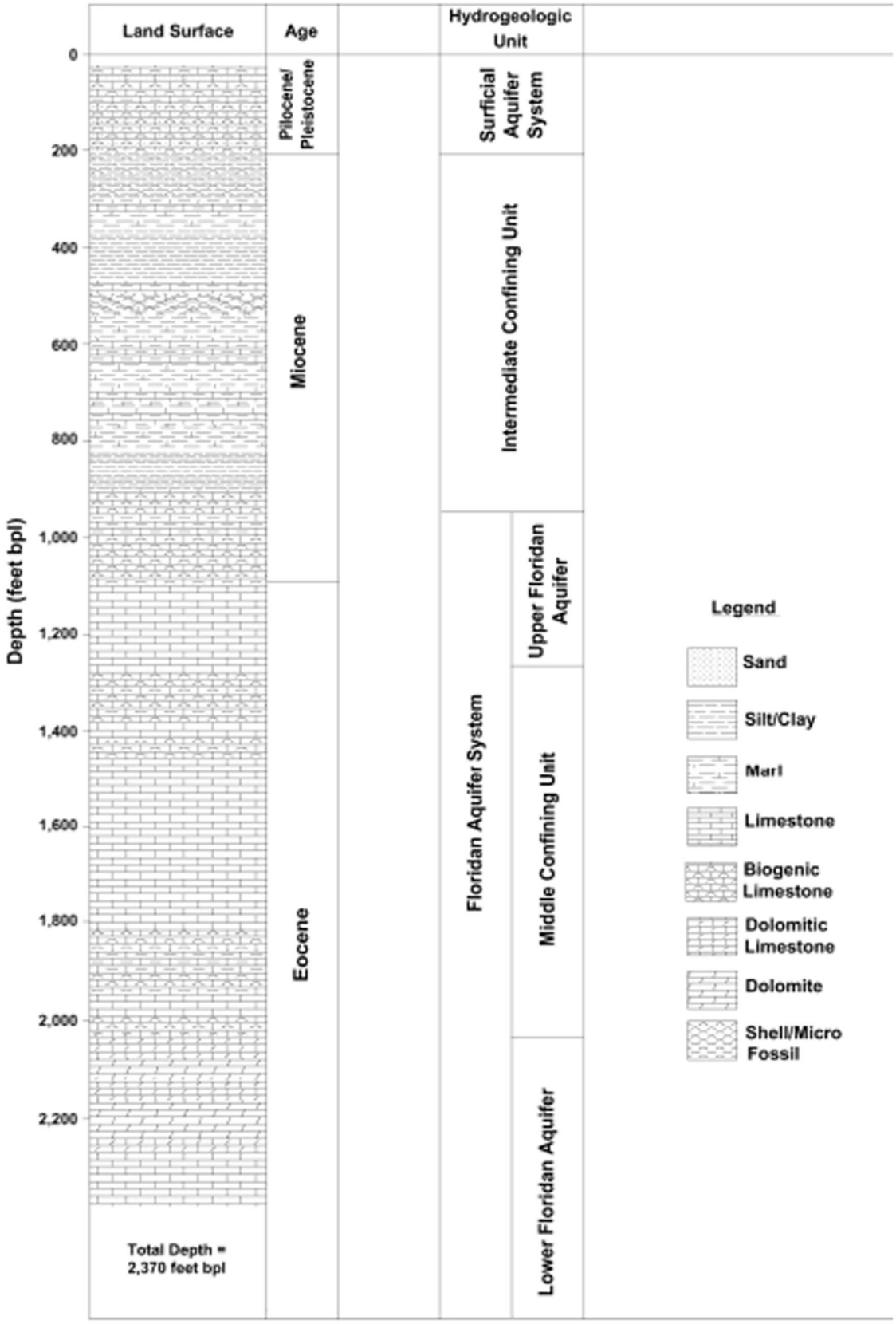

Figure 4. Hydrogeologic Section for the Western Hillsboro Site

Table 3. Construction and Testing Activities Associated with EXW-1

Date	Description of Activities
11/15/99	Project initiated (Notice to Proceed)
11/20/99	Set up rig over EXW-1 and installed 4 pad monitor wells
12/09/99	Installed surface casing (55 ft; 42-inch diameter steel) at EXW-1
12/10/99	Drilled 10-inch diameter pilot hole to 210 feet bpl
12/11/99	Conducted geophysical logging of EXW-1 pilot hole to 210 feet bpl
12/12/99	Reamed pilot hole and installed 36-inch diameter steel casing to 205 feet bpl
01/06/00	Drilled 10-inch diameter pilot hole from 205 to 1,225 feet bpl
01/06/00	Conducted geophysical logging of EXW-1 pilot hole to 1,225 feet bpl
01/10/00	Temporarily backfilled pilot hole to 1,000 feet bpl with crushed limestone
01/28/00	Reamed pilot hole with 35-inch diameter bit to 1,015 feet bpl
01/28/00	Conducted geophysical logging of EXW-1 pilot hole to 1,015 feet bpl
01/30/00	Installed 24-inch diameter steel production casing to 1,015 feet bpl
01/30/00	Pressured grout - 850 bags at 94 pounds per bag neat cement
01/30/00	Ran temperature survey to verify top of cement at 850 feet bpl
03/01/00	Second stage of grouting completed
03/01/00	Ran temperature survey to verify top of cement at 240 feet bpl
03/01/00	Third stage of grouting completed to pad level
03/09/00	Conducted 100-psi pressure test of 24-inch diameter production casing
03/10/00	Ran cement bond log of the 24-inch diameter production casing
03/22/00	Drilled out cement plug (as a result of pressure grouting) within 24-inch diameter casing by reverse air method
03/29/00	Drilled out backfill with 10-inch diameter bit by reverse-air method to 1,225 feet bpl
03/30/00	Developed open hole interval by the reverse-air and natural flow techniques
03/31/00	Conducted geophysical logging of EXW-1 pilot hole to 1,225 feet bpl
04/05/00	Packer test was conducted from 1,160 to 1,225 feet bpl
04/10/00	Packer test was conducted from 1,015 to 1,150 feet bpl
04/12/00	Pilot hole was reamed with a 22-inch diameter drill bit
04/26/00	Developed open hole interval by the reverse air and natural flow techniques
04/27/00	Conducted geophysical logging of EXW-1 pilot hole to 1,225 feet bpl
05/25/00	Well development via a turbine pump between 2,500 to 3,000 gpm
05/25/00	Step drawdown test conducted at successive increments of 500 gpm, ranging between 1,000 and 3,000 gpm
06/02/00	Well acidization was conducted to the open hole section of EXW-1 using 5,000 gal. of sulfuric acid (36%)
06/03/00	EXW-1 was developed out by flushing it with fresh water
06/16/00	Step drawdown test conducted at successive increments of 800 gpm, ranging between 2,000 and 5,200 gpm
11/15/00	A 60-hour constant-rate discharge (3,050-gpm) test was conducted on an interval from 1,015 to 1,225 feet bpl

of this interval with values of approximately 2 barnes per electron (b/e). Both the irregular shape of the x-y caliper trace and borehole diameter exceeding the bit size (nominal 10-inch) indicates a poorly consolidated interval. Qualitatively, the resistivity profile of the induction log also suggests a porous horizon whereby the medium resistivity curve (RILM) reads near the shallow resistivity curve (RLL3) as a result of drilling mud invading the porous sediments (see **Appendix C, Figure C-3**).

A change in lithology occurs below 485 feet bpl, which is identified by both a decrease in sonic travel times and natural gamma radiation (Arcadia Formation?). The interval from 485 to 915 feet bpl is composed of poorly indurated mudstones to wackestones. Thin, intermittent, high porosity, moderately indurated, carbonate units are identified by the sonic log from 485 to 915 feet bpl. These produce an irregular, spiked sonic trace with average sonic travel times of approximately 110 µsec/ft (see **Appendix C, Figure C-3**). The photoelectric log values from PBF-10 within this interval range between 3 and 4 b/e indicating a mixed carbonate lithology including a minor silt/sand component (Hallenburg, 1998). The natural gamma log below 485 feet bpl produces thin, intermittent, high gamma radiation peaks, associated primarily with intervals of high phosphate sand/ silt content. The sediments from 915 feet to 985 feet in depth are composed of yellowish to greenish gray, moderately indurated wackestone containing 25 to 35 percent nonindurated carbonate mud. These low permeable units form the lower boundary of the intermediate confining unit.

Floridan Aquifer System

The FAS consists of a series of Tertiary aged limestones and dolostones. The system includes permeable sediments of the lower Arcadia Formation, Suwannee Limestone, Ocala Limestone, Avon Park Formation, and the Oldsmar Formation. The Paleocene age Cedar Keys Formation with evaporitic gypsum and anhydrite forms the lower boundary of the FAS (Miller, 1986).

The top of the FAS, as defined by the Southeastern Geological Society Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition (1986), coincides with the top of a vertically continuous permeable carbonate sequence. The Upper Floridan aquifer consists of thin, high permeable water bearing horizons interspersed within thick, low permeable units of early Miocene to middle Eocene aged sediments, including the Suwannee Limestone, Ocala Limestone, and the Avon Park Formation. At this site, the top of the FAS occurs at a depth of 985 feet bpl, which coincides with the basal Hawthorn unit (Reese and Memberg, 2000), part of the of the Arcadia Formation.

The lithology from 985 to 1,010 feet bpl is composed primarily of moderately indurated wackestones and packstones containing approximately 15-50 percent shell fragments and 10-15 percent quartz and phosphatic sands and silts. The sonic, induction, and caliper logs all indicate a competent, low porosity unit at 1,010 feet that continues to 1,025 feet bpl. The sonic travel time decreases to 90 µsec/ft, resistivity increases to 70 ohm-meter (ohm-m), and the caliper log indicates a relatively gauged borehole (i.e.,

similar to the diameter of the drill bit) that corresponds to a well-indurated yellowish-gray packstone unit.

Sediments from 1,025 to 1,070 feet bpl consist of yellowish gray, moderately indurated wackestones interspersed with thin fine-grained calcitic sandstones. Sonic-derived porosity values based on a limestone matrix (47.6 µsec/ft transit time) through this interval range between 40-45 percent. A change in lithology occurs at 1,070 feet bpl from a yellowish-gray, phosphatic wackestone to light-gray, clean, moderately indurated wackestone-packstone. This change at 1,070 feet bpl causes an attenuation of natural gamma activity, a slight increase in sonic travel times, and an enlarged borehole with increase water flow. These changes at 1,070 feet bpl may represent a flow zone that occurs near the top of a lithologic contact.

The light-gray moderately indurated wackestones and packestones continue from 1,070 feet to 1,170 feet bpl. Minor water production is identified by a deflection in the temperature log at 1,140 feet bpl. A light orange to yellowish gray, moderately to well indurated packstone unit is encountered from 1,170 to 1,205 feet bpl. A minor lost circulation interval was present at 1,205 feet bpl, necessitating the use of thinned mud to prevent additional mud loss by reducing the weight of the mud column. This resulted in no drill cutting returns at the surface. This continued to the total depth of the well, which was 1,225 feet bpl.

The fluid type logs (e.g., flow, temperature) indicate good production from flow zones between 1,050 and 1,170 feet bpl and 1,190 to 1,210 feet bpl. Below 1,210 feet bpl, the productive capacity is limited (as indicated by the fluid-type logs) suggesting lower permeable units near the base of the proposed storage horizon. Review of previous data from the FAS monitor well (PBF-10), located approximately 330 feet to the west of EXW-1, shows consistent lithologic and geophysical trends with depth indicating lower permeable sediments. The lower permeable sediments at 1,225 feet bpl marked the base of the production interval of EXW-1.

HYDROGEOLOGIC TESTING

Specific information was collected during the drilling program to determine the lithologic, hydraulic, and water quality characteristics of the FAS at the Western Hillsboro site. These data were to be used to design both the FAS monitor and exploratory wells for use in a site-specific aquifer test and for a long-term water level and water quality monitoring program.

Formation Sampling

During the drilling of the pilot hole, geologic formation samples (well cuttings) were collected, washed, and described on-site using the Dunham classification scheme (Dunham, 1962). Formation samples were collected continuously and separated based on their dominant lithologic or textural characteristics, and, to a lesser extent, color. If a massively bedded unit was encountered, composite samples were taken at 5-foot intervals.

The representative formation samples were split into two sets and distributed to the SFWMD and the Florida Geological Survey (FGS).

The lithostratigraphic column shown in **Figure 5** was constructed using the SFWMD's on-site drilling log for EXW-1 and PBF-10. A copy of the SFWMD's lithologic descriptions for well EXW-1 is provided in **Appendix E**.

Geophysical Logging

Geophysical logs were conducted in the pilot hole after each stage of drilling and before reaming of the borehole for casing installations. These logs were conducted to provide a continuous record of the physical properties of the subsurface formations and their contained fluids. These logs were later used to assist in the interpretation of lithology; to provide estimates of permeability, porosity, bulk density, and resistivity of the aquifer; and to determine the salinity of the groundwater using Archie's equation (Archie, 1942). In addition, the extent and degree of confinement of confining intervals can be discerned from the individual logs. The geophysical logs also provided data to determine the desired casing setting depths on the exploratory well. A cement bond log was conducted on the 24-diameter production casing for EXW-1 to assess the quality of the cement sheath as a result of grouting operations.

All geophysical log data were downloaded directly from the on-site logging processor in log American Standard Code for Information Interchange (ASCII) version 1.2 or 2.0 format. The geophysical log traces from log runs 1 through 9 for well EXW-1 are presented in **Appendix C.** The original geophysical logs and video surveys are archived and available for review at SFWMD's headquarters in West Palm Beach, Florida. A summary of the geophysical logging program conducted at this site is listed in **Table 4**.

Water Quality Data

Upon completion of well construction of EXW-1, background water quality samples were collected. The samples were analyzed to determine basic water quality characteristics (temperature, pH, and specific conductance) as well as primary and secondary drinking water standards (Chapter 62-550, Florida Administrative Code [F.A.C.]) and minimum criteria parameters (Chapter 62-520, F.A.C.).

On November 30, 2000, EXW-1 was purged until three borehole volumes were evacuated, or until field parameters of samples collected from the discharge pipe had stabilized. A limit of +/-5 percent variation in consecutive field parameter readings was used to determine chemical stability. The flow of water from the discharge point was adjusted to minimize the aeration and disturbance of the samples. Unfiltered and filtered samples were collected directly from the discharge point by SFWMD staff into a clean plastic bucket. An equipment blank was obtained prior to sampling to qualify sampling procedures. A Teflon bailer was then placed on a bailer stand where the sample bottles were filled slowly to minimize aeration. Replicate samples were collected from consecutive bailers (SFWMD, 1999).

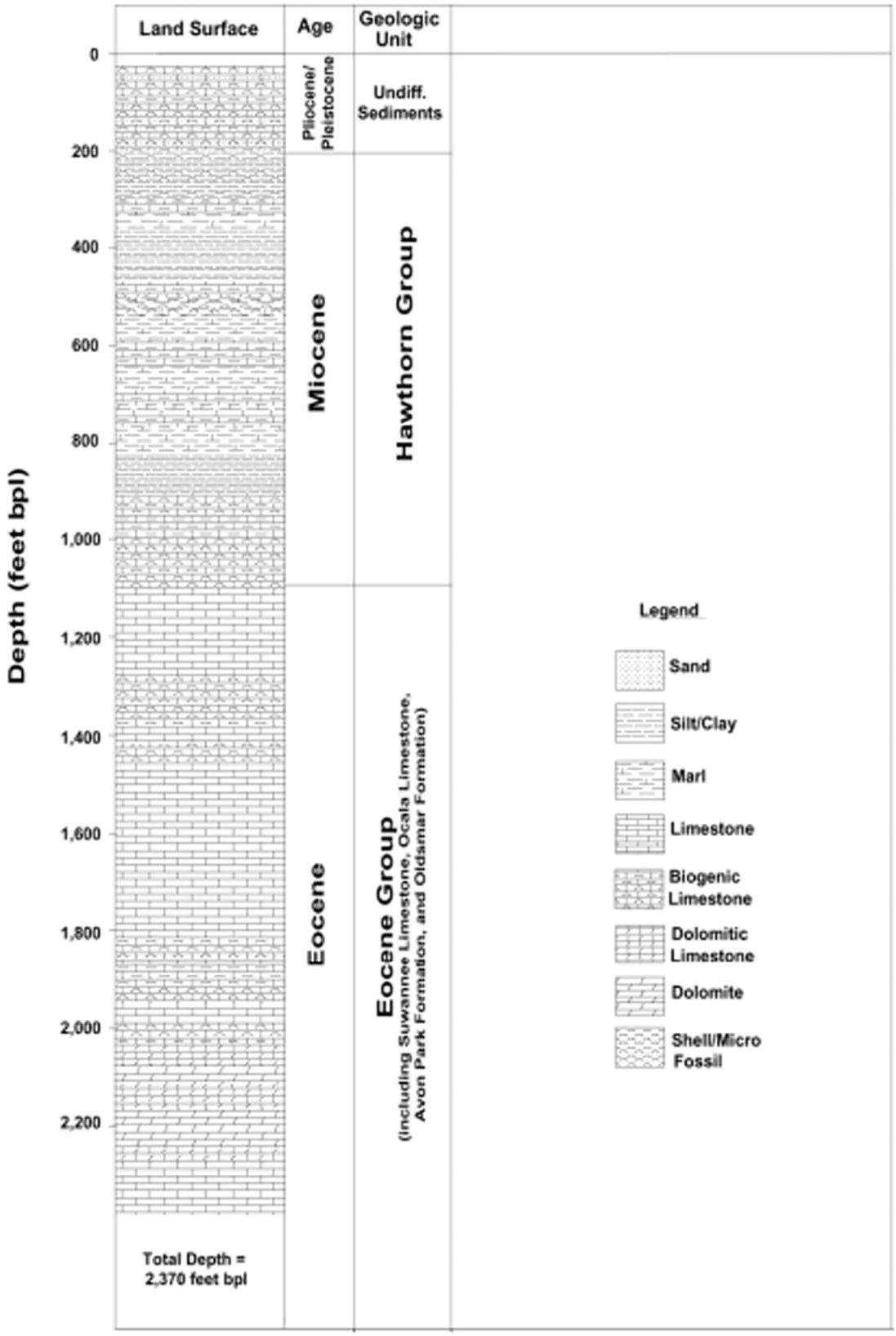

Figure 5. General Lithostratigraphy for the Western Hillsboro Site (generalized geology is based on testing results from the on-site monitor well - PBF-10)

Table 4. Summary of the Geophysical Logging Program for EXW-1

Run Number	Date	Logging Company	Elevation (ft NGVD)[a]	Logged Interval (feet bpl)	Caliper	Natural Gamma	Spontaneous Potential	Dual Induction	Sonic	Flowmeter	Temperature	Fluid resistivity	Cement Bond	Video
1	12/10/99	MV Geophysical	12.86	0-208	x	x	x	x						
2	12/11/99	MV Geophysical	12.86	0-210	x	x								
3	01/06/00	MV Geophysical	12.86	210-1,225	x	x	x	x	x					
4	01/28/00	MV Geophysical	12.86	207-1,015	x	x								
5	01/30/00	MV Geophysical	12.86	0-983		x					x			
6	03/01/00	MV Geophysical	12.86	0-701		x					x			
7	03/10/00	MV Geophysical	12.86	0-983									x	
8	03/31/00	MV Geophysical	12.86	0-1,229	x	x	x	x		x	x	x		x
9	04/27/00	MV Geophysical	12.86	900-1,225	x	x				x	x	x		

a. ft NGVD = feet National Geodetic Vertical Datum, 1929

Once the samples were collected, the bottles were preserved, if necessary, and immediately placed on ice in a closed container and transported to the SFWMD's water quality laboratory. The samples were then shipped to a laboratory operated by ELAB, Inc. located in Ormond Beach, Florida. The samples were analyzed for primary and secondary drinking water standards and minimum criteria parameters using United States Environmental Protection Agency (USEPA) and/or Standard Method procedures. The results of these analyses are presented in **Appendix F**.

Packer Tests

A preliminary packer test on an open hole interval 1,160 to 1,225 feet bpl was successfully completed on April 5, 2000. A single packer with an open port at its base was set at 1,160 feet bpl. The single packer was connected to nonperforated, 4-inch inner diameter drill pipe that extended back to land surface. A 15-horsepower submersible pump was installed within the standpipe at 137 feet bpl. A 100-psi pressure transducer was set to 110 feet bpl and then connected to an electronic data recorder (Hermit 3000 data logger) to measure water-level changes during testing operations. The pressure transducer readings within the standpipe and water quality parameters (temperature, pH, and specific conductance) of the purged formation water were monitored for stability. These parameters were used to determine the quality of isolation of the test interval. The drawdown and recovery phases of the formal packer test on the 1,160 to 1,225 foot interval were successfully completed on April 6, 2000.

The results of the drawdown test indicated good production, with a specific capacity (SC) of 22.6 gpm/ft-dd. The specific capacity was calculated using **Equation 1**.

$$SC = Q/Drawdown \quad (1)$$

$$SC = 95 \text{ gpm}/(12.3 \text{ feet} - 8.1 \text{ feet})$$

$$SC = 22.6 \text{ gpm/ft-dd}$$

where

SC	=	Specific capacity
Q	=	Pumping rate in gpm as measured by an in-line flowmeter
Drawdown	=	Aquifer head loss in feet, which is the measured drawdown minus the pipe friction losses. The frictional loss coefficient was 0.70 feet per 100 feet of pipe for a 4-inch inside diameter pipe with a flow rate of 95 gpm (Appendix 13.K., Driscoll, 1989). The pipe extended to 1,160 feet bpl resulting in a pipe frictional loss of 8.1 feet.

The productive nature of this interval enabled it to respond almost instantaneously to the limited applied pumping stress. The rapid reduction or addition of water within the standpipe, caused by the starting or stopping of pumping, induced a pressure wave into the formation. The response to this pressure wave as seen in the drawdown and recovery semi-log plots labeled PBF13-PT1D and PBF13-PT1R, respectively, masks its true drawdown and recovery responses. Therefore, no formal curve matching techniques were used to determine the transmissivity of this interval. These time series plots are provided in **Appendix G, Figure G-1 and G-2**.

Shortly before the end of the drawdown phase for Packer Test 1, a composite water sample was taken from the discharge point and field water quality parameters were measured. The results were as follows: temperature was 23.91 degrees Celsius (°C); specific conductance was 4,600 micromhos per centimeter (µmhos/cm); and pH was 7.57 standard units (s.u.). The composite water samples were submitted to the SFWMD's Water Quality Laboratory for major cation/anion/total dissolved solids (TDS) analysis. The analytical results are present in **Table 5**.

Table 5. Packer Test Water Quality Data from the Western Hillsboro Site

Identifier[a]	Depth Interval (feet bpl)	Sample Date	Cations (mg/L)[b]				Anions (mg/L)[c]			TDS	Field Parameters		
			Na^+	K^+	Ca^{2+}	Mg^{2+}	Cl^-	Alkalinity as $CaCO_3$	SO_4^{2-}		Specific Conductivity (µmhos/cm)	Temp (°C)	pH (s.u.)
EXW-1PT#2	1,015-1,150	04/10/00	1,228.1	45.8	157.7	182.3	2,336.3	131.6	734.0	5,110	8,223	23.82	7.52
EXW-1PT#1	1,160-1,225	04/05/00	722.6	30.9	103.2	117.1	1,287.6	125.0	397.9	2,932	4,600	23.91	7.57

a. PT = packer test
b. mg/L = milligram per Liter; Na = sodium; K = potassium; Ca = calcium, Mg = magnesium
c. Cl = chloride; $CaCO_3$ = calcium carbonate; SO_4 = sulfate, TDS = total dissolved solids

Upon completion of the first packer test, Diversified Drilling Corporation tripped the packer assembly out of the hole and reconfigured it for the second test. On April 7, 2000, Diversified Drilling Corporation installed the newly configured packer assembly and reinflated the single packer set at 1,150 feet bpl. The packer assembly consisted of 20 feet of slotted 4-inch inner diameter pipe connected to an 8 1/4-inch diameter packer. The remaining portion of drill stem that extended back to land surface consisted of nonperforated, 4-inch inner diameter drill pipe. A 15-horsepower submersible pump was installed within the standpipe at a depth of 100 feet bpl. A 100-psi pressure transducer was set to 90 feet bpl and then connected to an Hermit 3000 data logger, an electronic data recorder, to measure water level changes during testing operations. The 24-inch diameter steel casing set at 1,015 feet bpl formed the upper limit of the test interval. A preliminary test on the 1,015 to 1,150 foot bpl interval began the afternoon of April 7, 2000. The pressure transducer readings within the standpipe and water quality parameters (temperature, pH, and specific conductance) of the purged formation water were again monitored for stability. However, water quality indicators would not stabilize during the initial drawdown/pumping phase. A decision was made to stop the preliminary test and allow Diversified Drilling Corporation time to develop this interval over the weekend and begin preliminary testing on Monday, April 10, 2000.

Both the drawdown and recovery phases of the preliminary test were successfully completed during the afternoon of April 10, 2000. The water quality parameters and water levels in the standpipe stabilized during the initial pumping phase. Pumping ceased and water levels were allowed to recover to static conditions. The formal packer test was successfully completed on the same day. Drawdown data indicate relatively good production from the interval tested, yielding a specific capacity of 10.9 gpm/feet-drawdown. The SC was calculated using the following method:

$$SC = Q/Drawdown \quad (1)$$

$$SC = 105\ gpm/(18.0\ feet - 8.4\ feet)$$

$$SC = 10.9\ gpm/ft\text{-}dd$$

where

SC	=	Specific capacity
Q	=	Pumping rate in gpm as measured by an in-line flowmeter
Drawdown	=	Aquifer head loss in feet, which is measured drawdown minus the pipe friction losses. The friction loss coefficient is 0.73 feet per 100 feet of pipe for a 4-inch inside diameter pipe with a flow rate of 105 gpm (Appendix 13.K., Driscoll, 1989). The pipe extended to 1,150 feet bpl, resulting in a pipe frictional loss of 8.4 feet.

The productive nature of this interval also enabled it to respond almost instantaneously to a limited applied pumping stress. The rapid reduction or addition of water within the standpipe, caused by the starting or stopping of pumping, induced a pressure wave into the formation. The response to this pressure wave as seen in the

drawdown and recovery semi-log plots (**Figures G-3** and **G-4** in **Appendix G**) masks its true drawdown and recovery responses. Therefore, no formal curve matching techniques were used to determine the transmissivity of this interval.

Shortly before the end of the drawdown phase for Packer Test 2, a composite water sample was taken from the discharge point and field parameters measured. The field determined water quality results are as follows: temperature, 23.82°C; specific conductance, 8,223 µmhos/cm; and pH 7.52 s.u. The composite samples were submitted to the SFWMD's Water Quality Laboratory for major cation/anion/TDS analysis. The analytical results are reported in **Table 5**.

Step-Drawdown Tests

On May 25, 2000, Diversified Drilling Corporation began well development of EXW-1 before starting a high volume step-drawdown test. The well was developed via a turbine pump with pump rates varied between 2,500 to 3,000 gpm. The step-drawdown test was initiated after well development ceased and water levels within EXW-1 were allowed to recover to ambient conditions. The step-drawdown test was initiated by pumping EXW-1 at successive increments of 500 gpm, ranging between 1,000 gpm to 3,500 gpm. The specific capacity results of the first step-drawdown test are shown on **Figure 6**.

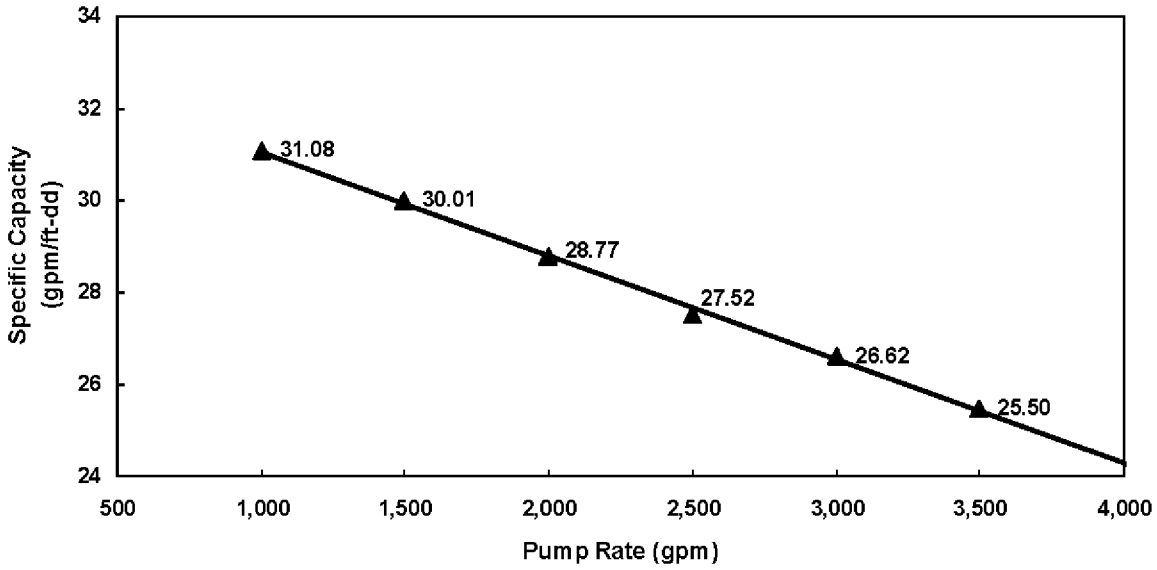

Figure 6. Results from Step-Drawdown Test No. 1 for EXW-1

Based on drawdowns and elevation of the pump and length of drop pipe within EXW-1, the higher pump rates (3,500 to 4,000 gpm) could not be achieved. However, the specific capacity results at the slightly lower pump rates indicate that the production capacity of EXW-1 would not be sufficient to meet the lower threshold limits of 40 to 50 gpm per foot of drawdown at an anticipated withdrawal/injection rate of 3,500 gpm or 5 mgd. Based on the unfavorable yields from the step-drawdown test, well acidization of EXW-1 was conducted by HydroChem Industrial Services of Jacksonville, Florida.

Following well acidization, a second step-drawdown test was then conducted on June 16, 2000. During the second step-drawdown test, EXW-1 was pumped at successive increments of 800 gpm, ranging between 2,000 gpm and 5,200 gpm. The results from the second step-drawdown test (**Figure** 7) indicate that the production capacity of EXW-1 doubled to approximately 50 gpm/ft-dd as a result of the well acidization. After the test, well construction was completed and the well was left idle until conditions were suitable to conduct a large-scale aquifer performance test.

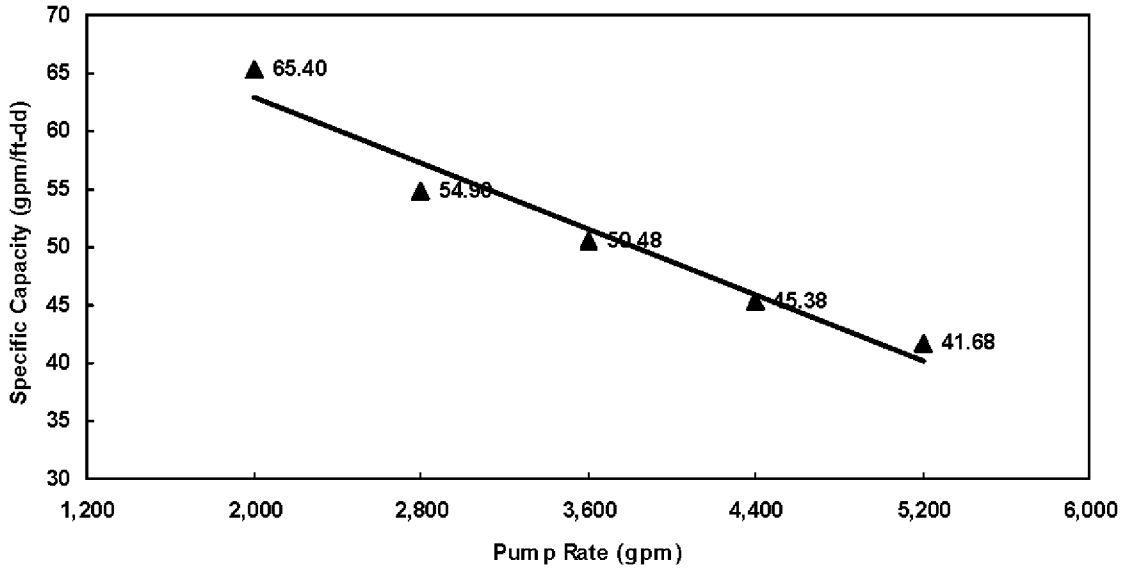

Figure 7. Results from Step-Drawdown Test No. 2 for EXW-1

Aquifer Performance Test

An APT was conducted to determine the hydraulic performance of a proposed ASR horizon (1,015 to 1,225 feet bpl) within the upper Floridan aquifer at the Western Hillsboro site. The principle factors of aquifer performance, such as transmissivity and storage coefficients, can be calculated from the drawdown and/or recovery data obtained from the proximal monitor well, PBF-10R, completed in the same interval. If the aquifer tested is semiconfined, the hydraulic parameter of leakance of the semipervious layer(s) can also be determined.

A 60-hour constant-rate discharge (3,050-gpm) test was conducted on an interval from 1,015 to 1,225 feet bpl. **Figure 8** shows the well configuration of the FAS monitor wells (PBF-10R, PBF-11, PBF-12, and EXW-1) used in the APT. The 60-hour drawdown phase was followed by a 72-hour recovery period, during which water levels were allowed to return to background condition.

A vertical turbine pump was positioned atop the test-production well on November 15, 2000, with 12-inch diameter intake pipe installed to 145 feet below top of casing. This depth was chosen based on preliminary data that indicated low to moderate drawdowns would occur. The wellhead was reinstalled with appurtenances consisting of a shut-off

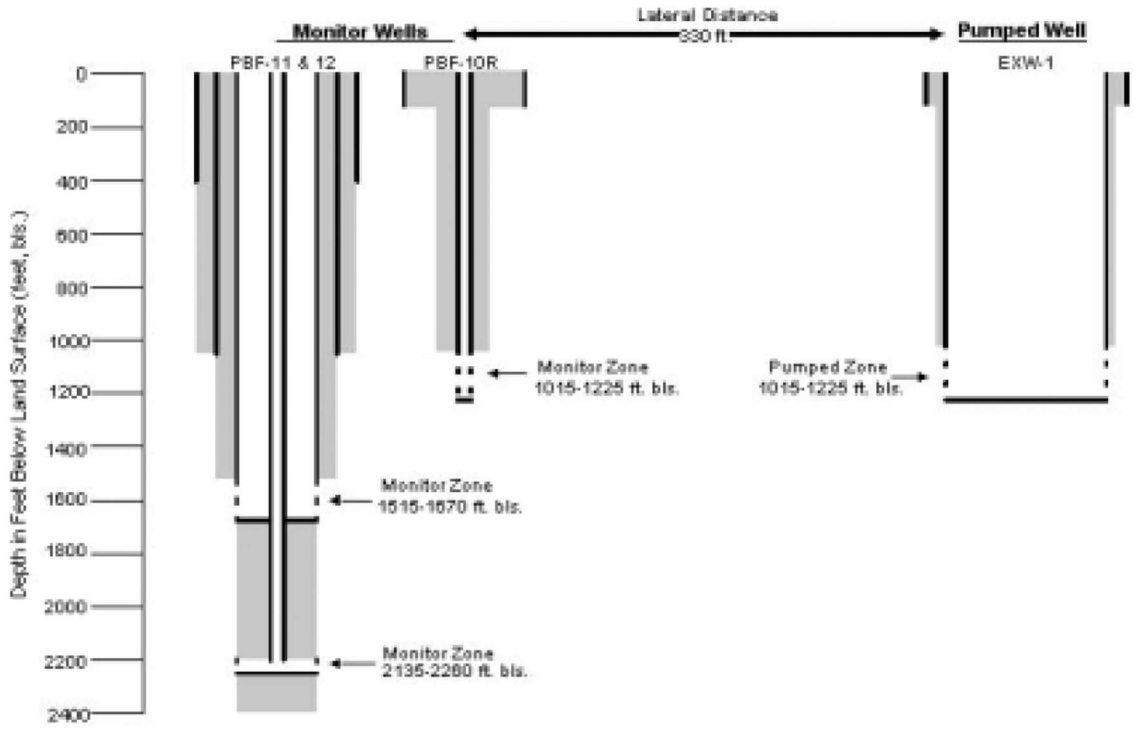

Figure 8. Well Configuration of the Aquifer Performance Test

valve, discharge pressure gauge, and a wellhead pressure gauge. A 16-inch diameter PVC discharge line was connected to the wellhead. A 16-inch diameter circular orifice weir with a 12-inch diameter orifice plate was used to measure discharge rates during pumping, verified by an in-line flowmeter. A pressure transducer was installed on the orifice weir to record discharge rates during the pump test at 2-minute intervals. Additional pressure transducers were installed on/in both the test-production (EXW-1) and monitor wells (PBF-10R, PBF-11, and PBF-12) and connected to a Hermit 3000 (Insitu, Inc) data logger via electronic cables. The transducers and data logger were used to measure and record water level changes at predetermined intervals during testing operations.

On November 15, 2000, a specific-capacity test was conducted to determine an appropriate pumping rate for the planned 72-hour drawdown test. Once completed, water levels were allowed to recover to static conditions. Later that day, the drawdown phase of the APT started by initiating pumping of EXW-1, located 330 feet east of the FAS monitor wells. The pumping rate was 3,050 gpm. During the drawdown phase, water levels and pump rates were continuously measured and recorded by the installed electronic instruments. Pumping continued uninterrupted for the next 60 hours, completing the drawdown phase on November 18, 2000. The drawdown phase of the APT was limited to 60 hours instead of the planned 72 hours. This was a result of elevated specific conductance of the surface water within the Hillsboro Canal; 800 meters downstream from the point of formation water discharges. The NPDES permit stipulated specific conductance within the Hillsboro Canal could not exceed 1,250 µmhos or 50 percent above background at the edge of an 800-meter mixing zone. Within 60 hours after pumping began, specific conductance increased to the specified limit, requiring the premature ending of the pumping portion of the test.

Semi-log plots of the drawdown data for both the test production well (EXW-1) and corresponding monitor well (PRB-10R) are shown in **Figure 9**. Maximum drawdowns in EXW-1 and PBF-10R were 79.8 feet (34.5 psi) and 28.9 feet (12.5 psi), respectively.

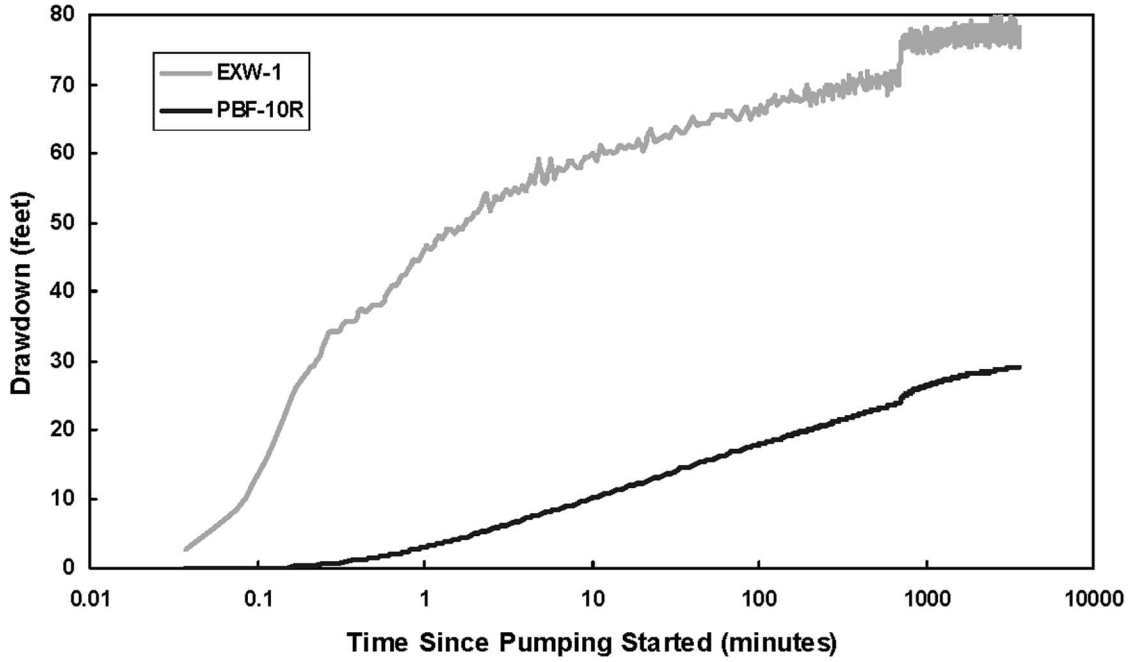

Figure 9. Time Series Plot of Aquifer Performance Test Drawdown Data from Wells EXW-1 and PBF-10R (1,015 to 1,225 feet bpl)

Time series plots of water level changes during the drawdown phase for the other two FAS monitor zones (PBF-11 and PBF-12) and barometric pressure data are included in **Figure 10**. The maximum water level change in PBF-11 during pumping was recorded at -1.3 feet (-0.6 psi) with PBF-12 water level fluctuations attributed to tidal loading and changes in atmospheric pressure (i.e., barometric effect).

Discharge data from the 16-inch diameter, circular orifice weir acquired during the pumping phase of the APT are shown in **Figure 11**. **Figure 11** shows minor fluctuations in the pump rate (less than +/-5 percent) during the course of the APT. These fluctuation were small enough to be inconsequential to the overall test results.

After approximately 24-hours of pumping, samples were taken from the discharge pipe for major cation/anion analyses. Before groundwater sampling, the field parameters of samples collected from the discharge pipe had stabilized. A limit of +/-5 percent variation in consecutive field parameter readings was used to determine chemical stability. Unfiltered and filtered samples were collected directly from the discharge point into a Teflon bailer. The bailer was then placed on a bailer stand where the sample bottles were filled slowly to minimize aeration. Duplicate samples were collected by sampling from consecutive bailers. Sample splits were collected from the same bailer.

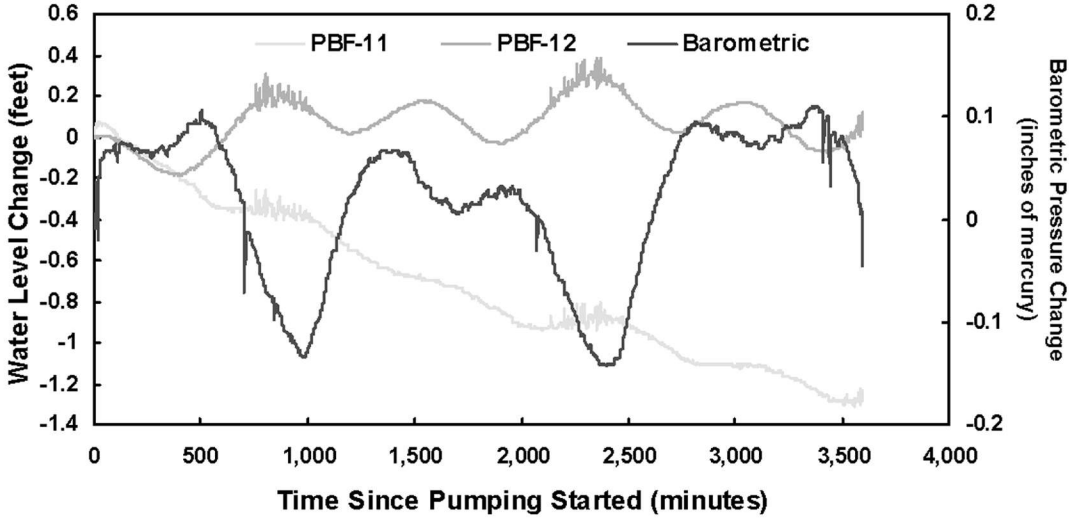

Figure 10. Time Series Plot of Aquifer Performance Test Water Level Data from the Lower Monitor Zones of Wells PBF-11 and PBF-12 during the Drawdown Phase of the APT

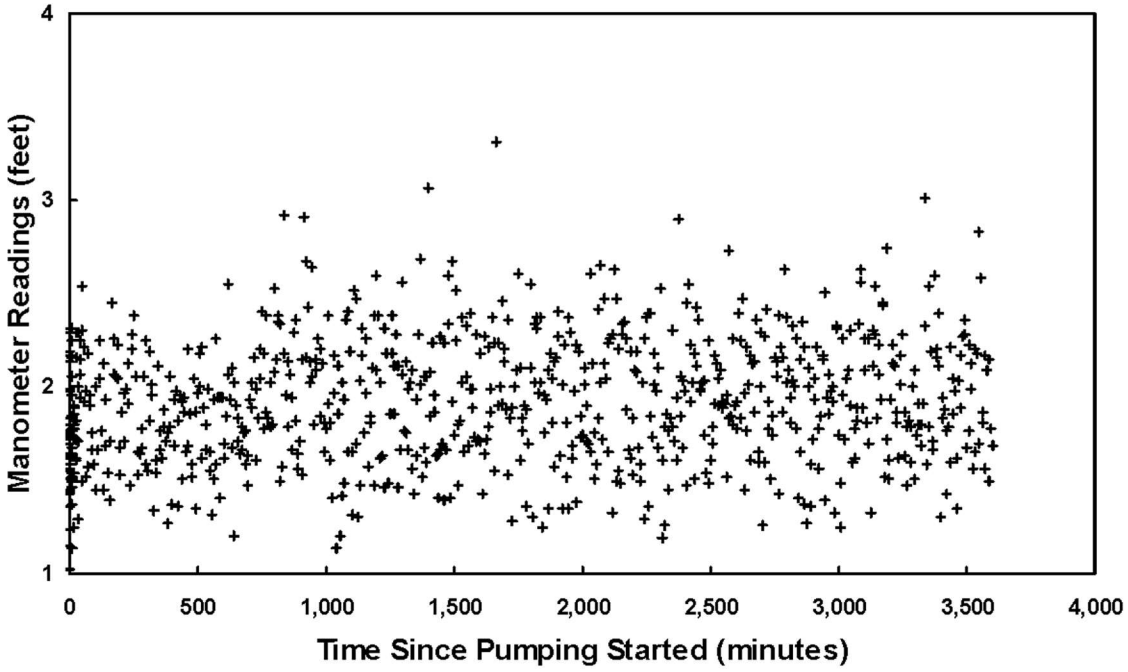

Figure 11. Time Series Plot of Aquifer Performance Test Pumping Rate Data for the Circular Orifice Weir

Once samples were collected, the bottles were preserved and immediately placed on ice in a closed container and transported to the SFWMD's water quality laboratory. The samples were then analyzed for major cation and anions using USEPA and/or Standard Method procedures (SFWMD, 1999). The results of the cation/anion analyses for EXW-1 are listed in **Table 6**.

Table 6. Composite Water Quality Data from the Western Hillsboro Site

Identifier	Depth Interval (feet bpl)	Sample Date	Cations (mg/L)[a]				Anions (mg/L)[b]			TDS	Field Parameters		
			Na^+	K^+	Ca^{2+}	Mg^{2+}	Cl^-	Alkalinity as $CaCO_3$	SO_4^{2-}		Specific Conductivity (µmhos/cm)	Temp (°C)	pH (s.u.)
EXW-1	1015-1225	11/16/00	1,020.0	37.4	139.0	143.0	1,812.0	141.2	560.6	4,064	6,587	23.78	7.17

a. Na = sodium; K = potassium; Ca = calcium, Mg = magnesium
b. $CaCO_3$ = calcium carbonate; SO_4 = sulfate, TDS = total dissolved solids

Before pumping stopped, the data loggers were reconfigured to record the recovery data. The pump was then manually stopped and water levels were allowed to recover to static condition. The recovery phase of the APT continued for 48 hours, ending on November 20, 2000. The recovery data for the pumped monitor zone (PBF-10R) is shown in **Figure 12**. Water level fluctuations during the recovery period for the lower monitor intervals (PBF-11 and PBF-12) and barometric pressure are shown in **Figure 13**. Electronic copies of the original drawdown, recovery, and manometer data for this APT are archived and available for review at the SFWMD headquarters in West Palm Beach, Florida.

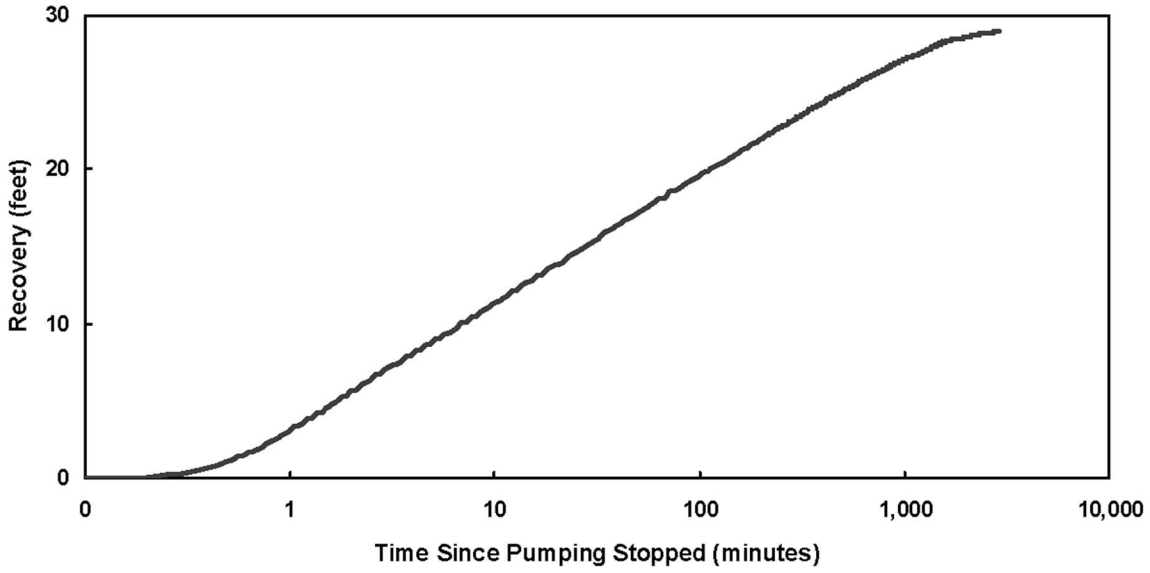

Figure 12. Time Series Plot of Aquifer Performance Test Recovery Data from Well PBF-10R

Following the 72-hour recovery phase, background water level data was collected for 7 days (November 21, 2000, to November 27, 2000) from the three monitor FAS horizons (PBF-10R, PBF-11, and PBF-12) to discern tidal and barometric effects. Time series plots of background water level data from the three FAS monitor zones and barometric pressures are included in **Figure 14**.

A log/log plot of drawdown versus time for PBF-10R is shown in **Figure 15**. The shape of the drawdown curve is indicative of a leaky-type aquifer. A leaky (semiconfined)

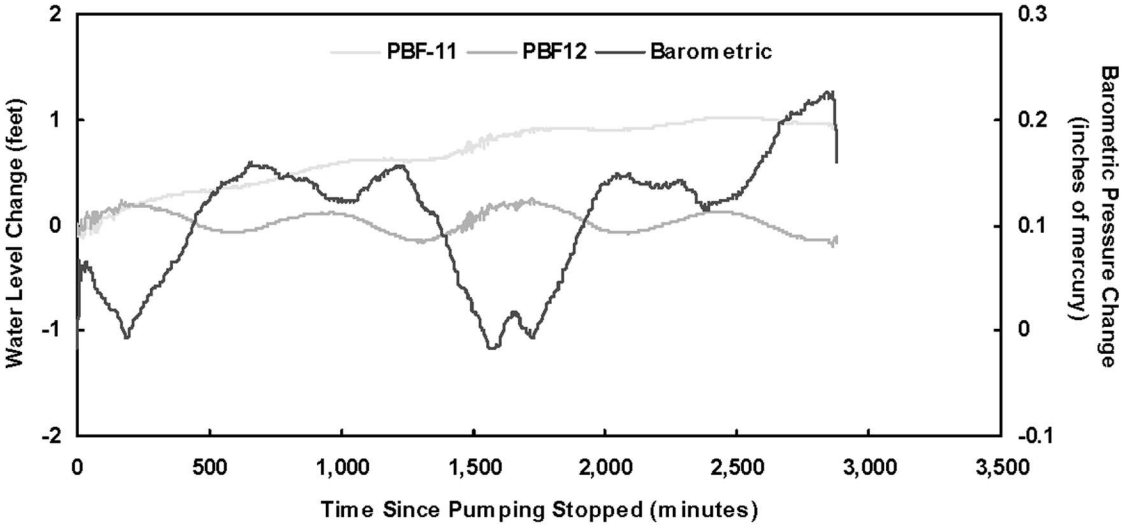

Figure 13. Time Series Plot of Aquifer Performance Test Water Level Data from Wells PBF-11 and PBF-12 from the Recovery Period

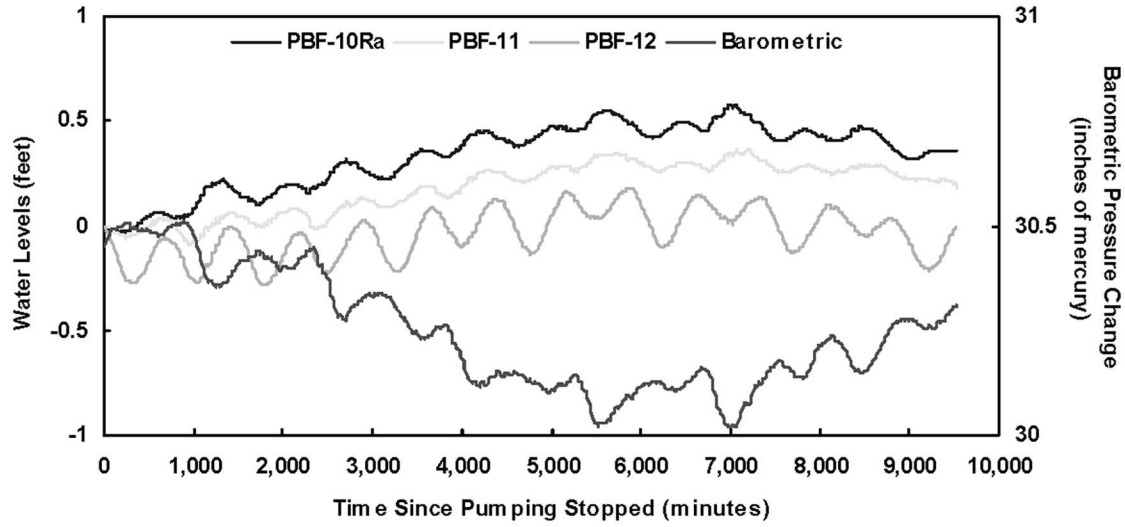

Figure 14. Time Series Plot of Background Water Levels for Wells PBF-10R, PBF-11, and PBF-12

aquifer is defined as an aquifer that loses or gains water (depending on the pressure gradients) through a semiconfining unit (aquitard). If a semiconfining unit is composed of a thick layer of poorly indurated, high porosity sediments, it may provide water to the pumping well.

Three different analytical solutions were applied to the drawdown data collected during the APT to determine transmissivity and the storage coefficient of the proposed ASR horizon at the Western Hillsboro site. The solutions used were Theis (1935), Hantush (1960), and Moench (1985). The analytical results from each method are listed in **Table** 7.

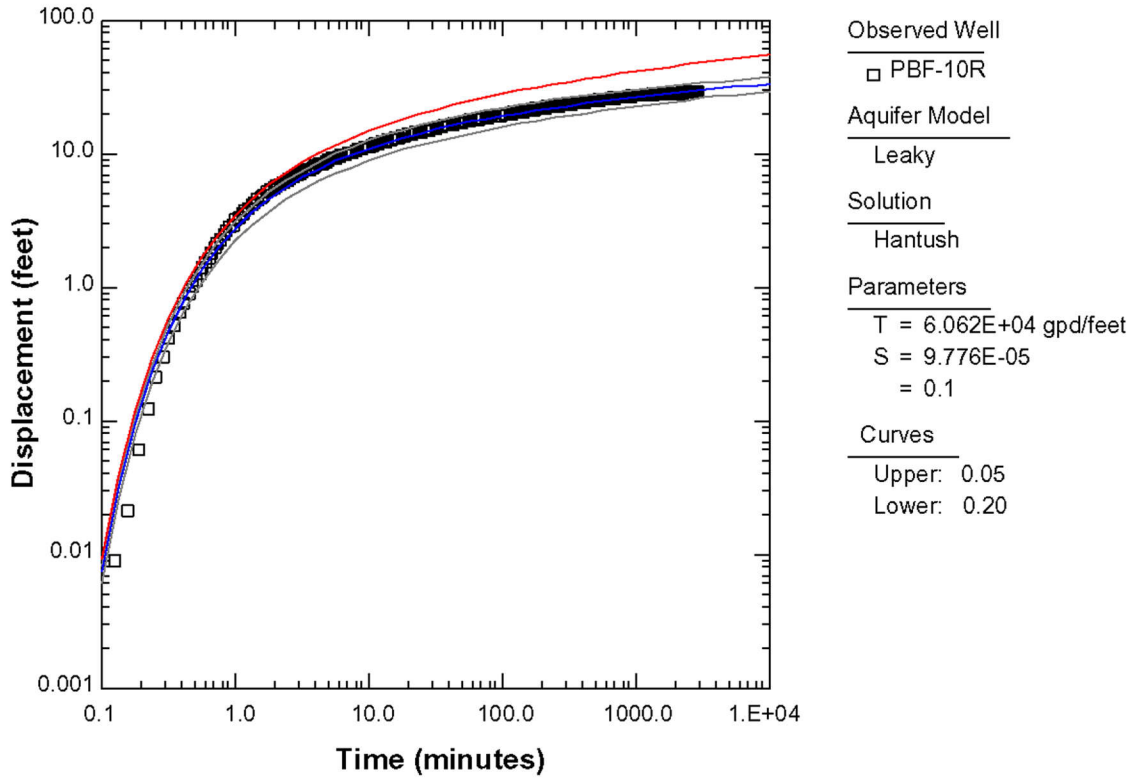

Figure 15. Log-Log Plot of Drawdown versus Time for Well PBF-10R

Table 7. Summary of Analytical Solutions

Analytical Method	Transmissivity (gpd/feet)	Storativity	β^{α}	r/B[b]
Theis,1935 (Confined)	83,470	9.776 E-05	NA[c]	NA
Hantush, 1960 (Leaky)	60,620	9.776E-05	0.10	NA
Moench, 1985 (Leaky)	75,830	1.147E-04	0.10	0.16

a. β storage factor
b. r/B = Leakage factor
c. NA = Not applicable

The Hantush (1960) analytical model appears to best represent the hydraulic conditions present within the upper Floridan aquifer based on the lithologic character of the overlying and underlying units, water level declines noted in PBF-11, and the resulting drawdown curve. The Hawthorn Group rests above the production interval, which is composed of approximately 800 feet of effectively impermeable clay layers interbedded with low permeable carbonate units. However, a monitor zone located above the test

interval was not available for monitoring to quantify the contribution from the overlying confining units. The underlying sediments at this site are composed of highly porous (25 percent to 45 percent) mudstones to wackestones that have the potential to supply additional water to the pumping well. The proximal FAS monitor well (PBF-11) completed below the test interval (1,515 to 1,670 feet bpl) was monitored during the APT to quantify the relative contribution of the underlying semiconfining units. During the pump test, water levels in PBF-11 declined a maximum of 1.3 feet (-0.6 psi) (**Figure 10**). This indicates that the low permeable unit below the production interval of EXW-1 is semiconfining in nature and additional water may be derived from it and lower units during pumping. Water level fluctuations in PBF-12 (2,135 to 2,260 feet bpl) during pumping are attributed to diurnal tidal and barometric pressure changes.

Hantush (1960) derived an analytical solution for predicting water level displacements in response to pumping in a leaky confined aquifer, assuming storage in the aquitard(s). Other assumptions related to this solution can be found in Hantush (1960). The production interval in the upper Floridan aquifer from 1,015 to 1,225 feet bpl yielded a transmissivity value of 60,620 gpd/foot and a storage coefficient of 9.8×10^{-5} based on the Hantush (1960) leaky aquifer model **(Table 7)**.

Pressure Analysis

A three-dimensional, steady state, finite difference model, MODFLOW, previously developed by SFWMD for the Lower East Coast Planning Area (encompassing Miami-Dade, Broward, and Palm Beach counties), was used in a local pressure analysis (Fairbank, 1999). The horizontal resolution of the model is one square mile with vertical discretization consisting of nine layers representing the following hydrogeologic units:

- Layer 1 – Surficial Aquifer System (used as an upper boundary)
- Layer 2 – Hawthorn Group (low permeability unit)
- Layer 3 – Upper Floridan aquifer (upper flow zone – Flow Zone 1)
- Layer 4 - Upper Floridan aquifer (interaquifer confining unit)
- Layer 5 - Upper Floridan aquifer (lower flow zone - Flow Zone 2)
- Layer 6 - Middle confining unit of the FAS
- Layer 7 - Lower Floridan aquifer (upper flow zone - Flow Zone 3)
- Layer 8 - Lower Floridan aquifer (lower permeable units)
- Layer 9 - Lower Floridan aquifer (Boulder Zone - used as a lower boundary)

This model was used to evaluate water level (pressure) changes as a result of simulating injecting water into EXW-1 (the upper Floridan aquifer) at a rate of 5 mgd. The results of the steady-state model stimulation are shown in **Figure 16**.

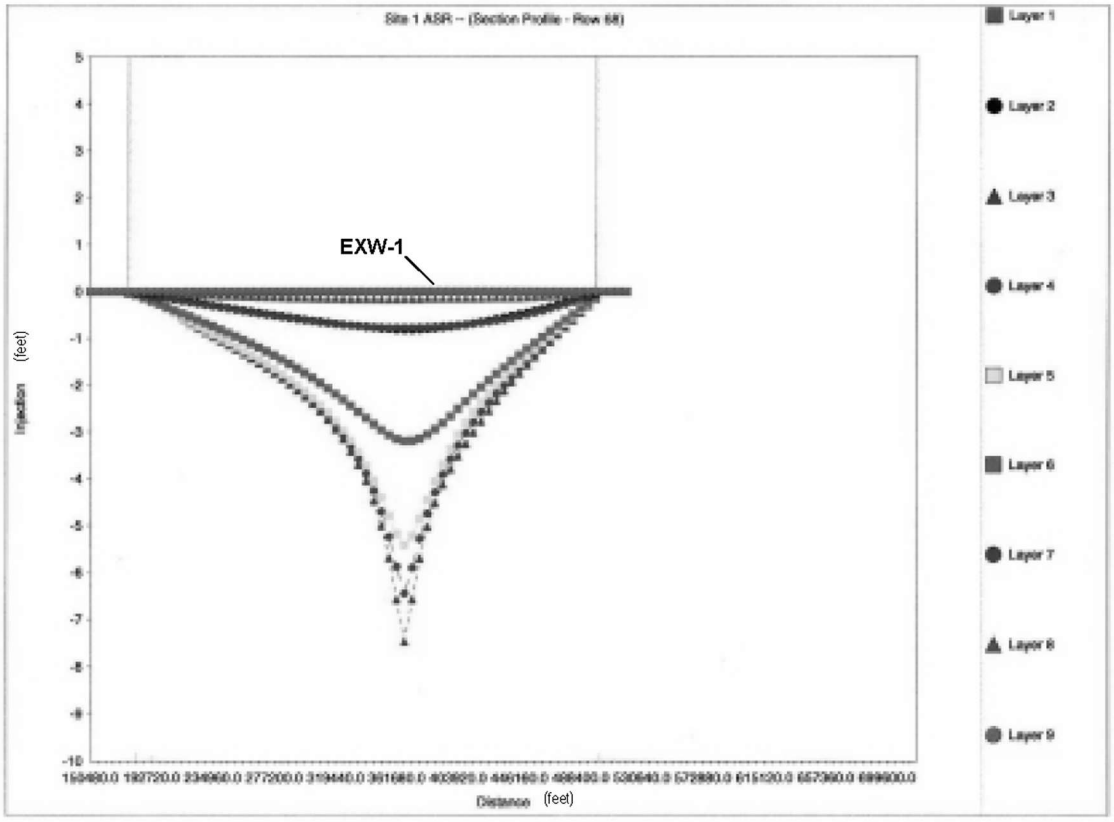

Figure 16. Results of Steady-State Model Simulation

The model results show a net increase of approximately 8 feet within the production interval (1,015 to 1,225 feet bpl - layer 3) in the model cell where the 5-mgd injection rate is simulated. The pressure changes within all the model layers, under and above the injection cell are as follows:

- Layer 1 - Surficial Aquifer System (upper boundary) - negligible to no simulate effect
- Layer 2 - Hawthorn Group (low permeability unit) - less than 0.75 feet
- Layer 3 - Upper Floridan aquifer (upper flow zone - Flow Zone 1) - 7.7 feet
- Layer 4 - Upper Floridan aquifer (interaquifer confining unit) - 6.5 feet
- Layer 5 - Upper Floridan aquifer (lower flow zone - Flow Zone 2) - 5.5 feet
- Layer 6 - Middle confining unit of the FAS - 3.2 feet
- Layer 7 - Lower Floridan aquifer (upper flow zone - Flow Zone 3) - 0.75 feet
- Layer 8 - Lower Floridan aquifer (lower permeable units) - less than 0.2 feet
- Layer 9 - Lower Floridan aquifer (Boulder Zone - used as a lower boundary)

Based on the simulated head changes in Layer 7, the layer that represents the interval containing water with TDS concentrations greater than 10,000 milligrams/Liter (mg/L), continuous long-term injection has a net effect of less than 1 foot. Therefore, the simulated effects suggest the potential for upconing of poorer quality water is limited. The simulated distribution for the various layers (hydrogeologic units) do not indicate pressure increases sufficient to induce horizontal or vertical fracture within the injection horizon or overlying/underlying confining units. The pressure required to fracture a formation is a function of the unconfined strength of the material that makes up the aquifer and the confining pressure (overburden pressure). Given the depth of even the upper formation, there is considerable confining pressure to resist fracturing. An injection pressure of greater than 1,015 psi would be necessary to overcome overburden stresses (1 psi per foot of depth multiplied by 1,015 feet from the top of production horizon at the site) to induce a horizontal fracture. A pressure of approximately 550 psi (1,000 feet multiplied by 0.55 psi per foot of depth) would be required to initiate a vertical fracture (Howard and Fast, 1970). Based on drawdown data from the 60-hour APT with a pump rate of 3,050 gpm, the maximum pressure reduction observed was 34.5 psi within the production well (EXW-1). The pressure reduction during pumping from static in the corresponding monitor well (PBF-10R) located 330 to the west was 12.1 psi. Since, the injection zone is a semi-confined, fully saturated aquifer, the pressure change due to injection should be the same as the pressure change that would result from withdrawal, albeit a rise instead of a drawdown.

SUMMARY

- A Class V, Group 8, 24-inch outer diameter exploratory well at the Western Hillsboro site was successfully constructed and tested in accordance with FDEP Permit Number UC 153872-001.
- Lithologic information and geophysical logs obtained from EXW-1 indicates that soft nonindurated detritial clays, silts, and poorly indurated mudstones of the Hawthorn Group predominate from 205 to 985 feet bpl. These low permeable sediments act as confining units separating the FAS from the SAS.
- The top of the FAS was identified at a depth of approximately 985 feet bpl, as defined by the Southeastern Geological Society Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition (1986).
- Lithologic and geophysical logs, packer test results, and specific capacity results indicate moderate to good production capacity of the upper Floridan aquifer from 1,015 to 1,225 feet bpl.
- A productive horizon in the upper Floridan aquifer from 1,015 to 1,225 feet bpl yielded a transmissivity value of 60,620 gpd/foot, and a dimensionless storage coefficient of 9.8×10^{-5} based on a leaky aquifer model.

- Composite water quality sampling of EXW-1 indicate that chloride and TDS exceed potable drinking water standards with chloride and TDS concentrations of 1,812 and 4,064 mg/L, respectively.
- The fluid-type logs (e.g., flow, temperature) indicate good production from flow zones between 1,050 and 1,170 feet bpl and 1,190 to 1,210 feet bpl. Below 1,210 feet bpl, the productive capacity is limited, as indicated by the fluid-type logs, suggesting lower permeable semiconfining units near the base of the proposed storage horizon.

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APPENDIX A
UNDERGROUND INJECTION CONTROL
CLASS V PERMIT FOR EXW-1

Department of Environmental Protection

Jeb Bush
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

David B. Struhs
Secretary

DEC 0 8 1999

CERTIFIED MAIL Z220324375
RETURN RECEIPT REQUESTED

NOTICE OF PERMIT

Frank Finch
Executive Director
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

PALM BEACH COUNTY
UIC - South Florida Water Management District
Site 1 Pilot Study
File No: 153872-001-UC
Class V Group 8 Exploratory Well EXW-1

Dear Mr. Finch:

Enclosed is Permit Number 153872-001-UC, to construct one Class V, Group 8, 24-inch outside diameter (OD) exploratory well, EXW-1, for South Florida Water Management District, West Palm Beach, Palm Beach County, Florida, issued pursuant to Section(s) 403.087, Florida Statutes (FS) and Florida Administrative Codes (FAC) 62-4, 62-520, 62-522, 62-528, 62-550, 62-600, 62-601 and 62-660.

Any party to this Order (permit) has the right to seek judicial review of the permit under Section 120.68, FS, by the filing of a Notice of Appeal under Rule 9.110 of the Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days after this notice is filed with the Clerk of the Department.

Should you have any questions, please contact Jose Calas, PE, or Heidi Vandor, PG, of this office, telephone (561) 681-6691 or (561) 681-6688, respectively.

Executed in West Palm Beach, Florida.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

12/8/99

Melissa L. Meeker
Director of District Management
Southeast District

Date

MLM/JLC/HV

cc: Francine Folkes, OGC/TLH
Steve Anderson, SFWMD
Heidi Vandor, FDEP/WPB
Richard Deuerling, FDEP/TLH
Tom Lefevre, PBCPHU
Lou Devillon, SFWMD
Nancy Marsh, USEPA/ATL
Ron Reese, USGS/MIA

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on DEC 0 8 1999 to the listed persons.
Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to the §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk

DEC 0 8 1999
Date

"More Protection, Less Process"

esopert.a

Department of Environmental Protection

Jeb Bush
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

David B. Struhs
Secretary

PERMITTEE:
Frank Finch
Executive Director
South Florida Water Management District
3301 Gun Club Road
West Palm Beach FL 33406-0000

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 0 8 1999
EXPIRATION DATE: DEC 0 7 2004
COUNTY: Palm Beach
LATITUDE/LONGITUDE: 26°21'07"N/80°17'42"W
PROJECT: SFWMD Site 1 Pilot Study
Class V Exploratory Well EXW-1

This permit is issued under the provisions of Chapter 403.087, Florida Statutes, and Florida Administrative Code (FAC) Rules 62-4, 62-520, 62-522, 62-528 and 62-550. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

TO CONSTRUCT: One Class V, Group 8 exploratory well, EXW-1. The well shall be constructed with 24-inch outside diameter (OD) carbon steel casing to a depth of approximately 1,000 feet below land surface (bls), with a nominal 24-inch open borehole drilled to a total depth of approximately 1,200 feet bls. Final depths will be determined during construction and field testing. The purpose of the permit is for the construction and testing of an exploratory well to obtain site specific subsurface information for the proposed aquifer storage and recovery (ASR) well network for the South Florida Water Management District ASR Pilot Study. The proposed future of use of exploratory well EXW-1 is as an ASR well. Injection of fluids into EXW-1 is not permitted as part of this permit. Existing SFWMD research well PBF-10 will be used as a monitor well during aquifer performance testing (APT).

IN ACCORDANCE WITH: Application to construct a Class V, exploratory well, EXW-1 received March 30, 1999. Request for Information (RFI) dated April 29, 1999; response to RFI received May 11, 1999; RFI dated June 10, 1999; response to RFI received June 30, 1999; publication of the Notice of Draft Permit in the Palm Beach Post on August 2, 1999; consideration of receipt of public comment received as a result of a public meeting held on September 8, 1999; and publication of the Intent to Issue Permit in the Palm Beach Post on November 6, 1999.

LOCATED AT: The Eastern convergence of the Hillsboro Canal, WCA 1, WCA 2A, Palm Beach County, Florida, 33445.

TO SERVE: Lower East Coast

SUBJECT TO: General Conditions 1-24 and Specific Conditions 1-9.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 0 8 1999
EXPIRATION DATE: DEC 0 7 2004
PROJECT: Class V Exploratory Well EXW-1

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, FS.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in subsections 403.087(7) FS, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations. This permit is not a waiver of, or approval of, any other Department permit that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:

   a. Have access to and copy any records that must be kept under conditions of the permit;
   b. Inspect facility, equipment, practices, or operations regulated or required under this permit;
   c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules. Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, permittee does not comply with or will be unable to comply with any condition or limitation specified in the permit, permittee shall immediately provide the Department with the following:

   a. A description of and cause of noncompliance; and
   b. The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to educe, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 0 8 1999
EXPIRATION DATE: DEC 0 7 2004
PROJECT: Class V Exploratory Well EXW-1

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.111 and 403.73, FS. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Rule 62-4.120 and 62-528.350 FAC, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. The permittee shall comply with the following:

    a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records shall be extended automatically unless the Department determines that the records are no longer required.
    b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
    c. Records of monitoring information shall include:
        - the date, exact place, and time of sampling or measurements;
        - the person responsible for performing the sampling or measurements;
        - the dates analyses were performed;
        - the person responsible for performing the analyses;
        - the analytical techniques or methods used;
        - the results of such analyses.
    d. The permittee shall furnish to the Department, within the time requested in writing, any information which the Department requests to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit..
    e. If the permittee becomes aware the relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

14. All applications, reports or information required by the Department shall be certified as being true, accurate and complete.

15. Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

16. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 08 1999
EXPIRATION DATE: DEC 07 2004
PROJECT: Class V Exploratory Well EXW-1

17. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

18. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

19. This permit may be modified, revoked and reissued, or terminated for cause, as provided in 40 CFR sections 144.39(a), 144.40(a), and 144.41 (1998). The filing of a request by the permittee for a permit modification, revocation or reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

20. The permittee shall retain all records of all monitoring information concerning the nature and composition of injected fluid until five years after completion of any plugging and abandonment procedures specified under rule 62-528.435, FAC. The permittee shall deliver the records to the Department office that issued the permit at the conclusion of the retention period unless the permittee elects to continue retention of the records.

21. All reports and other submittals required to comply with this permit shall be signed by a person authorized under rules 62-528.340(1) or (2), FAC. All reports shall contain the certification required in rule 62-528.340(4), FAC.

22. The permittee shall notify the Department as soon as possible of any planned physical alterations or additions to the permitted facility. In addition, prior approval is required for activities described in rule 62-528.410(1)(h).

23. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or injection activity which may result in noncompliance with permit requirements.

24. The permittee shall report any noncompliance which may endanger health or the environment including:

    a. Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or
    b. Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

    Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 08 1999
EXPIRATION DATE: DEC 07 2004
PROJECT: Class V Exploratory Well EXW-1

SPECIFIC CONDITIONS

1. General Requirements

a) This permit is to construct a Class V, Group 8 exploratory well EXW-1. The exploratory well system will include the existing research well PBF-10 for monitoring. This permit allows only for the construction and withdrawal testing of EXW-1 as an exploratory well in accordance with Chapter 62-528, FAC. Any modification of this exploratory well system to accept/inject waters must be accomplished through the regulatory process and may require the application and issuance of a new permit and Department approval.

b) Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures.

c) The permittee shall be subject to all requirements and regulations of Palm Beach County and the South Florida Water Management District regarding the construction, testing and operation of this well system.

d) Four permanent shallow surficial aquifer pad monitor wells (PMWs) shall be installed at the corners of the drilling pad and identified by location number and pad location, ie. NW, NE, SW, SE. The PMWs shall be sampled and analyzed prior to the onset of drilling. Initial analyses shall be submitted prior to the initiation of drilling. The PMWs are to be retained in service, sampled weekly and analyzed for chlorides (mg/L), conductivity (umho/cm), total dissolved solids and water level (relative to NGVD) during the construction and testing. In addition, the PMWs shall be sampled 48 hours prior to any maintenance, testing (including mechanical integrity testing) or repairs to the system which represent an increased potential for accidental discharge to the surficial aquifer. The results of these analyses shall be submitted to the Department within 30 days of the completion of the activity. A summary sheet from the FDEP Southeast District is attached. If located in a traffic area the well head must be protected by a traffic bearing enclosure and cover. The cover must lock and be specifically marked to identify the well and its purpose.

e) Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

f) Changes to this construction permit, and/or any change in the storage zone or Floridan aquifer monitor well zone, may be addressed by a request for a permit modification in accordance with Rule 62-528, FS.

2. Construction and Testing Requirements

a) The measurement points for drilling and logging operations shall be surveyed and referenced to the National Geodetic Vertical Datum (NGVD) of 1929 prior to the onset of drilling activities for the exploratory well and associated monitor well.

b) No drilling operations shall begin without an approved disposal site for drilling fluids, cuttings, or waste. It shall be the permittee's responsibility to obtain the necessary approval(s) and permits for disposal prior to the start of construction. Any formation waters discharged to surface or surficial aquifer waters during aquifer performance test shall require an Industrial Wastewater permit from the Department.

c) The Department shall be notified within 48 hours after work has commenced.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 08 1999
EXPIRATION DATE: DEC 07 2004
PROJECT: Class V Exploratory Well EXW-1

d) Waters spilled during modification or testing of the exploratory well system shall be contained and properly disposed.

e) Hurricane Preparedness - Upon the issuance of a "Hurricane Watch" by the National Weather Service, the preparations to be made include but are not necessarily limited to the following:

- Secure all on-site salt and stockpiled additive materials to prevent surface and/or groundwater contamination.
- Properly secure drilling equipment and rig(s) to prevent damage to well(s) and on-site treatment process equipment.

f) Blow-out preventers shall be installed on wells prior to penetration of the Floridan Aquifer.

g) TAC and EPA review and Department approval are required prior to the following stages of well construction. Requests for approval shall be in the form of separate stand-alone documents:

- Spud date
- Final casing seat
- Plugging back pilot hole (if needed)
- Selection of the packer test intervals based upon testing of EXW-1

h) Upon completion of well construction, background water quality sampling shall be performed to determine water quality characteristics (chloride, conductivity, total dissolved solids, temperature and pH) as well as primary and secondary drinking water standards (Rule 62-550, FAC) and minimum criteria parameters (Rule 62-520, FAC), as attached.

i) The geophysical logging program for well construction, shall at a minimum, include:

(i) 9-7/8 inch pilot hole to approximately 200 feet bls, to the base of the surficial aquifer:
- Caliper
- Natural gamma
- Spontaneous potential
- Long and short normal electric

(ii) 36-inch reamed hole to approximately 200 feet bls, to the base of the surficial aquifer:
- Caliper
- Natural gamma

(iii) 9-7/8 inch pilot hole to approximately 1200 feet bls, the final depth of the well:
- Caliper
- Natural gamma
- Dual induction
- Spontaneous potential
- Borehole compensated sonic with VDL display

(iv) 36-inch reamed hole from approximately 200 feet bls to the top of the Floridan Aquifer at approximately 1000 feet bls:
- Caliper
- Natural gamma

(v) 24-inch cased hole to the top of the Floridan Aquifer at approximately 1000 feet bls:
- Temperature log after each stage of cementing

Frank Finch
Executive Director
South Florida Water Management District

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(vi) 24-inch reamed open hole below final casing to approximately 1200 feet bls final depth:
- Caliper
- Natural gamma
- Temperature (static)
- long and short normal electric
- Flowmeter (static and pumping)
- Fluid resistivity

(vii) Completed well:
- Downhole video survey with rotating lens
- Temperature

j) Testing during reverse air drilling of the pilot hole in the proposed storage zone, if applicable, shall be performed to determine water quality and hydraulic characteristics. The data, results and interpretation of the results shall be submitted with the weekly reports (SC 4.d). The testing shall, at a minimum, include the following:

(i) Bottom samples of formation water discharging from the reverse air discharge setup shall be collected and field analyzed for temperature, conductivity, pH and chlorides. Total dissolved solids shall be measured to establish a relationship between TDS and conductivity. At a minimum, water samples shall be collected at 30 foot intervals of the drilled borehole.

(ii) Flow tests shall be conducted every 30 feet of the drilled borehole or drill rod change. Each flow test shall include a static level measurement using a fixed manometer tube, a free artesian flow for 10 minutes, flow rate and drawdown measurements, specific capacity analysis and flow water sample collection.

(ii) A five gallon sample of formation fluid shall be collected from the completed well after development but before injection begins. Samples should be labeled as to well number, depth, type of sample and shipped to Dr. James Cowart, Department of Geology, Florida State University, Tallahassee, FL 32304.

k) Hydrogeologic testing of the proposed storage/injection zone from between approximately the 1000 to 1200 feet bls depth range:

i) At least 3-single/straddle packer tests shall be performed to determine the characteristics of the anticipated flow zones. A flow test shall be performed for each packer test and a water quality sample collected to determine the hydraulic and water quality characteristics of the tested intervals. The sample shall be analyzed for chloride, conductivity, temperature and TDS. The flow test shall be of sufficient duration to achieve stabilization of water levels and water quality. Pre and post test monitoring shall be performed to achieve stabilization of water levels.

ii) Aquifer performance test to include:
- 72-hour constant rate drawdown test
- 48-hour recovery test

l) The Department shall be notified at least 72 hours prior to pressure testing.

m) All mechanical integrity testing must be initiated during normal business hours, Monday through Friday.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 0 8 1999
EXPIRATION DATE: DEC 0 7 2004
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n) A pressure test for the final casing shall be performed. The final casing must be tested with a fluid-filled casing at 1.5 times the expected operating pressure with a test tolerance of + or - 5%. A Certificate of Calibration of the pressure gage must be provided to the Department staff witnessing the test, prior to commencement of the test, and with the final test reports.

o) UIC-TAC meetings are scheduled on the 2nd and 4th Tuesday of each month subject to a five working day prior notice and timely receipt of critical data by all UIC-TAC members and the United States Environmental Protection Agency (EPA), Region IV, Atlanta. Emergency meetings may be arranged when justified to avoid undue construction delays.

p) Department approval at a scheduled UIC-TAC meeting shall be based on the permittee's presentation that shows compliance with Department rules and this permit.

3. **Quality Assurance/Quality Control Requirements**

a) Pursuant to Rule 62-528.440(5)(b), FAC, the Professional Engineer(s) of Record shall certify all documents related to the completion of all well construction. The Department shall be notified immediately of any change of the Engineer(s) of Record.

b) In accordance with Section 492, Florida Statutes, all documents prepared for the geological/hydrogeological evaluation of the exploratory well system shall be signed and sealed by a Florida Licensed Professional Geologist or qualified Florida Licensed Professional Engineer.

c) Continuous on-site supervision by qualified personnel (engineer or geologist) is required during all testing, geophysical logging and cementing operations.

4. **Reporting Requirements**

a) All reports, documents and surveys required by this permit shall be submitted concurrently to all members of the UIC-TAC and the United States Environmental Protection Agency (EPA), Region IV, Atlanta. The UIC-TAC shall consist of representatives of the following agencies:

- Department of Environmental Protection, West Palm Beach
- Department of Environmental Protection Tallahassee
- United States Geological Survey (USGS), Miami
- South Florida Water Management District (SFWMD), West Palm Beach
- Palm Beach County Public Health Unit (PBCPHU), West Palm Beach

b) The Department and other applicable agencies must be notified of any unusual or abnormal events occurring during construction, and in the event the Permittee is temporarily unable to comply with the provisions of the permit (e.g., on-site spills, artesian flows, large volume circulation losses, equipment damage due to: fire, wind and drilling difficulties, etc.). Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance.

c) Prior to site preparation for the exploratory well system, a drilling and construction schedule shall be submitted. Also, prior to site preparation, a site drawing(s) shall be submited for TAC and EPA review and Department approval at a scale that will show well locations and all surface features of the exploratory well system.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
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EXPIRATION DATE: DEC 07 2004
PROJECT: Class V Exploratory Well EXW-1

d) **Weekly progress reports** shall be submitted throughout the construction process, and shall include at a minimum the following information:

- A cover letter summary of the daily engineer report and driller's log
- A projection for activities in the next reporting period.
- Daily engineers report and driller's log with detailed descriptions of all drilling progress, cementing, testing, logging, casing and steel liner installation activities, etc.
- Lithologic logs, geophysical logs, flow test reports and water quality test results with interpretations.
- Interpretive flow test reports shall include the following:
  - Development records
  - Well head artesian pressure
  - Specific capacity testing, aquifer performance testing
  - Water quality
- Interpretation with all test results and geophysical logs as they relate to the week's activities
- Detailed description of any unusual construction related events that occur during the reporting period.
- Weekly water quality analysis and water levels for the four PMWs.

e) Per Rules 62-528.410(4)(c), 62-528.420(4)(c) and 62-528.605(2), FAC, the selection of the final casing seat and the proposed storage zone must be approved by the Department. To obtain approval, the permittee must submit a request to the Department in the form of a separate stand-alone document. All requests shall be accompanied by technical justification including, but not be limited to the following items:

- Adequacy of mechanical properties of the formation to create a casing seal.
- Geophysical log interpretations, as the interpretations relate to the casing seat.
- Lithologic drilling rate and weight on bit data, with interpretations (related to the casing seat).
- Identification of storage zone boundaries and characteristics, including hydrogeologic data and interpretations.
- Water quality data with interpretations.
- Demonstration of confinement and evaluation of potential for upconing of poorer quality water. Use all appropriate formation testing information including but not limited to hydrological, geophysical and water quality data collected in EXW-1 and other data collected from any other nearby, in particular the nearby existing research well PBF-10, that will provide useful correlative information for interpretive purposes.

f) The submittal for the request for approval to plug back the pilot hole, if necessary, to modify the storage zone, shall include:

- Withdrawal test data for the storage zone, with interpretations and evaluation.
- Water quality reports.
- Geophysical log interpretations including flow analysis, as the interpretations relate to the request.
- Identification of storage zone boundaries and characteristics.
- Demonstration of confinement and evaluation of potential for upconing of poorer quality water. Use all appropriate formation testing information including but not limited to hydrological, geophysical and water quality data collected in EXW-1 and other data collected from any other nearby, in particular the nearby existing research well PBF-10, that will provide useful correlative information for interpretive purposes.
- Justification of necessity or lack of necessity of BHC sonic log.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 0 8 1999
EXPIRATION DATE: DEC 0 7 2004
PROJECT: Class V Exploratory Well EXW-1

g) An interpretation of all test results and geophysical logs must be submitted with all submittals.

h) Upon completion of analysis of cores, if applicable, and sample cuttings, the permittee shall contact the Underground Injection Control Section of the Department of Environmental Protection in Tallahassee to arrange their transfer to the Florida State Geologic Survey.

i) Within 30 days of completion of construction and APT, a final report shall be submitted. The report shall include, but not be limited to, all information and data collected under Rules 62-528.605, 62-528.615, and 62-528.635, FAC, with interpretations. The report shall include:

- Transmissivity test data for the storage zone, with evaluation.
- Evaluation of the maximum injection capacity within safe pressure limits.
- Evaluation of confinement and potential for upconing of poorer quality water.
- Record (as-built) drawings of the exploratory well, surface equipment, instrumentation and appurtenances, if applicable, certified by the engineer of record.
- Summary of all water quality, water level and well performance data collected, with conclusions and recommendations.
- Well locations surveyed relative to permanent reference points by a Florida registered land surveyor, and located on a site plan by latitude and longitude, recorded in the public record.
- Factory mill certificates for all casing pipe.

6. Surface Equipment

a) The integrity of the monitor zone sampling systems shall be maintained at all times. Sampling lines and equipment shall be kept free of contamination with independent discharges and no interconnections with any other lines. Sampling lines shall be clearly and unambiguously identified by monitoring zone at the point at which samples are drawn. All reasonable and prudent precautions shall be taken to ensure that samples are properly identified by monitor zone and that samples obtained are representative of those zones.

b) The surface equipment for the exploratory well system must maintain compliance with Department rules for water hammer control, screening, access for logging and testing, and reliability and flexibility in the event of damage to the well and piping. Additionally, a regular program of exercising the valves integral to the well head shall be instituted on a quarterly basis.

c) The exploratory well and monitoring well surface equipment and piping, if applicable, shall be kept free of corrosion at all times.

d) Spillage onto the injection well pad during construction activities, and any waters spilled during mechanical integrity testing, other maintenance, testing or repairs to the system shall be contained by an impermeable wall around the edge of the pad and disposed of via approved and permitted methods.

e) The four surficial aquifer monitor wells installed at the corners of the well pad shall be secured, maintained, and retained in service.

Frank Finch
Executive Director
South Florida Water Management District

PERMIT NUMBER: 153872-001-UC
DATE OF ISSUE: DEC 08 1999
EXPIRATION DATE: DEC 07 2004
PROJECT: Class V Exploratory Well EXW-1

7. **Plugging and Abandonment**

a) The permittee shall unconditionally obligate themselves to plug and abandon the well should the well become a threat to the waters of the State, if the well is no longer used, or if the well is no longer usable for its intended purpose, per Rules 62-528.460(1) and 62-528.605(2), FAC.

b) In the event the well must be plugged and abandoned, the permittee shall obtain an FDEP permit, as required by Rule 62-528.645, FAC.

8. **Permit Extension(s), Renewal(s) and Authorization to Use**

a) Pursuant to Rule 62-4.080(3), a permittee may request that a permit be extended as a modification of an existing permit. A request for an extension is the responsibility of the permittee and shall be submitted to the Department before the expiration of the permit. In accordance with Rule 62-4.070(4), FAC, a permit cannot be extended beyond the maximum 5 year statutory limit. Should construction need to continue beyond the 5 years of this permit, the permittee must apply for a new construction permit.

9. **Signatories and Certification Requirements**

a) All reports and other submittals required to comply with this permit shall be signed by a person authorized under Rules 62-528.340(1) or (2), FAC.

b) In accordance with Rule 62-528.340(4), FAC, all reports shall contain the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Melissa L. Meeker 12/8/99
Melissa L. Meeker Date
Director of District Management
Southeast District

MLM/JLCH/lw

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APPENDIX B
CASING FACTORY MILL CERTIFICATES AND DEVIATION SURVEY DATA

BERG STEEL PIPE CORP.
P. O. BOX 59209
PANAMA CITY, FL 32412-0209
850/769-2273

MILL TEST REPORT

PAGE: 1

SOLD TO: THOMAS PIPE
P.O. BOX 53187
BATON ROUGE, LA
70805

CUSTOMER ORDER NO: 4083PT
MILL ORDER NO: B07624

NOTES:
ALL PIPE MANUFACTURED IN THE USA
PROCESS OF MANUFACTURE - DSAW

BILL OF LADING NO: 077165 077212 077213
077215 077216 077217 077218 077226 077249
077250 077251 077252 077253 077254 077255 077256 077257 077258 077261 077262 077275 077277
077279 077280 077281 077284 077285 077286 077288 077290 077291 077294 077295 077299 077300
077320 077321

THESE MILL TEST REPORTS APPLY TO
YOUR P.O. # 5030
BARTOW STEEL REF. # 14819

SHIPMENT DATE: 6/08/98 - 6/12/98

ITEM NO.	QUANTITY	O.D.	WALL	GRADE SPECIFICATION	HYDROSTATIC TEST PRESSURE (PSI)	DWELL (SEC)
3	148	42.000"	.375"	API 5L GR B	380	10

---- BASE MATERIAL----

ITEM NO.	HEAT NO.	YIELD P.S.I.	TENSILE P.S.I.	ELONG %	Y/T	C	MN	P	S	CB	V	TI	AL	SI	CR	MO	CU	NI	B	CE
3	D42200	46712	70847	38.5	.66	.15	.92	.013	.007	.007	.002	.001	.025	.22	.033	.007	.020	.024		.316
3	D42202	47451	71564	40.0	.66	.15	.90	.013	.007	.006	.001	.002	.023	.21	.032	.004	.017	.026	.0001	.312
3	D42203	43554	69024	38.5	.63	.16	.92	.013	.008	.007	.002	.002	.028	.22	.033	.007	.020	.025		.322
3	D43886	44309	70149	37.0	.63	.15	.91	.016	.007	.007	.003	.001	.029	.21	.041	.006	.022	.028	.0002	.315
3	D43887	40900	70827	38.0	.58	.15	.93	.014	.008	.004	.002	.002	.030	.21	.039	.007	.025	.021	.0001	.318
3	E44101	49137	72034	37.5	.68	.14	1.00	.015	.007	.007	.009	.002	.026	.22	.035	.005	.019	.034	.0001	.323
3	E45902	45928	73087	37.0	.63	.16	.93	.012	.008	.003	.002	.002	.023	.23	.036	.007	.022	.028		.325
3	Y47368	46120	71931	36.0	.64	.16	.93	.012	.007	.003	.004	.002	.025	.21	.030	.008	.020	.035		.327
3	Y47417	47538	71935	36.5	.66	.15	.97	.012	.010	.005	.006	.002	.022	.20	.023	.005	.015	.024		.322
3	401N5541	46296	68981	39.0	.67	.13	.78	.014	.010	.001	.001	.002	.046	.20	.030	.007	.020	.020		.270
3	401W5551	47429	66294	40.5	.72	.13	.77	.013	.008	.003	.003	.002	.040	.18	.030	.004	.017	.040		.267
3	411A3131	43557	67495	37.0	.65	.14	.73	.014	.010	.007	.003	.001	.036	.18	.030	.004	.039	.032	.0002	.274
3	412A8131	42410	65696	38.5	.65	.13	.74	.013	.006	.006	.003	.001	.046	.19	.037	.007	.027	.039	.0001	.266
3	412W0821	47863	68871	41.0	.69	.13	.77	.017	.008	.004	.003	.002	.040	.20	.032	.005	.015	.034		.253
3	422A7641	44090	67545	40.5	.65	.14	.81	.010	.008	.007	.004	.001	.055	.19	.025	.004	.031	.031	.0001	.286
3	422A7651	43040	67051	34.5	.64	.14	.81	.010	.008	.007	.004	.001	.056	.19	.024	.004	.031	.032	.0002	.285

WE CERTIFY THAT THIS REPORT IS CORRECT AS CONTAINED IN THE COMPANY RECORDS. PIPE WERE MANUFACTURED, TESTED, AND INSPECTED IN COMPLIANCE WITH THE LATEST EDITION OF THE APPLICABLE SPECIFICATION.

CERTIFICATION NUMBER: 077165 ________ DATE: 6/22/98

BERG STEEL PIPE CORP.
P. O. BOX 59209
PANAMA CITY, FL 32412-0209
850/769-2273

MILL TEST REPORT

PAGE: 1

SOLD TO: THOMAS PIPE
P.O. BOX 53187

BATON ROUGE, LA
70805

CUSTOMER ORDER NO: TBR4603
MILL ORDER NO: B08323

BILL OF LADING NO: 083586 083588 083590 083592 083593 083595 083597 083598 083600 083601 083602 083603 083605 083607 083609 083612 083615 083617 083618 083624 083625 083626 083627 083628 083629 083631 083636 083637 083688 083694

NOTES:
ALL PIPE MANUFACTURED IN THE USA
PROCESS OF MANUFACTURE - DSAW
MELTED AND MANUFACTURED IN THE USA

SHIPMENT DATE: 7/30/1999 - 8/04/1999

ITEM NO.	QUANTITY	O.D.	WALL	GRADE SPECIFICATION	HYDROSTATIC TEST PRESSURE (PSI)	DWELL (SEC)
1	248	26.000"	.375"	API 5L B/X42 *	790	10

*PIPE MANUFACTURED IN ACCORDANCE WITH NACE MR0175
TENSILE SPECIMENS STRIP TYPE PER API5L FIGURE 6E

THESE MILL TEST REPORTS APPLY TO
YOUR P.O. # 5030
BARTOW STEEL REF. # 14940

---- BASE MATERIAL----

ITEM NO.	HEAT NO.	YIELD P.S.I.	TENSILE P.S.I.	ELONG %	Y/T	C	MN	P	S	CB	V	TI	AL	SI	CR	MO	CU	NI	B	CE
1	G7266663	45221	71014	38.5	.64	.16	.81	.008	.011	.002	.004	.001	.031	.21	.037	.007	.016	.024	.0002	.308
						TEST PIPE: 945562-7 MFG: GSS														
1	G7270120	45782	70936	38.5	.65	.17	.81	.009	.009	.002	.004	.002	.037	.22	.028	.005	.017	.024	.0002	.315
						TEST PIPE: 945491-1 MFG: GSS														
1	G7270184	46321	71757	37.5	.65	.16	.86	.010	.012	.002	.004	.002	.045	.24	.039	.007	.014	.023	.0003	.315
						TEST PIPE: 945565-8 MFG: GSS														
1	G7466777	45285	69926	38.5	.65	.14	.80	.007	.009	.002	.003	.001	.034	.21	.036	.006	.020	.025	.0002	.285
						TEST PIPE: 945563-5 MFG: GSS														
1	G7466778	44923	70919	36.5	.63	.16	.83	.008	.012	.002	.003	.001	.036	.22	.031	.004	.025	.023	.0002	.309
						TEST PIPE: 945622-4 MFG: GSS														
1	G7466780	42824	68935	37.0	.64	.16	.73	.008	.012	.002	.003	.001	.036	.22	.036	.005	.016	.024	.0002	.304
						TEST PIPE: 945625-5 MFG: GSS														

WE CERTIFY THAT THIS REPORT IS CORRECT AS CONTAINED IN THE COMPANY RECORDS. PIPE WERE MANUFACTURED, TESTED, AND INSPECTED IN COMPLIANCE WITH THE LATEST EDITION OF THE APPLICABLE SPECIFICATION.

CERTIFICATION NUMBER: 083586 Mike Biggs DATE: 8/05/1999

FORM QC-400 Rev 2 2/99

검 사 증 명 서 (A)

MILL INSPECTION CERTIFICATE

HYUNDAI PIPE CO., LTD.

현대강관주식회사

ULSAN PLANT / SEOUL OFFICE

CERTIFICATE NO.	E-7-03-372
PAGE	3
DATE OF ISSUE	APR. 3, 1997. E4702800
CONTRACT P.O. NO.	
COMMODITY	E.R.W. STEEL PIPE
SPECIFICATION	API 5LB/ASTM A53B
CUSTOMER	

BARTOW STEEL, INC.
MILL TEST REPORT
FOR SUBMITTAL INFORMATION ONLY
PENDING APPROVAL FOR PURCHASE

TYPE OF PIPE END	DIMENSION (OUTDIA. x THICK. x LENGTH)	QUANTITY (PCS)	WEIGHT (KG)	HYDROSTATIC TEST	Visual & dimension tests	HEAT NO.	YIELD STRENGTH	TENSILE STRENGTH		ELONG. (%)	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	REMARK
						A07187	32.5	49.7	52.3	38	18	1	78	20	8	6	1	2	1	Tr	
							46250	70700	74400												
						A07564	35.0	50.2	53.6	38	16	1	71	14	6	6	1	2	1	Tr	
							49800	71400	76200												
BPEB OD	24" x .500" x40.000'	61	136.885	62	G G G G G	A06500	30.4	48.7	51.3	37	18	Tr	78	14	9	6	1	2	1	Tr	
	(610.0mm x12.70mm x 12.192M)			880			43250	69300	73000												
						A06642	31.8	48.8	51.4	31	17	Tr	77	13	6	6	1	2	1	Tr	
							45250	69400	73100												
						A07564	35.0	50.2	53.6	38	16	1	71	14	6	6	1	2	1	Tr	
							49800	71400	76200												
	TOTAL ->	5000	980.688																		

BARTOW STEEL, INC.
MILL TEST REPORT
FOR SUBMITTAL INFORMATION ONLY
PENDING APPROVAL FOR PURCHASE

NOTES: Type of pipe End

BPE	Black Plain End Squarecut	GPE	Galvanized Plain End Squarecut
BPEB	Black Plain End Beveled	GPEB	Galvanized Plain End Beveled
BTC	Black Threaded & Coupled	GTC	Galvanized Threaded & Coupled
BVJ	Black Victaulic Joint	GVJ	Galvanized Victaulic Joint
ETC	Enameled Threaded & Coupled		

ND: Nominal Dia. OD: Outside Diameter; Unit: M: Meter, F: Feet, I: Inch; Flattening or Bending Test; Nondestructive Test; Crush Test; W: Weld Part; Reverse Flattening Test; H: Heat (Ladle) Analysis, P: Product Analysis; G: Good; Grit Test; Visual & Dimension Test; Weld Ductility Test; Flaring Test; B: Base Metal

본 제품은 완전무결하여 합격되었음을 보증합니다.

WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN ACCEPTED IN ACCORDANCE WITH THE PRESCRIBED SPECIFICATION AND ORDER.

SURVEYOR

INSPECTION MANAGER

HYUNDAI PIPE CO., LTD.

검 사 증 명 서 (A)
MILL INSPECTION CERTIFICATE

현대강관주식회사
HYUNDAI PIPE CO., LTD.

Certificate No.: E-7-04-286 | Page: 1
Date of Issue: MAY. 7, 1997.
Contract P/O No.:
Commodity: E.R.W. STEEL PIPE
Specification: API 5LB/ASTM A53B
Customer:

Dimension (Outdia. × Thick × Length)	Quantity (PCS)	Weight (KG)	Hydrostatic Test (psi)	Tests	Heat No.	Yield Strength	Tensile Strength	Elong. (%)	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V
8-5/8" x .250" x 42.000' (219.1mm x 6.35mm x 12.802M)	1	[illegible]	88 / 1230	G G G G G	A08245	27.7 / 39400	45.9 / 65700	48.0 / 68200	38	14	Tr	69	20	8	6	1	2	1	Tr
24" x .500" x 40.000' (610.0mm x 12.70mm x 12.192M)	73	106,206	62 / 880	G G G G G	A08881	32.5 / 46200	49.2 / 70000	52.0 / 74800	40	17	Tr	38	16	8	6	1	2	1	Tr
					A09258	31.8 / 45200	48.2 / 68600	51.6 / 73400	43	17	1	75	16	7	6	1	2	1	Tr
					A09662	31.1 / 44200	48.8 / 69400	51.4 / 73000	40	17	1	76	14	8	6	1	2	1	Tr
TOTAL ->	74	106,612																	

NOTES: Type of pipe end

WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE PRESCRIBED SPECIFICATION AND ORDER.

SURVEYOR

INSPECTION MANAGER

HYUNDAI PIPE CO., LTD

FORM RP 58
July 1979

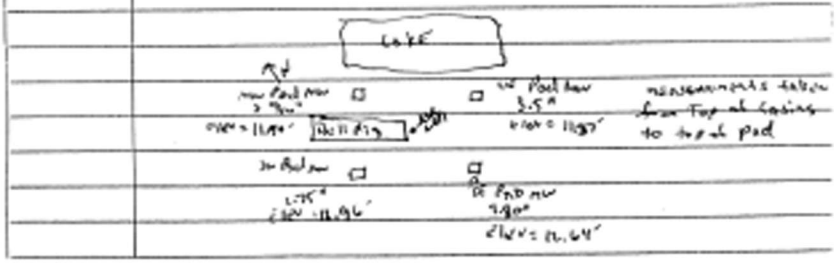
WELL DRILLER'S LOG

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

PROJECT Lake 3 ASR WELL NO. PW-D DATE 1/15/00

Production Casing String 24-inch diameter Steel Casing

DEPTH	DESCRIPTION – ROCK TYPE, COLOR, HARDNESS, OTHER
1.	AO8861 LK 18932
2	AO8861 LK 18969
3	AO9258 LK 18921
4	AO 8861 LK 18963
5	AO 9258 LK 18995
6	AO8861 LK 19000
7	AO8861 LK 18989
8	AO8861 LK 18961
9	AO8861 LK 18930
10	AO 9258 LK 18963
11	AO 9258 LK 19002
12	AO8861 LK 18993
13	AO8861 LK 19001
14	AO9258 LK 18994
15	AO8861 LK 18990
16	AO9258 LK 18968
17	AO 8861 LK 18929
18	AO 9258 LK 18964
19	AO8861 LK 18927
20	AO8861 LK 18928
21	AO 9258 LK 18991
22	AO 8861 LK 18992
23	AO9258 LK 19003
24	AO 9258 LK 18966
25	AO 9258 LK 18967



JAN 27 '00 12:13PM FROM :BARTOW STEEL 863 619 8779 2000.01-26 15:36 P.2 #723 P.01/03

B I L L   O F   L A D I N G   No: BLK 6766

Ship From:
Bartow Steel, Inc.
5015 S. Florida Ave.
Suite 301
Lakeland, Fl. 33813
Tel: 863 619-7473 Fax: 863 619-8779

Ship Date 12Jan00 at 14:10 From LKF
Probill 16703-339
Via SANCHEZ TRUCK
FOB DELIVERED
Frt INCLUDED
Route 0- 0 Manifest
Vhcle Trailer
Slp Mike Gilliard

Consigned To: (000)
DIVERSIFIED DRILLING
SOUTH FL. WATER MGNT. DIST.
PALM BEACH COUNTY
Tel: 813 988-1132 Fax:

Sold To: (5647)
DIVERSIFIED DRILLING
8801 MAISLIN DR
P O BOX 290699
TAMPA, FL 33687-0699

B I L L   O F   L A D I N G   - REPRINT

1) Our Order BLK- 16703- 1 Your PO # 5374
Carbon Steel Pipe ERW API 5L B
24" OD X .500 WALL X 40'

Heat Number	Tag No	Quantity	PCS	Wt LBS
A08861	LK18930	40 FT	1	5020
A09258	LK18963	40 FT	1	5020
A08861	LK18993	40 FT	1	5020
A09258	LK19002	40 FT	1	5020
A09258	LK18994	40 FT	1	5020
A08861	LK19001	40 FT	1	5020
A09258	LK18968	40 FT	1	5020
A08861	LK18990	40 FT	1	5020
	Total:	320 FT	8	40160

Bartow Steel, Inc
Specialists in Steel Pipe

2) Our Order BLK- 16703- 2 Your PO # 5374
Carbon Steel Pipe ERW API 5L B
24" OD X .500 WALL X 20'

Heat Number	Tag No	Quantity	PCS	Wt LBS
A08861	LK18926	20 FT	1	2510

	Tags	PCS	LBS
TOTAL:	9	9	42670

FROM INTERSECTION OF 441 & 827, GO WEST ON 827,

FOR 5.2 MILES TO 2ND CONCRETE BRIDGE ACROSS

HILLSBORO CANAL (RIG WILL BE VISABLE @ THIS POINT

Page: 1 ....Continued

		CARRIER Sanchez	FREIGHT Prepaid ☐ Collect ☐
SIGNATURE OF CONSIGNOR X		AGENT PER (Driver's Signature) X Calvin Willis	
If charges are to be prepaid, write or stamp here, "To be Prepaid."	RECEIVED $ To apply in payment of the charge on the property described hereon.	AGENT OR CASHIER 1-12-00 (The signature here acknowledges only the amount prepaid.)	CHARGES ADVANCED $

JAN 27 '00 12:14PM P.3
FROM :BARTOW STEEL 863 619 8779 2000.01-26 15:37 P.03 P.02/03

BILL OF LADING NO: BLK 5/64

Ship From:
Bartow Steel, Inc,
815 S. Florida Ave.
Suite 301
Lakeland, Fl. 33813
Tel:-863-619-7473 Fax: 863 619-8779

Ship Date 12Jan00 at 13:12 From LKF
Probill 16703-339
Via SANCHEZ TRUCK
FOB DELIVERED
Frt INCLUDED
Route 0- - 0 Manifest
Vhcle Trailer
Slp Mike Gilliard
Sold To: (5647)
DIVERSIFIED DRILLING
8801 MAISLIN DR
P O BOX 290699
TAMPA, FL 33687-0699

Consigned To: (000)
DIVERSIFIED DRILLING
SOUTH FL. WATER MGMT. DIST.
PALM BEACH COUNTY
Tel: 813 988-1132 Fax:

B I L L O F L A D I N G - REPRINT

1) Our Order BLK- 16703- 1 Your PO # 5374
Carbon Steel Pipe ERW API 5L B
24" OD X .500 WALL X 40'

Heat Number	Tag No	Quantity	PCS	Wt LBS
A08861	LK18927	40 FT	1	5020
A08861	LK18928	40 FT	1	5020
A08861	LK18929	40 FT	1	5020
A09258	LK18964	40 FT	1	5020
A09258	LK19003	40 FT	1	5020
A09258	LK18966	40 FT	1	5020
A09258	LK18991	40 FT	1	5020
A08861	LK18982	40 FT	1	5020
A09258	LK18967	40 FT	1	5020
	Total:	360 FT	9	45180

Bartow Steel Inc
Specialists in Steel Pipe

	Tags	PCS	LBS
TOTAL:	9	9	45180

FROM INTERSECTION OF 441 & 827, GO WEST ON 827,

FOR 5.2 MILES TO 2ND CONCRETE BRIDGE ACROSS

HILLSBORO CANAL (RIG WILL BE VISABLE @ THIS POINT -

(813)988-1132 OFFICE
(813)917-5565 JOBSITE

Page: 1 .... Last

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignee, the consignee shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.	CARRIER Sanchez	PREPAID Prepaid ☐ Collect ☐
SIGNATURE OF CONSIGNEE X	AGENT PER (Driver's Signature) X	
If charges are to be prepaid, write or stamp here, "To Be Prepaid." RECEIVED $ To apply in payment of the charges on the property described hereon.	AGENT OR CASHIER 1-12-00	CHARGES ADVANCED $

JAN 27 '00 12:14PM
FROM :BARTOW STEEL 863 619 8779 2000.01-26 15:37 P.4
P.03/03

B I L L O F L A D I N G No: BLK 6780

Ship From:
Bartow Steel, Inc.
.015 S. Florida Ave.
Suite 301
Lakeland, Fl. 33813
Tel: 863 619-7473 Fax: 863 619-8779

Ship Date 12Jan00 at 17:56 From LKF
Probill 16703-339
Via SANCHEZ TRUCK
FOB DELIVERED
Frt INCLUDED
Route 0- 0 Manifest
Vhcle Trailer
Slp Mike Gilliard
Sold To: (5647)
DIVERSIFIED DRILLING
8801 MAISLIN DR
P O BOX 290699
TAMPA, FL 33687-0699

Consigned To: (000)
DIVERSIFIED DRILLING
SOUTH FL. WATER MGMT. DIST.
PALM BEACH COUNTY
Tel: 813 988-1132 Fax:

B I L L O F L A D I N G

1) Our Order BLK- 16703- 1 Your PO # 5374
Carbon Steel Pipe ERW API 5L B
24" OD X .500 WALL X 40'

Heat Number	Tag No	Quantity	PCS	Wt LBS
A09358	LK18931 ✓	40 FT	1	5020
A08861	LK18962	40 FT	1	5020
A08861	LK18932	40 FT	1	5020
A08861	LK18969	40 FT	1	5020
A08861	LK18989 ✓	40 FT	1	5020
A08861	LK18961 ✓	40 FT	1	5020
A09258	LK18995	40 FT	1	5020
A08861	LK19000	40 FT	1	5020
	Total:	320 FT	8	40160

BS Bartow Steel Inc
Specialists in Steel Pipe

Tags	PCS	LBS
TOTAL:	8	40160

FROM INTERSECTION OF 441 & 827, GO WEST ON 827,

FOR 5.2 MILES TO 2ND CONCRETE BRIDGE ACROSS

HILLSBORO CANAL (RIG WILL BE VISABLE @ THIS POINT

(813)988-1132 OFFICE
(813)917-5565 JOBSITE

Page: 1 .... Last

ect to Section 7 of Conditions of applicable bill of lading. If this shipment is to be delivered to the consignee without Recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.	CARRIER: SANCHEZ TRUCK SERV	FREIGHT: Prepaid ☐ Collect ☐
SIGNATURE OF CONSIGNOR: X	AGENT PER (Driver's Signature): X 1/13/00	
If charges are to be prepaid,	RECEIVED To apply in payment of the charges	AGENT OR CASHIER	CHARGES ADVANCED

Table B-1. Deviation Summary of EXW-1 UIC Permit - 153872-001[a]

Date	Depth (feet)	Deviation (degrees)	Construction Activity
11/24/99	55	0	9 7/8-inch pilot hole
11/27/99	150	0	9 7/8-inch pilot hole
11/28/99	205	0	9 7/8-inch pilot hole
12/15/99	300	0	9 7/8-inch pilot hole
12/16/99	392	0	9 7/8-inch pilot hole
12/16/99	485	0	9 7/8-inch pilot hole
12/16/99	578	0	9 7/8-inch pilot hole
12/21/99	670	0	9 7/8-inch pilot hole
12/22/99	766	0	9 7/8-inch pilot hole
01/04/00	856	0	9 7/8-inch pilot hole
01/05/00	949	0	9 7/8-inch pilot hole
01/05/00	1,044	0	9 7/8-inch pilot hole
01/05/00	1,137	0	9 7/8-inch pilot hole
01/06/00	1,200	0	9 7/8-inch pilot hole

a. Instrument used is a SureShot - Model A 7 Degree

APPENDIX C
GEOPHYSICAL LOGS

Legend for Geophysical Log Traces

AMP3	amplitude
CPS	counts per second
degF	degrees Fahrenheit
DT	delta time
DTMP	delta temperature
FLOWN	flowmeter - dynamic
FLOWNS	flowmeter - static
FRES	fluid resistivity
ft	feet
GAPI	gamma American Petroleum Institute units
GR	gamma ray
in	inches
mV	milliVolts
MV	milliVolts
Ohm-m	ohm-meters
RILD	deep resistivity curve
RILM	medium resistivity curve
RLL3	shallow resistivity curve
SP	spontaneous potential
TEMP	temperature
TT3	travel time
usec	microsecond
usec/ft	microseconds per foot
XCAL	x caliper
YCAL	y caliper

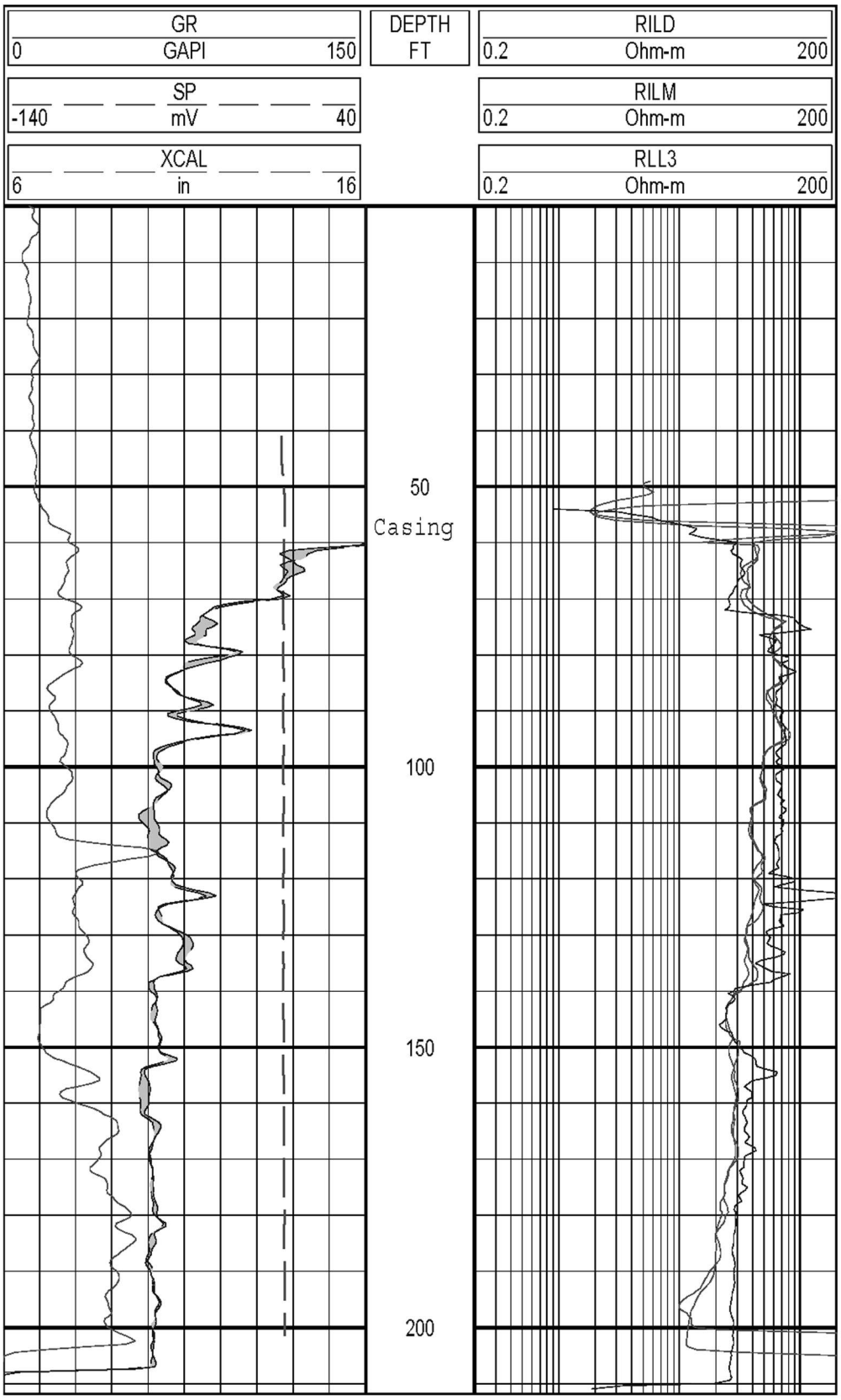


Figure C-1. Individual Log Traces from Geophysical Log Run 1

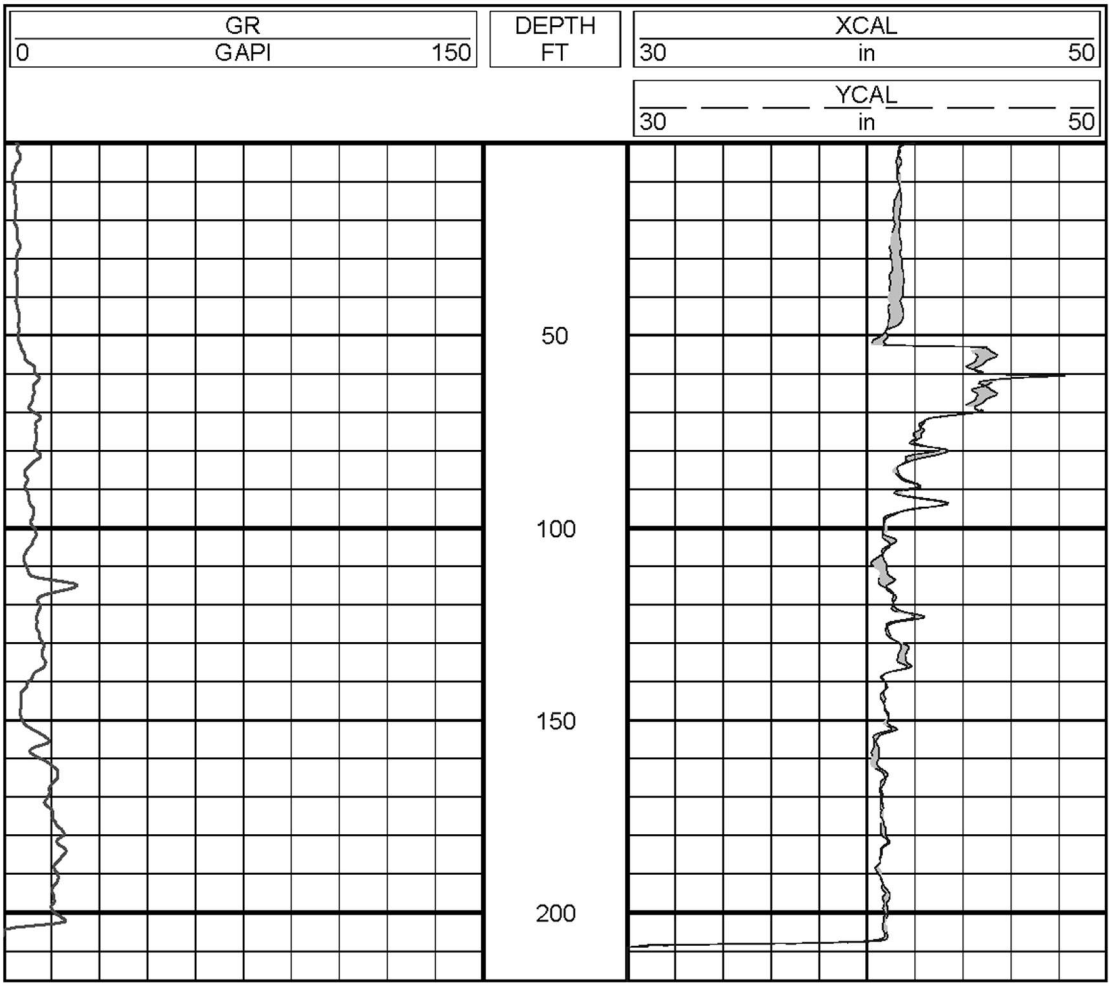


Figure C-2. Individual Log Traces from Geophysical Log Run 2

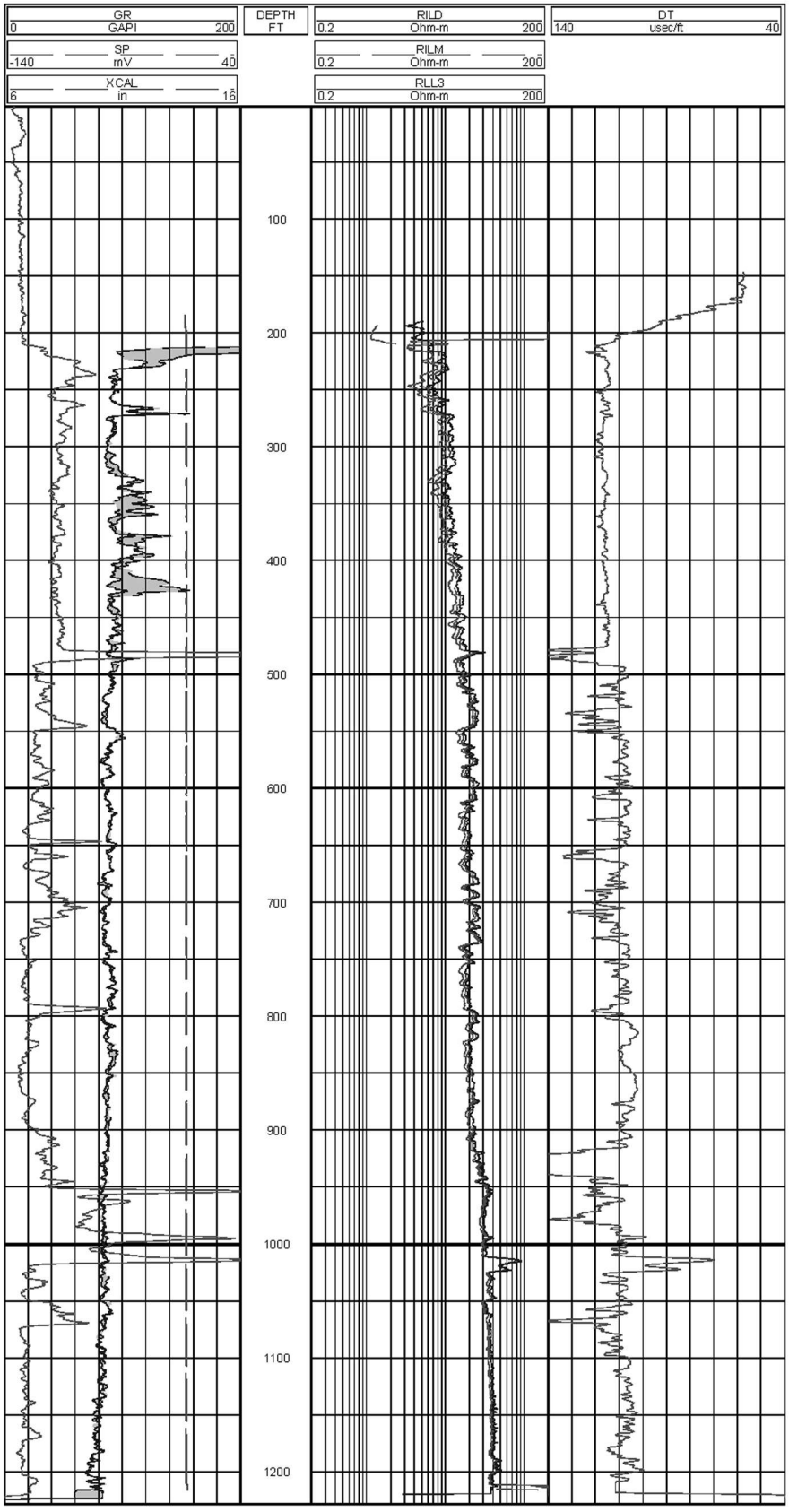


Figure C-3. Individual Log Traces from Geophysical Log Run 3

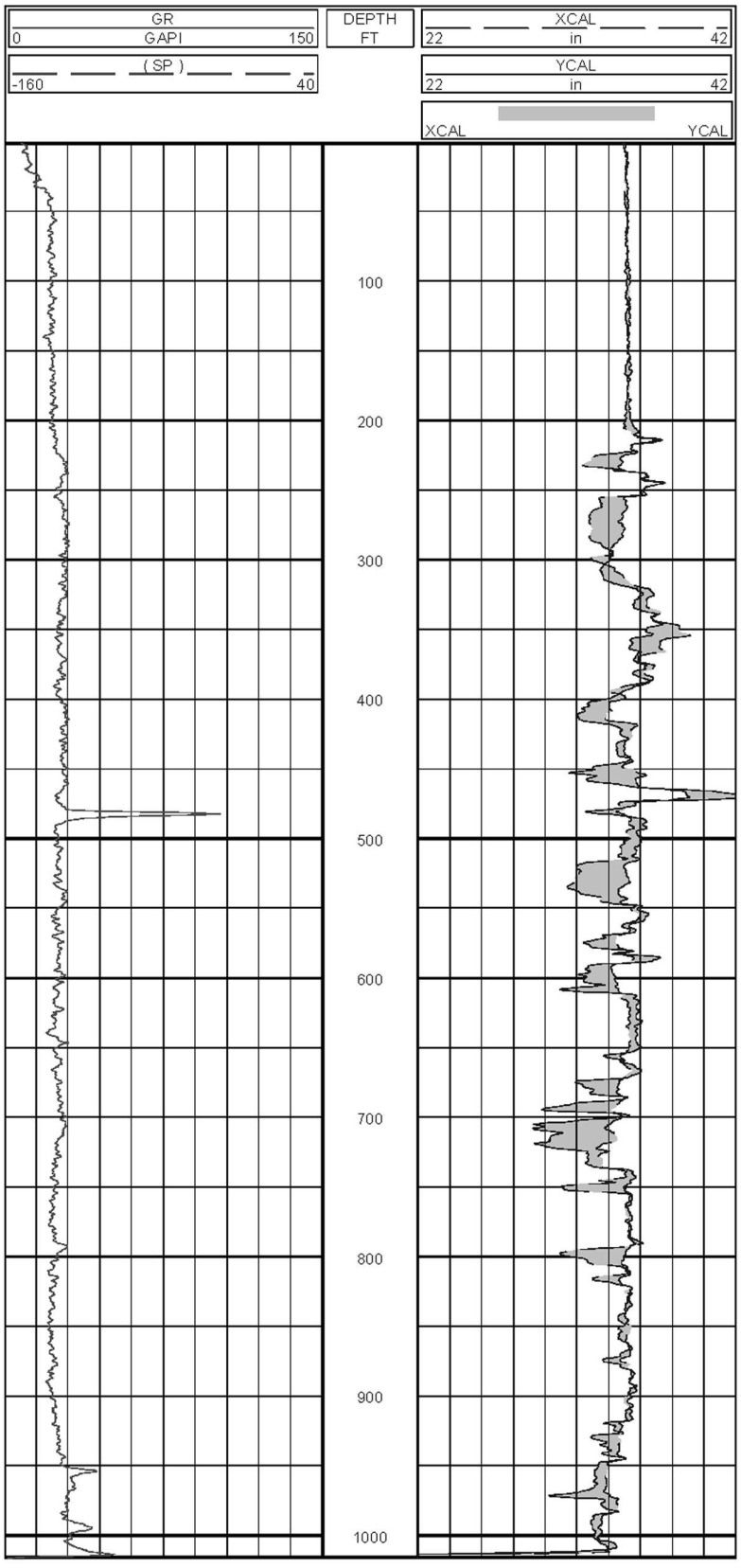


Figure C-4. Individual Log Traces from Geophysical Log Run 4

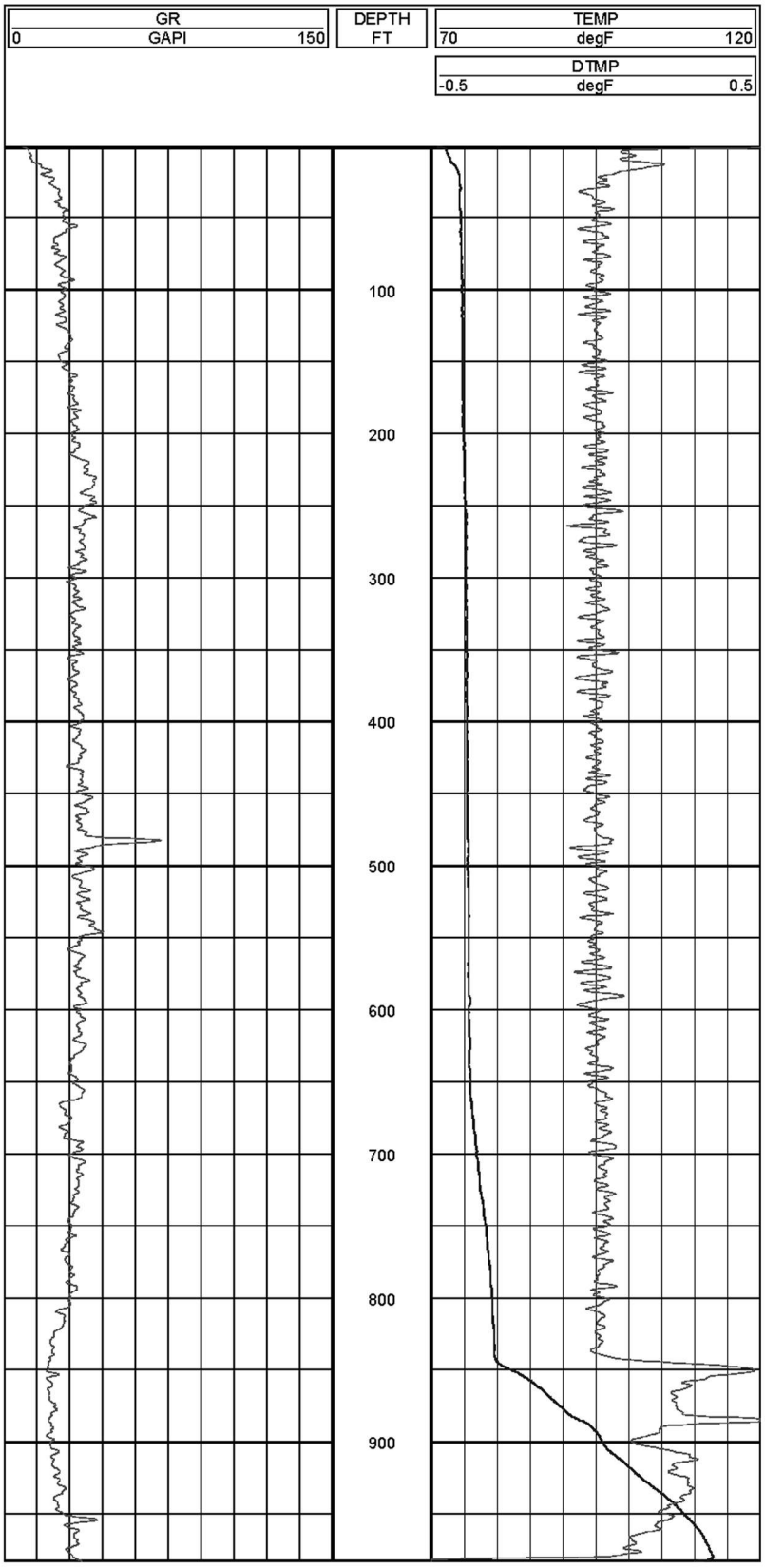


Figure C-5. Individual Log Traces from Geophysical Log Run 5

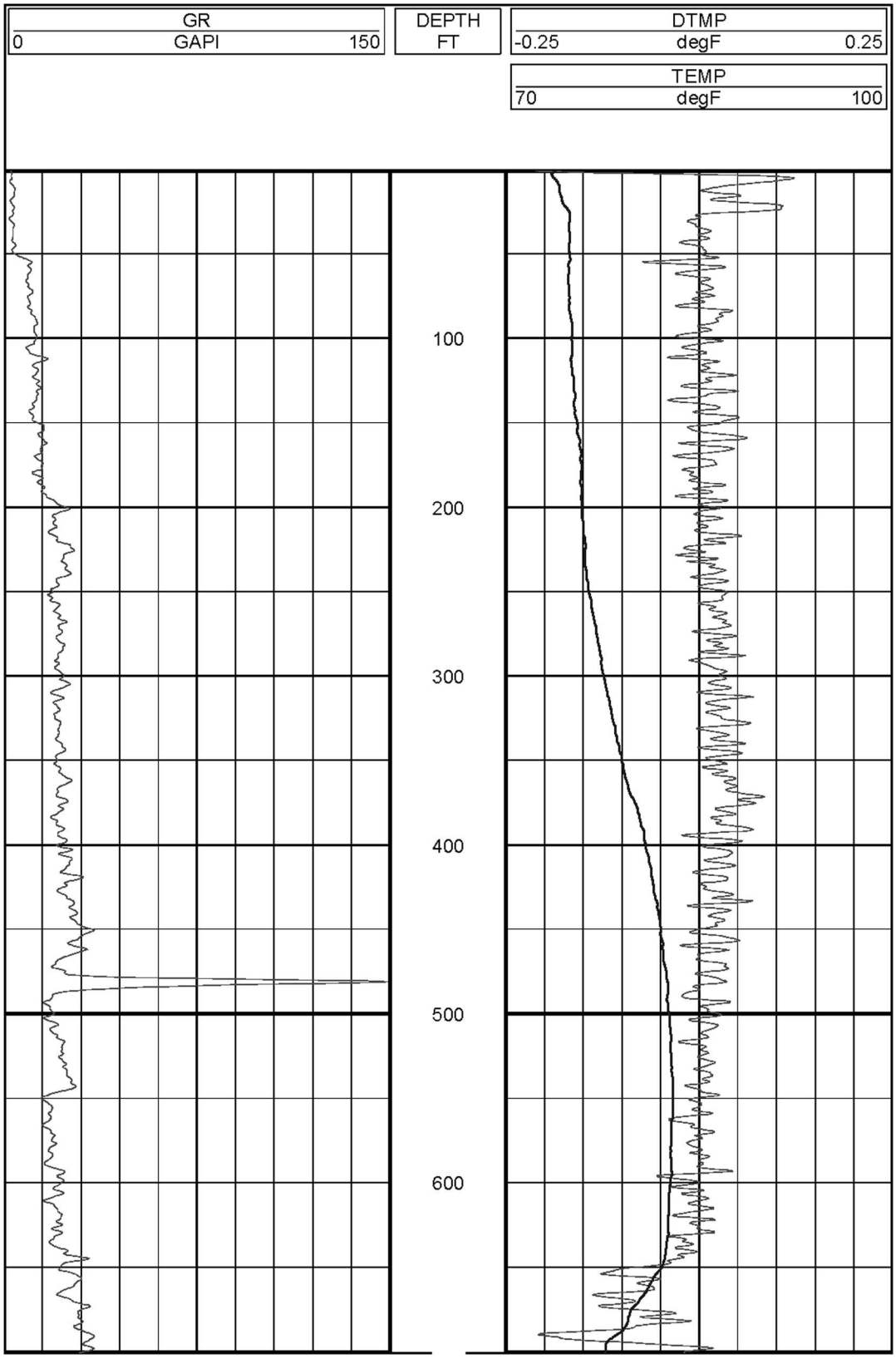


Figure C-6. Individual Log Traces from Geophysical Log Run 6

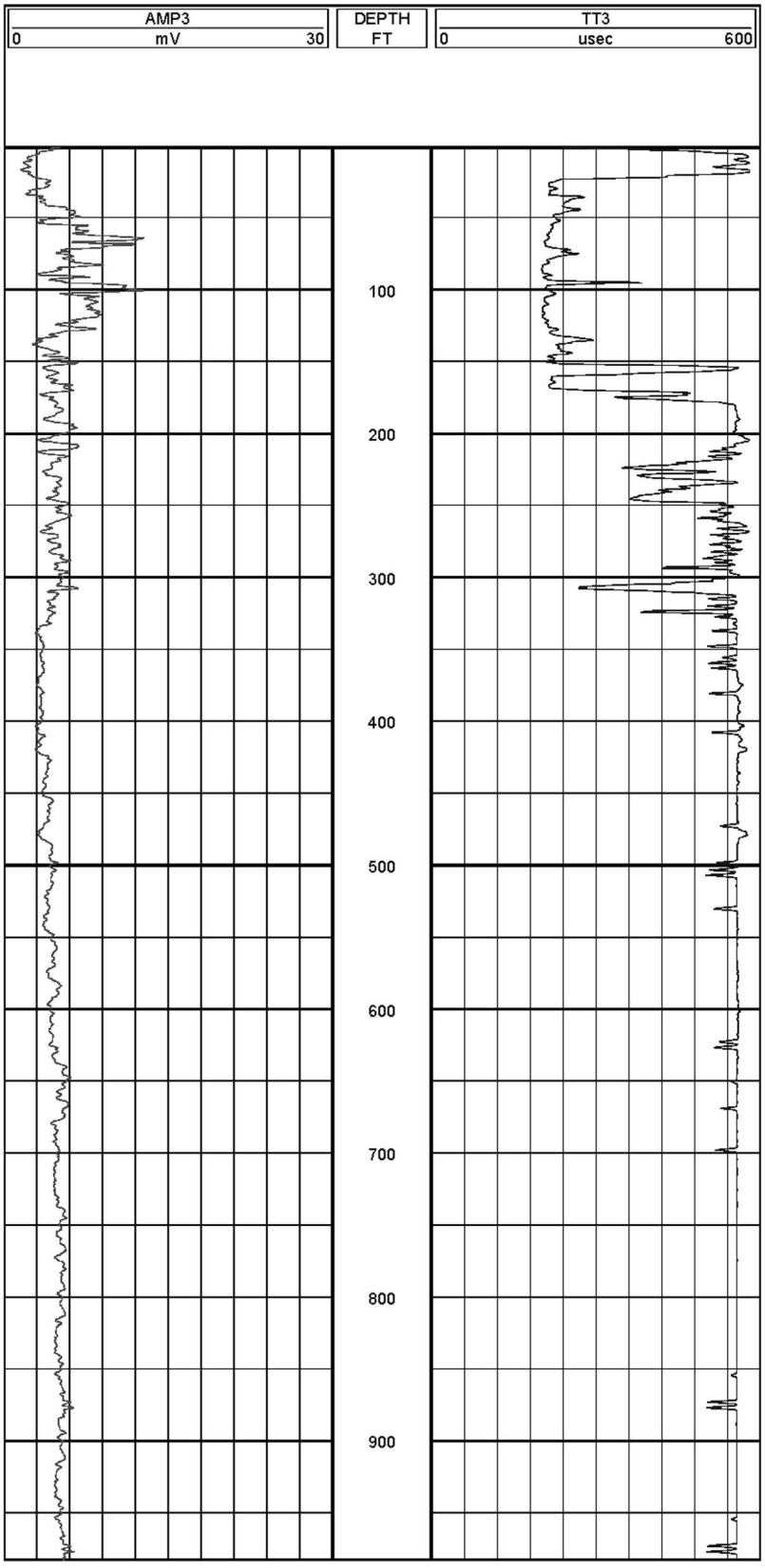


Figure C-7. Individual Log Traces from Geophysical Log Run 7

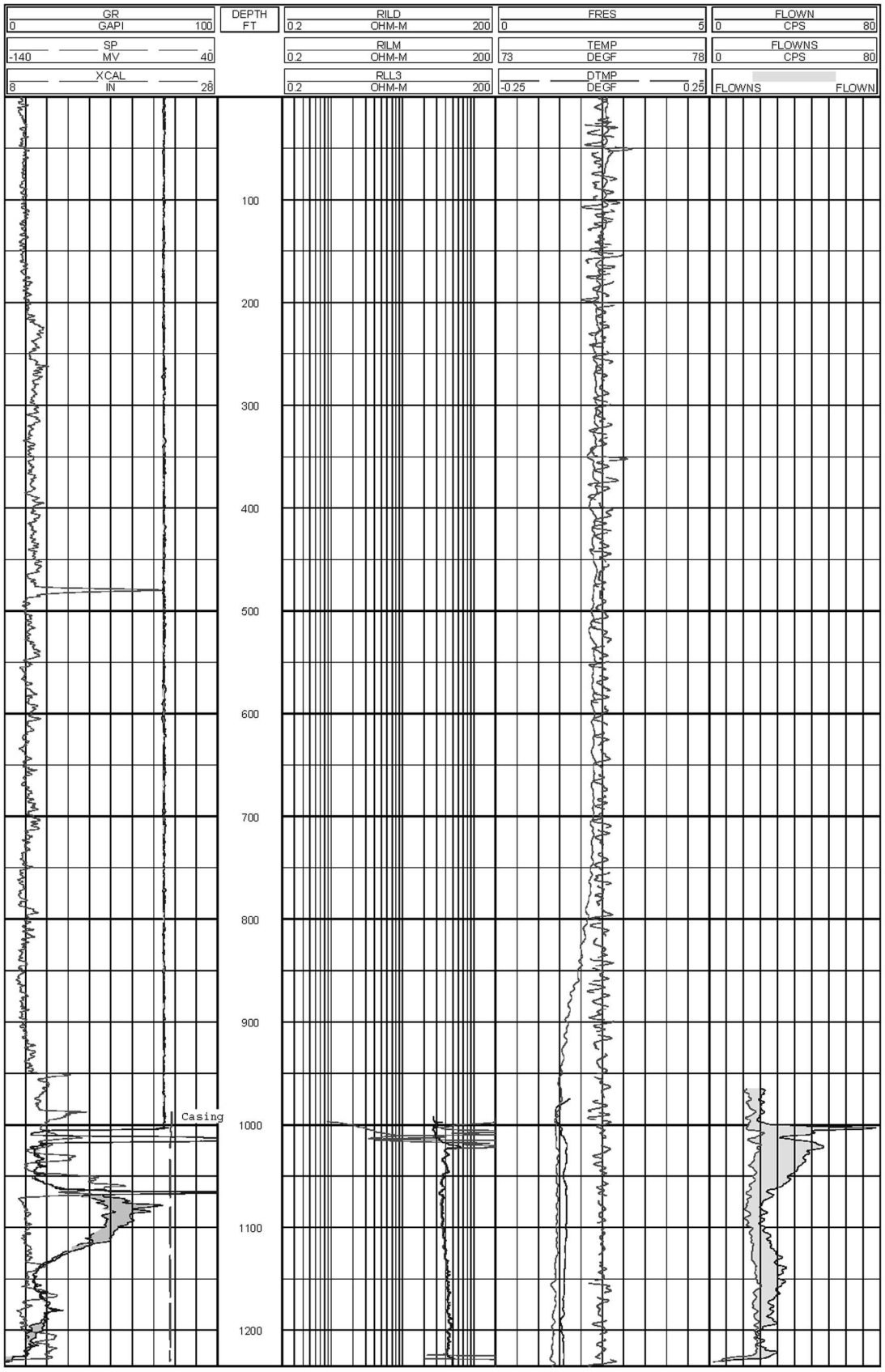


Figure C-8. Individual Log Traces from Geophysical Log Run 8

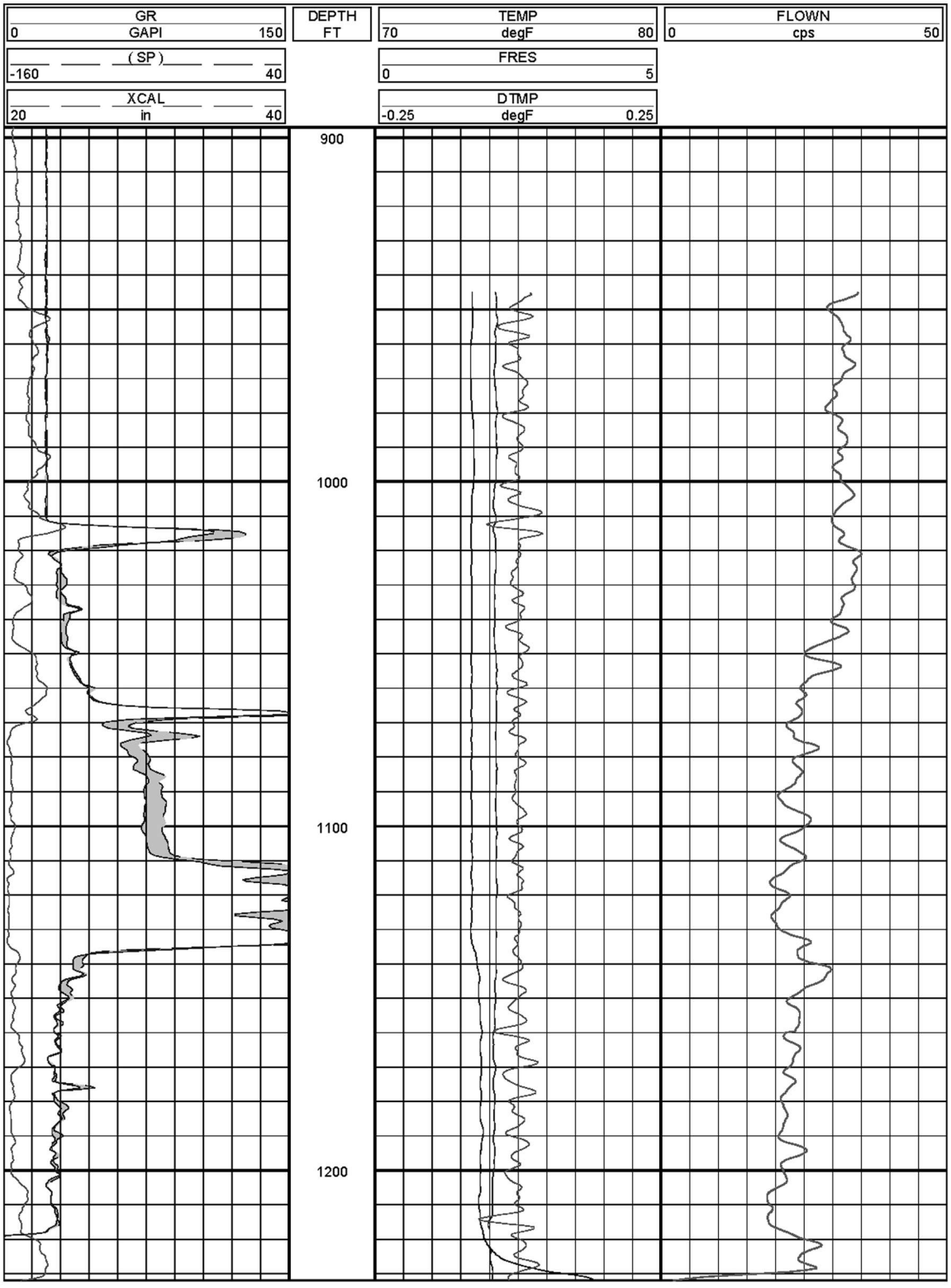


Figure C-9. Individual Log Traces from Geophysical Log Run 9

APPENDIX D
SITE PLAN MAP

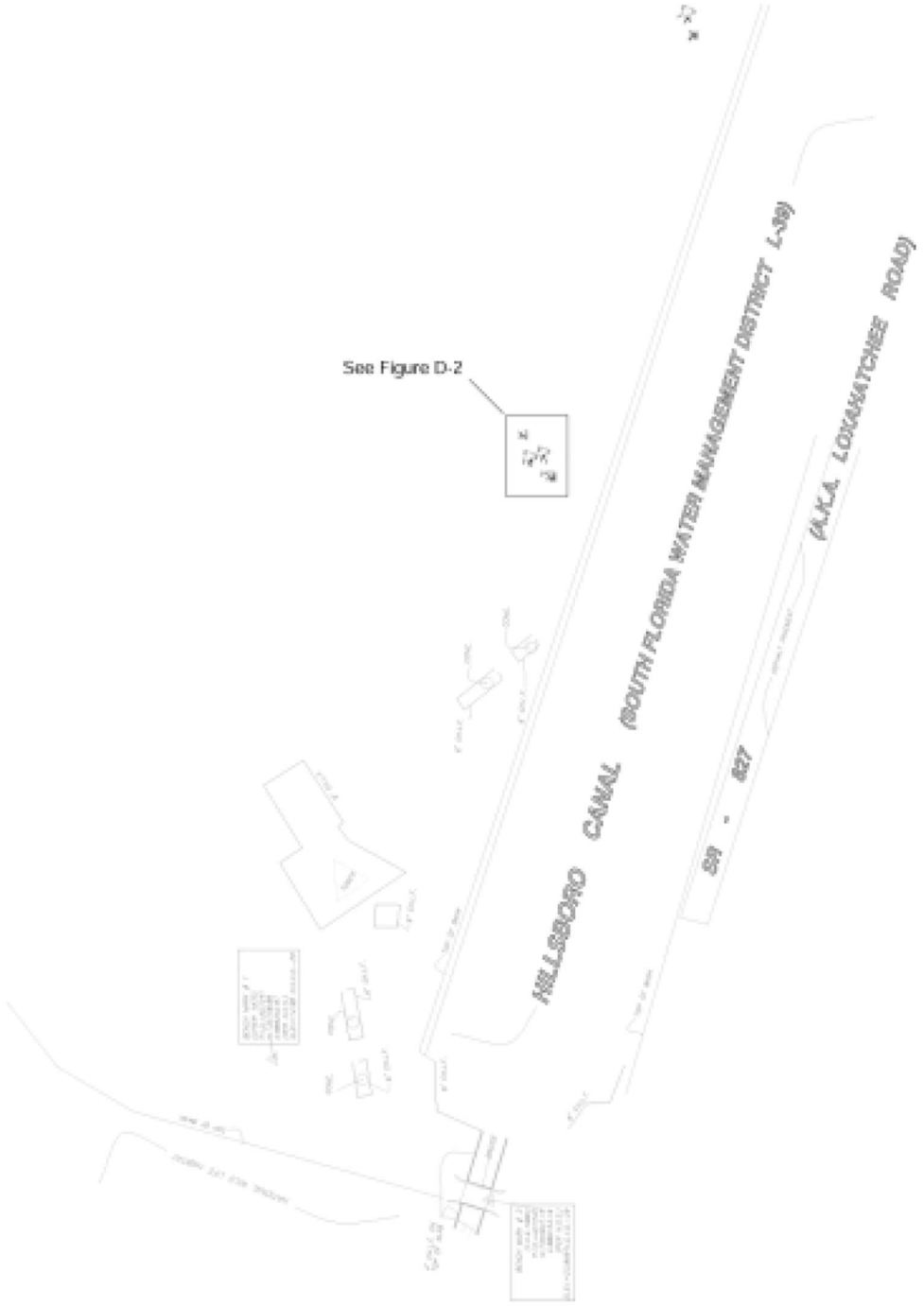


Figure D-1. Site Plan for Western Hillsboro Basin

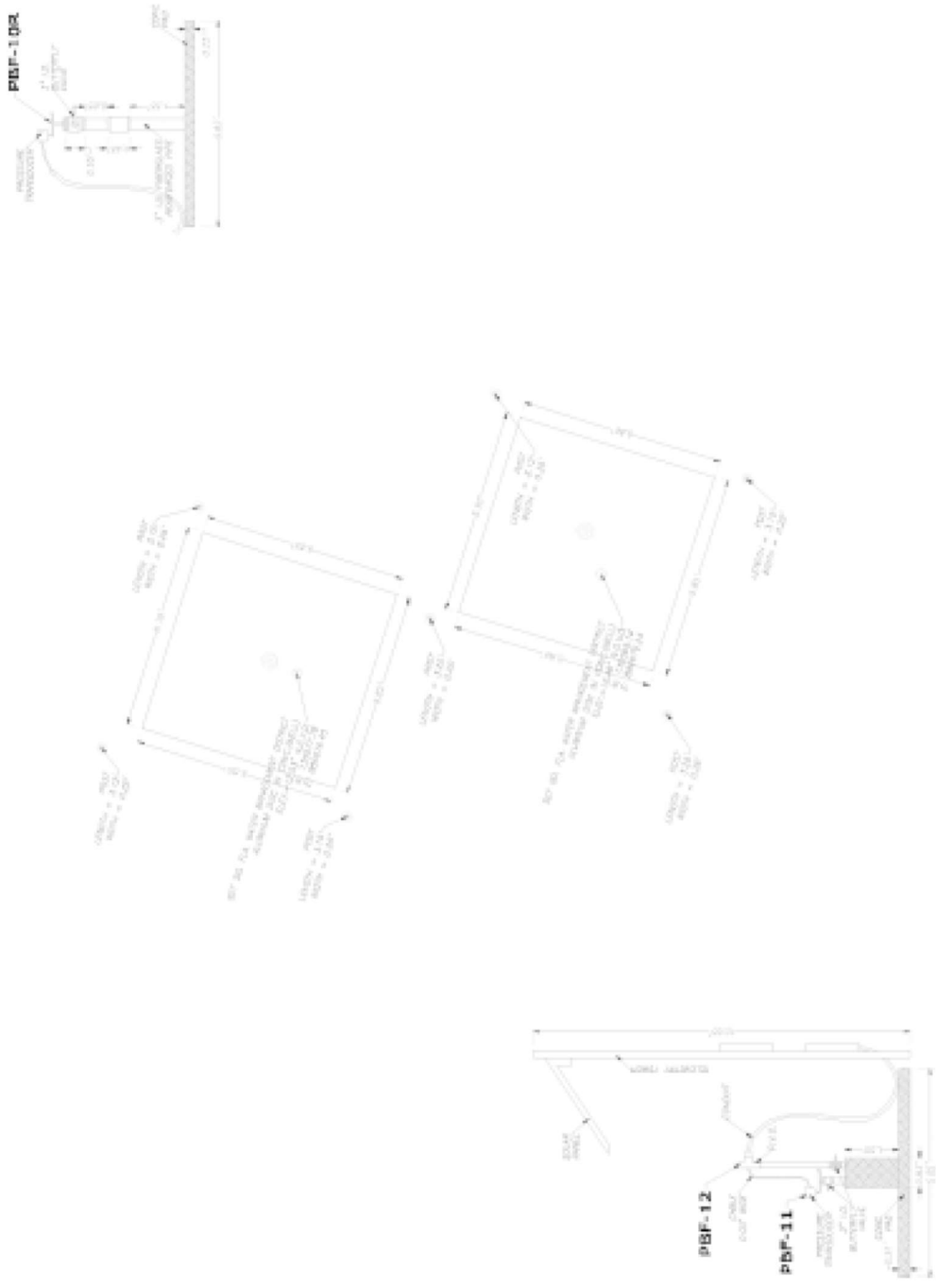


Figure D-2. Inset for the Western Hillsboro Basin Site Plan

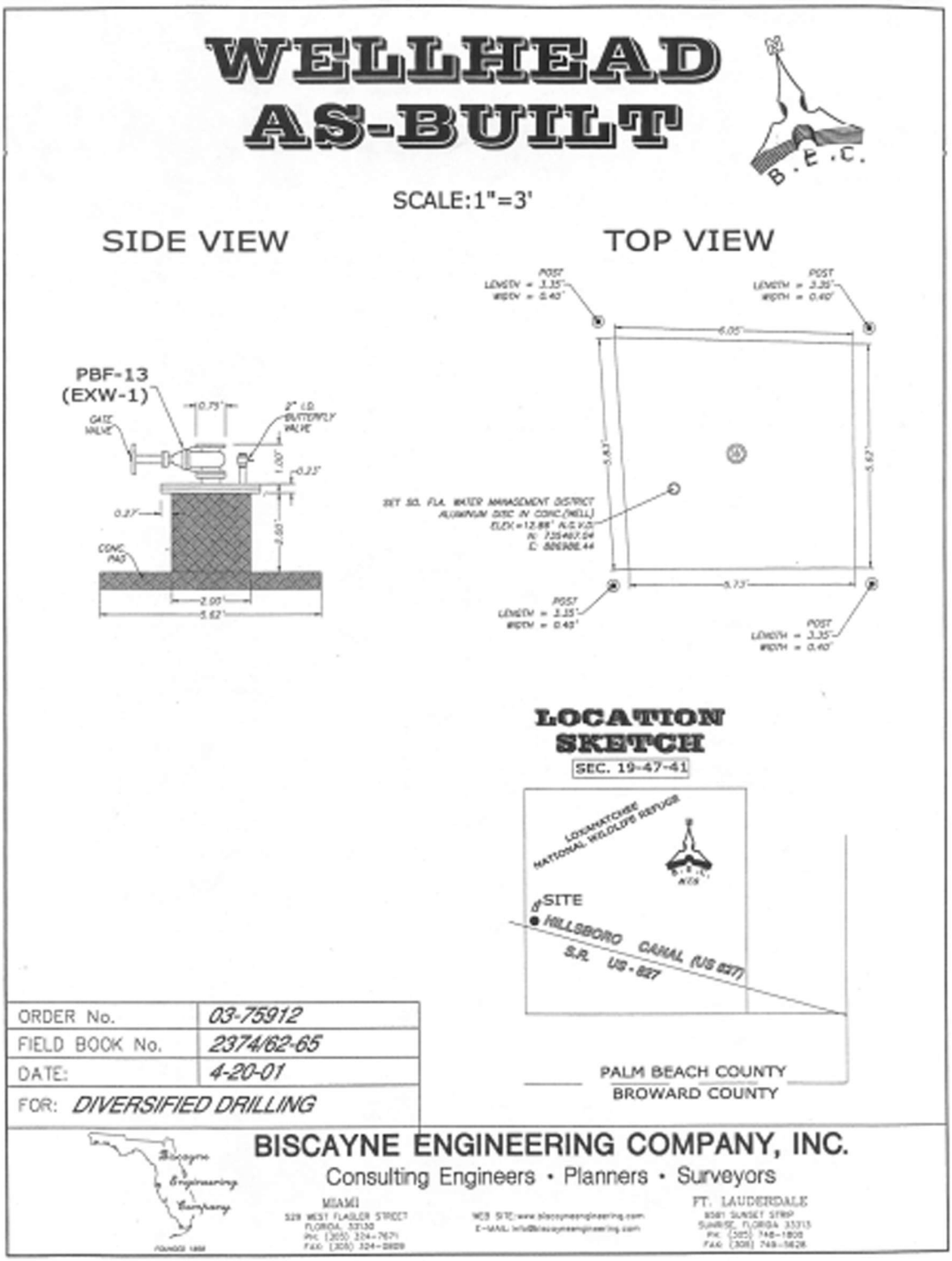


Figure D-3. Wellhead As-Built for the Western Hillsboro Basin Site

APPENDIX E
LITHOLOGIC DESCRIPTIONS

Western Hillsboro Basin - Site 1 Pilot Study
Exploratory Well EXW-1
Lithologic Description

Date	Depth (feet bpl) From	To	Description
12/09/99	0	10	No sample
12/09/99	10	15	Light olive gray to white; moderately indurated calcerous sandstone to sandy limestone; grain size is fine to coarse; 30% shell fragments; calcilutite matrix; sparry calcite cement; intergranular and moldic porosity
12/09/99	15	20	Yellowish gray unconsolidated shell bed with thin limestone stringers; intergranular porosity
12/09/99	20	45	Yellowish gray to light gray; moderately indurated sandstone; grain size is fine to coarse; 50% shell fragments; calcilutite matrix; intergranular and moldic porosity
12/09/99	45	50	Yellowish gray to light gray; unconsolidated shell bed with 35% quartz sand; sand is in the form of small calcereous sandstone fragments; intergranular porosity; some recystallization
12/10/99	50	70	Yellowish gray to light gray; moderately indurated sandstone; grain size is very fine to coarse; 40% shell fragments; calcilutite matrix; sparry calcite cement; intergranular and moldic porosity; 2% phosphatic sand
12/10/99	70	110	Yellowish gray; well indurated calcereous sandstone; grain size is very fine to coarse; 30% shell fragments; calcilutite matrix; sparry calcite cement; intergranular and moldic porosity; 3% phosphatic sand
12/10/99	110	200	Yellowish gray; moderately indurated limestone (biogenic); 65% allochems; calcilutite matrix; sparry calcite cement 20-40% quartz sand; 2% phosphatic sand; intergranular and moldic porosity; 2% phosphatic sand
12/10/99	200	210	Yellowish gray; poorly indurated silt, clay, and calcilutite matrix; 15-20% fine grained quartz sand; intergranular porosity; 3% phosphatic sand/silt
12/15/99	210	230	Same as above
12/15/99	230	270	Light olive gray; poorly indurated silt clay and calcilutite matrix; 10-15% fine grained quartz sand; intergranular porosity; 10% phosphatic sand/silt
12/15/99	270	280	Yellowish gray; moderately indurated limestone calcilutite and clay matrix; 30% silt; 20-25% quartz sand; intergranular porosity; 10% phosphatic sand/silt
12/15/99	280	290	Light olive gray poorly indurated silt/clay, clay, and calcilutite matrix; 20-25% fine grained quartz sand;10% limestone; 10% shell fragments
12/15/99	290	300	Light olive gray to yellowish gray; moderately indurated calcereous sandstone; grain size is very fine to medium; calcilutite matrix and minor sparry calcite cement; 25% silt; 15% shell fragments; 5% phosphatic sand/silt
12/15/99	300	330	Yellowish gray to light olive gray; moderately indurated limestone (biogenic and skeletal); 70% allochems; calcilutite matrix and sparry calcite cement; 20-25% quartz sand; 15% silt; 20% shell fragments; intergranular and moldic porosity
12/15/99	330	358	Light olive gray; poorly indurated silt (clayey, sandy silt), clay, and calcilutite matrix; 20-25% fine grained quartz sand; 3% shell fragments; 2% phosphatic sand/silt

Western Hillsboro Basin - Site 1 Pilot Study
Exploratory Well EXW-1
Lithologic Description

Date	Depth (feet bpl) From	To	Description
12/16/99	358	375	Yellowish gray to olive gray; moderately indurated shelly; sandy limestone; 60% allochems; calcilutite matrix; 20-30% quartz sand; 20% silt; 20% shell fragments; low intergranular porosity; minor moldic porosity
12/16/99	375	485	Olive gray; nonindurated silt/clay; stiff, sticky, cohesive clay and calcilutite matrix; 20-25% fine grained quartz sand; trace of phosphate; low permeability
12/16/99	485	495	Yellowish gray; moderately indurated silty limestone 60% allochems; calcilutite matrix (micrite); clay matrix; 25% silt; 20% very fine-grained sand; 5% shell fragments; low intergranular porosity; phosphatic
12/16/99	495	505	Yellowish to olive gray; poorly to nonindurated silt/clay, clay, and calcilutite matrix; 5% fine grained quartz sand; 15% limestone; trace of phosphate
12/16/99	505	550	Yellowish to light gray; poorly indurated biomicrite (wackestone); 40% allochems; calcilutite matrix (micrite); 5-10% silt; 5% fine-grained sand; 5% shell fragments; 2-3% phosphatic sand
12/16/99	550	575	Yellowish to light gray; poorly indurated biomicrite (wackestone); 50% allochems; calcilutite matrix (micrite); 10-15% silt; 20% quartz sand; 40% shell fragments; 2-3% phosphatic sand
12/16/99	575	610	Yellowish to light gray; poorly indurated biomicrite (wackestone); 40% allochems; calcilutite matrix (micrite); 5% quartz sand; 10-20% shell fragments; 2-3% phosphatic sand
12/21/99	610	645	Yellowish gray; poorly to moderately indurated wackestone; 40-50% allochems; calcilutite matrix (micrite); 5% quartz sand; 10-20% shell fragments; 3% phosphatic sand
12/21/99	645	700	Yellowish to light gray; poorly indurated biomicrite (wackestone); 40% allochems; calcilutite matrix (micrite); 3% quartz sand; 10-20% shell fragments; 2-3% phosphatic sand
12/21/99	700	730	Yellowish gray; poorly to moderately indurated wackestone; 40-50% allochems; calcilutite matrix (micrite); 5% quartz sand; 10-20% shell fragments; 3% phosphatic sand
12/21/99	730	765	Yellowish to light gray; nonindurated to poorly indurated biomicrite (wackestone); 20% allochems; calcilutite matrix (micrite); 10-20% shell fragments; stringer of moderately indurated limestone; 3-5% phosphatic sand
12/21/99	765	798	Yellowish to light gray; nonindurated to poorly indurated carbonate mud; 10% allochems; calcilutite matrix; clay matrix; 10% shell fragments; 1-2% phosphatic sand with 7% at base
01/04/99	798	864	Same as above
01/05/99	864	869	Light green; nonindurated silty clay; sticky and cohesive
01/05/99	869	915	Yellowish to light gray nonindurated to poorly indurated carbonate mud (mudstone); 20% allochems; calcilutite matrix (biomicrite); 5% shell fragments; 1% phosphatic sand

Western Hillsboro Basin - Site 1 Pilot Study
Exploratory Well EXW-1
Lithologic Description

	Depth (feet bpl)		
Date	From	To	Description
01/05/99	915	946	Yellow to greenish gray; poorly to moderately indurated wackestone; sparry cement; calcilutite matrix; 50% shell fragments; 35% carbonate mud; 1-2% phosphatic sand; traces of silty clay clasts
01/05/99	946	985	Yellowish, greenish gray; moderately indurated wackestone; 60% allochems; calcilutite matrix; greenish clay matrix; 50% shell fragments; 25% carbonate mud; 10% quartz sand; 5% phosphatic sand
01/05/99	985	1,010	Yellowish tan; moderately indurated packstone; 70% allochems; calcilutite matrix; sparry calcite cement; 30% shell fragments; 10% quartz; 7% phosphatic sand
01/05/99	1,010	1,025	Yellowish gray; well indurated packstone; 70% allochems; calcilutite matrix; sparry calcite cement; 15% shell fragments; 3-5% quartz; 3% phosphatic sand
01/05/99	1,025	1,060	Yellowish gray; moderately indurated wackestone calcilutite matrix; 5-10% shell fragments interspersed with fine-grained calcitic sandstone
01/05/99	1,060	1,138	Light gray; moderately indurated wackestone, 5% sparry calcite; minor poorly indurated mudstone, less than 5% shell fragments; less than 2% silt to fine-grained sand
01/06/99	1,138	1,170	Same as above
01/06/99	1,170	1,205	Light orange to yellowish gray; moderately to well indurated friable packstone; 80% allochems; 5% sparry calcite, less than 5% shell fragments; less than 1% phosphatic sand
01/06/99	1,205	1,225	No sample (minor lost circulation; used thinned muds as not to induce additional mud loss by weight of mud column resulting in no drill cutting returns)

APPENDIX F
PRIMARY AND SECONDARY DRINKING WATER AND MINIMUM CRITERIA PARAMETERS

EQUIPMENT BLANKS

No QA Review * Does not get loaded to dbhy
2/16/01

Florida Certification: #E83079

ELAB, Inc.

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FEB 15 2001
QA UNIT

MS. LINDA CREAN
SOUTH FLORIDA WATER MGMT.DIST.
8894 BELVEDERE RD.
WEST PALM BEACH,FL 33411

ANALYTICAL REPORT

Page 1

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C11904M003
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RP1

Lab Sample Number: 0011676 1
Client Sample Number: 964
Sample Description: EQUIPMENT BLANK DI WATER

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
1613A	DIOXIN (2,3,7,8-TCDD)	0.56	U	pg/L	0.56	SWL	12/21/00	12/07/00
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	ACENAPHTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	ACENAPHTHYLENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZIDINE	25	U	ug/L	25	VG	12/10/00	12/03/00
625	BENZ(A)ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(B)FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(K)FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(G,H,I)PERYLENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(A)PYRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-CHLOROETHOXY) METHANE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-CHLOROETHYL) ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-CHLOROISOPROPYL) ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-ETHYLHEXYL) PHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-BROMOPHENYL PHENYL ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BUTYL BENZYL PHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2-CHLORONAPHTHALENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-CHLORO-3-METHYLPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2-CHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-CHLOROPHENYL PHENYL ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	CHRYSENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIBENZO(A,H)ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DI-n-BUTYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,3-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,4-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	3,3'-DICHLOROBENZIDINE	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DICHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIETHYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,4-DIMETHYLPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIMETHYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00

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Florida Certification #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01
Client's P.O. Number: C119048009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPT

Lab Sample Number: 0011676 1
Client Sample Number: 964
Sample Description: EQUIPMENT BLANK DI WATER
Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	4,6-DINITRO-2-METHYLPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DINITROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DINITROTOLUENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,6-DINITROTOLUENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2-DIPHENYLHYDRAZINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DI-n-OCTYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIOXIN (2,3,7,8-TCDD) (SCREEN)	100	U	ug/L	100	VG	12/10/00	12/03/00
625	FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	FLUORENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROBUTADIENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROCYCLOPENTADIENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROETHANE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	INDENO(1,2,3-CD)PYRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	ISOPHORONE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	NAPHTHALENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	NITROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2-NITROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-NITROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	N-NITROSODIMETHYLAMINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	N-NITROSODIPHENYLAMINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	N-NITROSODI-n-PROPYLAMINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	PENTACHLOROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	PHENANTHRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	PHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	PYRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2,4-TRICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,4,6-TRICHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
	GW CHLORINATED PESTICIDES & PCB							
505	ALACHLOR	1.5	U	ug/L	1.5	TCE	12/02/00	12/01/00
505	ATRAZINE	2.5	U	ug/L	2.5	TCE	12/02/00	12/01/00

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ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119040009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPI

Lab Sample Number: 0011676 1
Client Sample Number: 964
Sample Description: EQUIPMENT BLANK DI WATER

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	ON CHLORINATED PESTICIDES & PCB							
505	g-BHC (LINDANE)	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/0
505	CHLORDANE	0.020	U	ug/L	0.020	TCE	12/02/00	12/01/0
505	DIELDRIN	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/0
505	HEPTACHLOR	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/0
505	HEPTACHLOR EPOXIDE	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/0
505	HEXACHLOROBENZENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	HEXACHLOROCYCLOPENTADIENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	METHOXYCHLOR	0.050	U	ug/L	0.050	TCE	12/02/00	12/01/0
505	SIMAZINE	1.5	U	ug/L	1.5	TCE	12/02/00	12/01/0
505	TOXAPHENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1016	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1221	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1232	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1242	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1248	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1254	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1260	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	TOTAL PCB'S	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
	DRINKING WATER ORGANIC HERBICIDES							
515.1	2,4-D	0.10	U	ug/L	0.10	DAD	12/05/00	12/04/0
515.1	DALAPON	1.0	U	ug/L	1.0	DAD	12/05/00	12/04/0
515.1	DINOSEB	0.20	U	ug/L	0.20	DAD	12/05/00	12/04/0
515.1	PENTACHLOROPHENOL	0.040	U	ug/L	0.040	DAD	12/05/00	12/04/0
515.1	PICLORAM	0.10	U	ug/L	0.10	DAD	12/05/00	12/04/0
515.1	2,4,5-TP (SILVEX)	0.20	U	ug/L	0.20	DAD	12/05/00	12/04/0
	DRINKING WATER ORGANIC CARBAMATES							
531.1	CARBOFURAN	2.0	U	ug/L	2.0	KNA	12/05/00	12/04/0
531.1	OXAMYL (VYDATE)	2.0	U	ug/L	2.0	KNA	12/05/00	12/04/0
	DW DISINFECTANT BY-PRODUCTS							
504.1	1,2-DIBROMO-3-CHLOROPROPANE	0.020	U	ug/L	0.020	DAD	12/05/00	12/04/0
504.1	ETHYLENE DIBROMIDE	0.020	U	ug/L	0.020	DAD	12/05/00	12/04/0

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Florida Certification #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01
Client's P.O. Number: C11904D009
Project Number:
Project Name: LDC
Elab Report Name: Finalnew->Final2.RPt

Lab Sample Number: 0011676 1
Client Sample Number: 904
Sample Description: EQUIPMENT BLANK DI WATER
Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
	DW MISC. SOC'S - GLYPHOSATE							
547	GLYPHOSATE	6.0	U	ug/L	6.0	LMR/KMA	12/01/00	
	DW MISC. SOC'S - ENDOTHALL							
548.1	ENDOTHALL	9.0	U	ug/L	9.0	KMA	12/06/00	11/30/00
	DW MISC. SOC'S - DIQUAT							
549.1	DIQUAT	0.40	U	ug/L	0.40	KMA	12/04/00	11/30/00
	DW GROUP I UNREGULATED OC PESTICIDES							
525.2	ALDRIN	0.10	U	ug/L	0.10	TKA	12/06/00	12/01/00
525.2	DIELDRIN	0.13	U	ug/L	0.13	TKA	12/06/00	12/01/00
525.2	PROPACHLOR	0.20	U	ug/L	0.20	TKA	12/06/00	12/01/00
	DW GROUP I UNREGULATED--CARBAMATES							
531.1	ALDICARB (TEMIK)	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
531.1	ALDICARD SULFONE	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
531.1	ALDICARB SULFOXIDE	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
531.1	CARBARYL	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
531.1	3-HYDROXYCARBOFURAN	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
531.1	METHIOCARB	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
531.1	METHOMYL	2.0	U	ug/L	2.0	KMA	12/05/00	12/04/00
	DW REG AND UNREG VOCATILE ORGANICS							
502.2	BENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMODICHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOFORM	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CARBON TETRACHLORIDE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROFORM	0.64		ug/L	0.50	RME	11/30/00	
502.2	CHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	2-CHLOROTOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	4-CHLOROTOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DIBROMOCHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DIBROMOMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	

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ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119044C09
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final1.RPT

Lab Sample Number: 0011676 1
Client Sample Number: 954
Sample Description: EQUIPMENT BLANK DI WATER

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	SW 846 AND OTHER VOLATILE ORGANICS							
502.2	1,2-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,4-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DICHLORODIFLUOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	cis-1,2-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	trans-1,2-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DICHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	2,2-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROPROPENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROPROPENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	ETHYLBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	METHYL TERT-BUTYL ETHER (MTBE)	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	MONOCHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	STYRENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,1,2-TETRACHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,2,2-TETRACHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TETRACHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2,4-TRICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,1-TRICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,2-TRICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TRICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TRICHLOROFLUOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2,3-TRICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	VINYL CHLORIDE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	XYLENES, TOTAL	0.50	U	ug/L	0.50	RME	11/30/00	

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Florida Certification: #E83079
ELAB, Inc.

AMALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C11904M009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew:>Final2.RPT

Lab Sample Number: 0011676 1
Client Sample Number: 966
Sample Description: EQUIPMENT BLANK DI WATER

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	SW ADIPATES, PHTHALATES, AND PAH'S							
525.2	BENZO(A)PYRENE	0.10	U	ug/L	0.10	TRA	12/06/00	12/01/0
525.2	DI(2-ETHYLHEXYL)PHTHALATE	2.0	U	ug/L	2.0	TRA	12/06/00	12/01/0
525.2	DI(2-ETHYLHEXYL)ADIPATE	1.6	U	ug/L	1.6	TRA	12/06/00	12/01/0
110.2	COLOR	5.0	U	UNIT	5.0	MBO	11/29/00	16:11
120.1	SPECIFIC CONDUCTANCE	0.880		umhos/cm	1.0	MBO	11/29/00	
SM2330B	LANGLIER SATURATION INDEX	-6.98		-----		KTE	12/07/00	
140.1	ODOR	1.0	U	TON	1.0	MBO	11/29/00	16:15
150.1	pH	6.82		UNIT		MBO	11/29/00	16:20
160.1	TOTAL DISSOLVED SOLIDS (TDS)	5.0	U	mg/L	5.0	MBO	11/29/00	
180.1	TURBIDITY	0.10	U	NTU	0.10	MBO	11/29/00	16:04
100.2	ASBESTOS	0.20	U	MFL	0.20	EMSL	12/13/00	12/01/00
335.2	CYANIDE - TOTAL	0.010	U	mg/L	0.010	TPK	12/04/00	
350/351.2	ORGANIC NITROGEN (as N)	0.50	U	mg/L	0.50	TPK	11/30/00	
351.2	TOTAL KJELDAHL NITROGEN (as N)	0.50	U	mg/L	0.50	TPK	11/30/00	
365.4	TOTAL PHOSPHORUS	0.10	U	mg/L	0.10	TPK	11/30/00	
350.1	AMMONIA NITROGEN (as N)	0.050	U	mg/L	0.050	TPK	11/29/00	
405.1	BOD 5-day	2.0	U	mg/L	2.0	MMA	11/29/00	
425.1	SURFACTANTS (MBAS)	0.10	U	mg/L	0.10	MMA	11/29/00	
900.0	GROSS ALPHA	0.5+/-0.4	U	pCi/L	0.5+/-0.4	MJV	12/11/00	
900.0	GROSS BETA	1.0+/-0.7	U	pCi/L	1.0+/-0.7	MJV	12/11/00	
SM7500Ra	RADIUM 226	0.2+/-0.1		pCi/L		MJV	12/14/00	
SM7500Ra	RADIUM 228	1.0+/-0.8	U	pCi/L	1.0+/-0.8	MJV	12/14/00	
300.0	CHLORIDE	0.50	U	mg/L	0.50	KFE	11/29/00	
300.0	FLUORIDE	0.050	U	mg/L	0.050	KFE	11/29/00	
300.0	NITRATE NITROGEN (as N)	0.050	U	mg/L	0.050	KFE	11/29/00	17:44
300.0	NITRITE NITROGEN (as N)	0.050	U	mg/L	0.050	KFE	11/29/00	17:44
300.0	NITROGEN - NO3/NO2 (NOX)	0.050	U	mg/L	0.050	KFE	11/29/00	
300.0	ORTHOPHOSPHATE - P	0.10	U	mg/L	0.10	KFE	11/29/00	17:44
300.0	SULFATE	0.50	U	mg/L	0.50	KFE	11/29/00	
204.2	ANTIMONY (TOTAL)	3.0	U	ug/L	3.0	JAS	12/04/00	
7421	LEAD (TOTAL)	1.0	U	ug/L	1.0	EN	12/01/00	

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Florida Certification: #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11033676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119043003
Project Number:
Project Name: LKC
Elab Report Name: Finalnew->Final2.RPT

Lab Sample Number: 0011676 1
Client Sample Number: 964
Sample Description: EQUIPMENT BLANK DI WATER

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
7470	MERCURY	0.20	U	ug/L	0.20	EM	12/04/00	
7740	SELENIUM (TOTAL)	2.0	U	ug/L	2.0	EM	12/04/00	
7841	THALLIUM (TOTAL)	1.0	U	ug/L	1.0	JAS	12/04/00	
200.7	ALUMINUM (TOTAL)	100	U	ug/L	100	EM	11/30/00	
200.7	ARSENIC (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	BARIUM (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	BERYLLIUM (TOTAL)	1.0	U	ug/L	1.0	EM	11/30/00	
200.7	CADMIUM (TOTAL)	1.0	U	ug/L	1.0	EM	11/30/00	
200.7	CHROMIUM (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	COPPER (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	IRON (TOTAL)	40	U	ug/L	40	EM	11/30/00	
200.7	MANGANESE (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	NICKEL (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	SILVER (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	SODIUM (TOTAL)	0.50	U	mg/L	0.50	EM	11/30/00	
200.7	ZINC (TOTAL)	20	U	ug/L	20	EM	11/30/00	

Data Qualifier Code Key:
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Lab Sample Number: 0011676 2
Client Sample Number: 965
Sample Description: GROUND H2O

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
1613A	DIOXIN (2,3,7,8-TCDD)	0.84	U	pg/L	0.84	GWL	12/21/00	12/07/00
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	ACENAPHTHENE	5.0	U	ug/L	5.0	VO	12/18/00	12/01/00
625	ACENAPHTHYLENE	5.0	U	ug/L	5.0	VO	12/18/00	12/01/00

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FIELD SAMPLE

EXW-1
(1,015 TO 1,225 FEET BPL)

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Florida Certification #E83009
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11003576
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119044009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew-sFinal2.RPI

Lab Sample Number: 0011676 2
Client Sample Number: 965
Sample Description: GROUND H20

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Date Prepared
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZIDINE	25	U	ug/L	25	VG	12/10/00	12/03/00
625	BENZ(A)ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(B)FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(K)FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(G,H,I)PERYLENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BENZO(A)PYRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-CHLOROETHOXY) METHANE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-CHLOROETHYL) ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-CHLOROISOPROPYL) ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BIS(2-ETHYLHEXYL) PHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-BROMOPHENYL PHENYL ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	BUTYL BENZYL PHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2-CHLORONAPHTHALENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-CHLORO-3-METHYLPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2-CHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-CHLOROPHENYL PHENYL ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	CHRYSENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIBENZO(A,H)ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DI-n-BUTYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,3-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,4-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	3,3'-DICHLOROBENZIDINE	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DICHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIETHYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,4-DIMETHYLPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIMETHYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4,6-DINITRO-2-METHYLPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DINITROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DINITROTOLUENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00

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Florida Certification #883079

ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 1100676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119849000
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPI

Lab Sample Number: 6011676 2
Client Sample Number: 965
Sample Description: GROUND H20

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	2,6-DINITROTOLUENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2-DIPHENYLHYDRAZINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DI-n-OCTYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIOXIN [2,3,7,8-TCDD] (SCREEN)	100	U	ng/L	100	VG	12/10/00	12/03/00
625	FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	FLUORENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROBUTADIENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROCYCLOPENTADIENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	HEXACHLOROETHANE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	INDENO[1,2,3-CD]PYRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	ISOPHORONE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	NAPHTHALENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	NITROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2-NITROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-NITROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	N-NITROSODIMETHYLAMINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	N-NITROSODIPHENYLAMINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	N-NITROSODI-n-PROPYLAMINE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	PENTACHLOROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	PHENANTHRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	PHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	PYRENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2,4-TRICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,4,6-TRICHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
	GC CHLORINATED PESTICIDES & PCB							
505	ALACHLOR	1.5	U	ug/L	1.5	TCE	12/02/00	12/01/00
505	ATRAZINE	2.5	U	ug/L	2.5	TCE	12/02/00	12/01/00
505	g-BHC (LINDANE)	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/00
505	CHLORDANE	0.020	U	ug/L	0.020	TCE	12/02/00	12/01/00
505	DIELDRIN	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/00

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Florida Certification: #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11888676
Date Received: 11/29/00
Date Reported: 01/05/01
Client's P.O. Number: C113049089
Project Number:
Project Name: LEC
Elab Report Name: Finalnew-wFinal2.RPT

Lab Sample Number: 0011676 2
Client Sample Number: 965
Sample Description: GROUND H2O
Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	DW CHLORINATED PESTICIDES & PCB							
505	HEPTACHLOR	0.030	U	ug/L	0.030	TCE	12/02/00	12/01/0
505	HEPTACHLOR EPOXIDE	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/0
505	HEXACHLOROBENZENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	HEXACHLOROCYCLOPENTADIENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	METHOXYCHLOR	0.050	U	ug/L	0.050	TCE	12/02/00	12/01/0
505	SIMAZINE	1.5	U	ug/L	1.5	TCE	12/02/00	12/01/0
505	TOXAPHENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1016	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1221	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1232	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1242	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1248	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1254	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1260	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	TOTAL PCB'S	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
	DRINKING WATER ORGANIC HERBICIDES							
515.1	2,4-D	0.10	U	ug/L	0.10	GAO	12/05/00	12/04/0
515.1	SALAPON	1.0	U	ug/L	1.0	GAO	12/05/00	12/04/0
515.1	DINOSEB	0.20	U	ug/L	0.20	GAO	12/05/00	12/04/0
515.1	PENTACHLOROPHENOL	0.040	U	ug/L	0.040	GAO	12/05/00	12/04/0
515.1	PICLORAM	0.10	U	ug/L	0.10	GAO	12/05/00	12/04/0
515.1	2,4,5-TP (SILVEX)	0.20	U	ug/L	0.20	GAO	12/05/00	12/04/0
	DRINKING WATER ORGANIC CARBAMATES							
531.1	CARBOFURAN	2.0	U	ug/L	2.0	KSA	12/05/00	12/04/0
531.1	OXAMYL (VYDATE)	2.0	U	ug/L	2.0	KSA	12/05/00	12/04/0
	DW DISINFECTANT BY-PRODUCTS							
504.1	1,2-DIBROMO-3-CHLOROPROPANE	0.020	U	ug/L	0.020	GAO	12/05/00	12/04/0
504.1	ETHYLENE DIBROMIDE	0.020	U	ug/L	0.020	GAO	12/05/00	12/04/0
	DW MISC. SOC'S - GLYPHOSATE							
547	GLYPHOSATE	6.0	U	ug/L	6.0	LMA/EAA	12/01/00	
	DW MISC. SOC'S - ENDOTHALL							

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Florida Certification #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11300676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119049089
Project Number:
Project Name: LEC
Elab Report Name: Finalrev-xFinal2.RPT

Lab Sample Number: 0011676 2
Client Sample Number: 965
Sample Description: GROUND H2O

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Date Prepared
	DW MISC. SOC'S - ENDOTHALL							
548.1	ENDOTHALL	9.0	U	ug/L	9.0	MSM	12/06/00	11/30/00
	DW MISC. SOC'S - DIQUAT							
549.1	DIQUAT	0.40	U	ug/L	0.40	RSA	12/04/00	11/30/00
	DW GROUP I UNREGULATED OC PESTICIDES							
525.2	ALDRIN	0.10	U	ug/L	0.10	TKA	12/07/00	12/01/00
525.2	DIELDRIN	0.13	U	ug/L	0.13	TKA	12/07/00	12/01/00
525.2	PROPACHLOR	0.20	U	ug/L	0.20	TKA	12/07/00	12/01/00
	DW GROUP I UNREGULATED-CARBAMATES							
531.1	ALDICARB (TEMIK)	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
531.1	ALDICARB SULFONE	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
531.1	ALDICARB SULFOXIDE	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
531.1	CARBARYL	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
531.1	3-HYDROXYCARBOFURAN	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
531.1	METHIOCARB	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
531.1	METHOMYL	2.0	U	ug/L	2.0	RSA	12/05/00	12/04/00
	DW BNC AND UNREG VOLATILE ORGANICS							
502.2	BENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMODICHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOFORM	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CARBON TETRACHLORIDE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROFORM	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	2-CHLOROTOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	4-CHLOROTOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DIBROMOCHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DIBROMOMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	

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WEST PALM BEACH, FL 33411

Florida Certification #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11306676
Date Received: 11/29/00
Date Reported: 01/05/01
Client's P.O. Number: CL1904MC09
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPT

Lab Sample Number: 0011676 2
Client Sample Number: 955
Sample Description: GROUND H2O
Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
	EW REG AND UNREG VOLATILE ORGANICS							
502.2	1,4-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DICHLORODIFLUOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	cis-1,2-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	trans-1,2-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DICHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	2,2-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROPROPENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROPROPENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	ETHYLBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	METHYL TERT-BUTYL-ETHER (MTBE)	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	MONOCHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	STYRENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,1,2-TETRACHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,2,2-TETRACHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TETRACHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2,4-TRICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,1-TRICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,2-TRICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TRICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TRICHLOROFLUOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2,3-TRICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	VINYL CHLORIDE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	XYLENES, TOTAL	0.50	U	ug/L	0.50	RME	11/30/00	
	GC ADIPATES, PHTHALATES, AND PAH'S							
525.2	BENZO(A)PYRENE	0.10	U	ug/L	0.10	TKA	12/07/00	12/01/00

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ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C115049009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final3.RPT

Lab Sample Number: 0011676 2
Client Sample Number: 965
Sample Description: GROUND H20

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	DW ADIPATES, PHTHALATES, AND PAH'S							
525.2	DI(2-ETHYLHEXYL)PHTHALATE	2.0	U	ug/L	2.0	TXA	12/07/00	12/01/0
525.2	DI(2-ETHYLHEXYL)ADIPATE	1.6	U	ug/L	1.6	TXA	12/07/00	12/01/0
110.2	COLOR	10		UNIT	5.0	MBO	11/29/00	16:12
120.1	SPECIFIC CONDUCTANCE	5370		umhos/cm	1.0	MBO	11/29/00	
SM3130B	LANGELIER SATURATION INDEX	0.25		----		KFK	12/07/00	
140.1	ODOR	6.0		TON	5.0	MBO	11/29/00	16:17
150.1	pH	7.66		UNIT		MBO	11/29/00	16:23
160.1	TOTAL DISSOLVED SOLIDS (TDS)	2800		mg/L	5.0	MBO	11/29/00	
180.1	TURBIDITY	25		NTU	0.10	MBO	11/29/00	16:07
199.2	ASBESTOS	0.20	U	MFL	0.20	EMSL	12/11/00	12/01/00
335.2	CYANIDE - TOTAL	0.010	U	mg/L	0.010	TPE	12/04/00	
350/351.2	ORGANIC NITROGEN (as N)	0.50	U	mg/L	0.50	TPE	11/30/00	
351.2	TOTAL KJELDAHL NITROGEN (as N)	0.66		mg/L	0.50	TPE	11/30/00	
365.4	TOTAL PHOSPHORUS	0.10	U	mg/L	0.10	TPE	11/30/00	
350.1	AMMONIA NITROGEN (as N)	0.55		mg/L	0.050	TPE	11/28/00	
405.1	BOD 5-day	2.9		mg/L	2.0	MBA	11/29/00	
425.1	SURFACTANTS (MBAS)	0.14		mg/L	0.10	SBA	11/29/00	
900.0	GROSS ALPHA	9.1+/-5.3	U	pCi/L	9.1+/-5.3	MJN	12/12/00	
900.0	GROSS BETA	26.8+/-4.7		pCi/L		MJN	12/12/00	
SM7500Ra	RADIUM 226	3.2+/-0.3		pCi/L		MJN	12/14/00	
SM7500Ra	RADIUM 228	2.1+/-0.8		pCi/L		MJN	12/14/00	
300.0	CHLORIDE	1400		mg/L	12	KFE	11/29/00	
300.0	FLUORIDE	2.0		mg/L	1.2	KFE	11/29/00	
300.0	NITRATE NITROGEN (as N)	1.2	U	mg/L	1.2	KFE	11/29/00	17:44
300.0	NITRITE NITROGEN (as N)	1.2	U	mg/L	1.2	KFE	11/29/00	17:44
300.0	NITROGEN - NO3/NO2 (NOX)	1.2	U	mg/L	1.2	KFE	11/29/00	
300.0	ORTHOPHOSPHATE - P	2.5	U	ug/L	2.5	KFE	11/29/00	17:44
300.0	SULFATE	623		mg/L	12	KFE	11/29/00	
204.2	ANTIMONY (TOTAL)	3.0	U	ug/L	3.0	JAG	12/04/00	
7421	LEAD (TOTAL)	1.0	U	ug/L	1.0	EM	12/01/00	
7470	MERCURY	0.20	U	ug/L	0.20	EM	12/04/00	

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ANALYTICAL REPORT

Submission Number: 11333676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C11936W019
Project Number:
Project Name: LEC
Elab Report Name: Finalsew-sFinal2.RP1

Lab Sample Number: 0011676 2
Client Sample Number: 965
Sample Description: GROUND WTR

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
7740	SELENIUM (TOTAL)	2.0	U	ug/L	2.0	EM	12/06/00	
7841	THALLIUM (TOTAL)	1.0	U	ug/L	1.0	JAS	12/04/00	
200.7	ALUMINUM (TOTAL)	100	U	ug/L	100	EM	11/30/00	
200.7	ARSENIC (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	BARIUM (TOTAL)	12		ug/L	10	EM	11/30/00	
200.7	BERYLLIUM (TOTAL)	1.0	U	ug/L	1.0	EM	11/30/00	
200.7	CADMIUM (TOTAL)	1.0	U	ug/L	1.0	EM	11/30/00	
200.7	CHROMIUM (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	COPPER (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	IRON (TOTAL)	90		ug/L	40	EM	11/30/00	
200.7	MANGANESE (TOTAL)	6.7		ug/L	5.0	EM	11/30/00	
200.7	NICKEL (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	SILVER (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	SODIUM (TOTAL)	760		mg/L	5.0	JAS	12/04/00	
200.7	ZINC (TOTAL)	20	U	ug/L	20	EM	11/30/00	

Data Qualifier Code Key:
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Lab Sample Number: 0011676 3
Client Sample Number: 966
Sample Description: REPLICATE SAMPLE

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
1613A	DIOXIN (2,3,7,8-TCDD)	0.77	U	pg/L	0.77	SWL	12/21/00	12/07/00
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	ACENAPHTHENE	5.0	U	ug/L	5.0	WG	12/12/00	12/01/00
625	ACENAPHTHYLENE	5.0	U	ug/L	5.0	WG	12/12/00	12/01/00
625	ANTHRACENE	5.0	U	ug/L	5.0	WG	12/12/00	12/01/00

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REPLICATE SAMPLE

EXW-1
(1,015 TO 1,225 FEET BPL)

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ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119048039
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPt

Lab Sample Number: 0011676 3
Client Sample Number: 946
Sample Description: REPLICATE SAMPLE

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Date Prepared
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	BENZIDINE	25	U	ug/L	25	VG	12/13/00	12/03/00
625	BENZ(A)ANTHRACENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BENZO(B)FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BENZO(K)FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BENZO(G,H,I)PERYLENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BENZO(A)PYRENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BIS(2-CHLOROETHOXY) METHANE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BIS(2-CHLOROETHYL) ETHER	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BIS(2-CHLOROISOPROPYL) ETHER	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BIS(2-ETHYLHEXYL) PHTHALATE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	4-BROMOPHENYL PHENYL ETHER	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	BUTYL BENZYL PHTHALATE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	2-CHLORONAPHTHALENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-CHLORO-3-METHYLPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2-CHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4-CHLOROPHENYL PHENYL ETHER	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	CHRYSENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIBENZO(A,H)ANTHRACENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DI-n-BUTYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,2-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,3-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	1,4-DICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	3,3'-DICHLOROBENZIDINE	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DICHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIETHYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,4-DIMETHYLPHENOL	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	DIMETHYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	4,6-DINITRO-2-METHYLPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DINITROPHENOL	20	U	ug/L	20	VG	12/10/00	12/03/00
625	2,4-DINITROTOLUENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00
625	2,6-DINITROTOLUENE	5.0	U	ug/L	5.0	VG	12/10/00	12/03/00

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ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01
Client's P.O. Number: C119366009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPT

Lab Sample Number: 0011676 3
Client Sample Number: 966
Sample Description: REPLICATE SAMPLE
Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
	PRIORITY POLLUTANT B/N/A EXTRACTABLES							
625	1,2-DIPHENYLHYDRAZINE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	DI-n-OCTYLPHTHALATE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	DIOXIN (2,3,7,8-TCDD) (SCREEN)	100	U	ug/L	100	VG	12/13/00	12/03/00
625	FLUORANTHENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	FLUORENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	HEXACHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	HEXACHLOROBUTADIENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	HEXACHLOROCYCLOPENTADIENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	HEXACHLOROETHANE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	INDENO(1,2,3-CD)PYRENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	ISOPHORONE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	NAPHTHALENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	NITROBENZENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	2-NITROPHENOL	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	4-NITROPHENOL	20	U	ug/L	20	VG	12/13/00	12/03/00
625	N-NITROSODIMETHYLAMINE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	N-NITROSODIPHENYLAMINE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	N-NITROSODI-n-PROPYLAMINE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	PENTACHLOROPHENOL	20	U	ug/L	20	VG	12/11/00	12/03/00
625	PHENANTHRENE	5.0	U	ug/L	5.0	VG	12/18/00	12/03/00
625	PHENOL	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	PYRENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	1,2,4-TRICHLOROBENZENE	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
625	2,4,6-TRICHLOROPHENOL	5.0	U	ug/L	5.0	VG	12/13/00	12/03/00
	GC CHLORINATED PESTICIDES & PCB							
505	ALACHLOR	1.5	U	ug/L	1.5	TCE	12/02/00	12/01/00
505	ATRAZINE	2.5	U	ug/L	2.5	TCE	12/02/00	12/01/00
505	g-BHC (LINDANE)	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/00
505	CHLORDANE	0.030	U	ug/L	0.030	TCE	12/02/00	12/01/00
505	ENDRIN	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/00
505	HEPTACHLOR	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/00

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8894 BELVEDERE RD.
WEST PALM BEACH, FL 33411

Florida Certification: #E83079
ELAB, Inc.

ANALYTICAL REPORT

Page 17

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C11934W009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPT

Lab Sample Number: 0011676 3
Client Sample Number: 966
Sample Description: REPLICATE SAMPLE

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
	DW CHLORINATED PESTICIDES & PCB							
505	HEPTACHLOR EPOXIDE	0.010	U	ug/L	0.010	TCE	12/02/00	12/01/0
505	HEXACHLOROBENZENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	HEXACHLOROCYCLOPENTADIENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	METHOXYCHLOR	0.050	U	ug/L	0.050	TCE	12/02/00	12/01/0
505	SIMAZINE	1.5	U	ug/L	1.5	TCE	12/02/00	12/01/0
505	TOXAPHENE	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1016	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1221	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1232	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1242	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1248	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1254	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	PCB 1260	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
505	TOTAL PCB'S	0.10	U	ug/L	0.10	TCE	12/02/00	12/01/0
	DRINKING WATER ORGANIC HERBICIDES							
515.1	2,4-D	0.10	U	ug/L	0.10	GAO	12/05/00	12/04/0
515.1	DALAPON	1.0	U	ug/L	1.0	GAO	12/05/00	12/04/0
515.1	DINOSEB	0.20	U	ug/L	0.20	GAO	12/05/00	12/04/0
515.1	PENTACHLOROPHENOL	0.040	U	ug/L	0.040	GAO	12/05/00	12/04/0
515.1	PICLORAM	0.10	U	ug/L	0.10	GAO	12/05/00	12/04/0
515.1	2,4,5-TP (SILVEX)	0.20	U	ug/L	0.20	GAO	12/05/00	12/04/0
	DRINKING WATER ORGANIC CARBAMATES							
531.1	CARBOFURAN	2.0	U	ug/L	2.0	KKA	12/05/00	12/04/0
531.1	OXAMYL (VYDATE)	2.0	U	ug/L	2.0	KKA	12/05/00	12/04/0
	DW DISINFECTANT BY-PRODUCTS							
504.1	1,2-DIBROMO-3-CHLOROPROPANE	0.020	U	ug/L	0.020	GAO	12/05/00	12/04/0
504.1	ETHYLENE DIBROMIDE	0.020	U	ug/L	0.020	GAO	12/05/00	12/04/0
	DW MISC. SOC'S - GLYPHOSATE							
547	GLYPHOSATE	6.0	U	ug/L	6.0	LMA/SGA	12/01/00	
	DW MISC. SOC'S - ENDOTHALL							
548.1	ENDOTHALL	9.0	U	ug/L	9.0	MBM	12/06/00	11/30/0

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ANALYTICAL REPORT

Page 16

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119049005
Project Number:
Project Name: LEC
Elab Report Name: Finalrew-rFinal2.RPT

Lab Sample Number: 0011676 3
Client Sample Number: 966
Sample Description: REPLICATE SAMPLE

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Date Prepared
	SW MISC. SOC'S - DIQUAT							
549.1	DIQUAT	0.40	U	ug/L	0.40	KHA	12/04/00	11/30/00
	SW GROUP I UNREGULATED OC PESTICIDES							
525.2	ALDRIN	0.10	U	ug/L	0.10	TKA	12/07/00	12/01/00
525.2	DIELDRIN	0.13	U	ug/L	0.13	TKA	12/07/00	12/01/00
525.2	PROPACHLOR	0.20	U	ug/L	0.20	TKA	12/07/00	12/01/00
	SW GROUP I UNREGULATED-CARBAMATES							
531.1	ALDICARB (TEMIK)	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
531.1	ALDICARB SULFONE	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
531.1	ALDICARB SULFOXIDE	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
531.1	CARBARYL	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
531.1	3-HYDROXYCARBOFURAN	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
531.1	METHIOCARB	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
531.1	METHOMYL	2.0	U	ug/L	2.0	KHA	12/05/00	12/04/00
	SW VOC AND UNREG VOLATILE ORGANICS							
502.2	BENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMODICHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOFORM	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	BROMOMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CARBON TETRACHLORIDE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROFORM	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	CHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	2-CHLOROTOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	4-CHLOROTOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DIBROMOCHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DIBROMOMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,4-DICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DICHLORODIFLUOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	

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ANALYTICAL REPORT

Page 19

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01

Client's P.O. Number: C119049C09
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RP1

Lab Sample Number: 0011676 3
Client Sample Number: 966
Sample Description: REPLICATE SAMPLE

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
	DW 502 AND 524.2 VOLATILE ORGANICS							
502.2	1,1-DICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	cis-1,2-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	trans-1,2-DICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	DICHLOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	2,2-DICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1-DICHLOROPROPENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,3-DICHLOROPROPENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	ETHYLBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	METHYL TERT-BUTYL-ETHER (MTBE)	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	MONOCHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	STYRENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,1,2-TETRACHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,2,2-TETRACHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TETRACHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TOLUENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2,4-TRICHLOROBENZENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,1-TRICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,1,2-TRICHLOROETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TRICHLOROETHENE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	TRICHLOROFLUOROMETHANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	1,2,3-TRICHLOROPROPANE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	VINYL CHLORIDE	0.50	U	ug/L	0.50	RME	11/30/00	
502.2	XYLENES, TOTAL	0.50	U	ug/L	0.50	RME	11/30/00	
	DW ADIPATES, PHTHALATES, AND PAH'S							
525.2	BENZO(A)PYRENE	0.10	U	ug/L	0.10	TKA	12/07/00	12/01/00
525.2	DI(2-ETHYLHEXYL)PHTHALATE	2.0	U	ug/L	2.0	TKA	12/07/00	12/01/00
525.2	DI(2-ETHYLHEXYL)ADIPATE	1.6	U	ug/L	1.6	TKA	12/07/00	12/01/00

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Florida Certification #E83079
ELAB, Inc.

ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/26/01

Client's P.O. Number: C119049009
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RPI

Lab Sample Number: 0011676 3
Client Sample Number: 966
Sample Description: REPLICATE SAMPLE

Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepared
110.2	COLOR	10		UNIT	5.0	MBO	11/29/00	16:13
120.1	SPECIFIC CONDUCTANCE	5360		umhos/cm	1.0	MBO	11/29/00	
SM2330B	LANGLIER SATURATION INDEX	0.38		----		KFE	12/07/00	
140.1	ODOR	7.0		TON	6.0	MBO	11/29/00	16:21
150.1	pH	7.70		UNIT		MBO	11/29/00	16:30
160.1	TOTAL DISSOLVED SOLIDS (TDS)	3100		mg/L	5.0	MBO	11/29/00	
180.1	TURBIDITY	9.9		NTU	0.10	MBO	11/29/00	16:14
100.2	ASBESTOS	0.20	U	MFL	0.20	ENEL	12/13/00	12/01/00
335.2	CYANIDE - TOTAL	0.010	U	mg/L	0.010	TPE	12/04/00	
350/351.2	ORGANIC NITROGEN (as N)	0.50	U	mg/L	0.50	TPK	11/30/00	
351.2	TOTAL KJELDAHL NITROGEN (As N)	0.51		mg/L	0.50	TPE	11/30/00	
365.4	TOTAL PHOSPHORUS	0.10	U	mg/L	0.10	TPE	11/30/00	
350.1	AMMONIA NITROGEN (as N)	0.58		mg/L	0.050	TPE	11/29/00	
405.1	BOD 5-day	3.2		mg/L	2.0	MMA	11/29/00	
425.1	SURFACTANTS (MBAS)	0.14		mg/L	0.10	MMA	11/29/00	
900.0	GROSS ALPHA	8.6+/-5.3	U	pCi/L	8.6+/-5.3	MJN	12/13/00	
900.0	GROSS BETA	26.8+/-4.7		pCi/L		MJN	12/13/00	
SM7500Ra	RADIUM 226	2.1+/-0.3		pCi/L		MJN	12/14/00	
SM7500Ra	RADIUM 228	1.0+/-0.6	U	pCi/L	1.0+/-0.6	MJN	12/14/00	
300.0	CHLORIDE	1400		mg/L	12	KFE	11/29/00	
300.0	FLUORIDE	1.6		mg/L	1.2	KFE	11/29/00	
300.0	NITRATE NITROGEN (as N)	1.2	U	mg/L	1.2	KFE	11/29/00	17:44
300.0	NITRITE NITROGEN (as N)	1.2	U	mg/L	1.2	KFE	11/29/00	17:44
300.0	NITROGEN - NO3/NO2 (NOX)	1.2	U	mg/L	1.2	KFE	11/29/00	
300.0	ORTHOPHOSPHATE - P	2.5	U	mg/L	2.5	KFE	11/29/00	17:44
300.0	SULFATE	420		mg/L	12	KFE	11/29/00	
204.2	ANTIMONY (TOTAL)	3.0	U	ug/L	3.0	JAS	12/04/00	
7421	LEAD (TOTAL)	1.0	U	ug/L	1.0	SM	12/01/00	
7470	MERCURY	0.20	U	ug/L	0.20	SM	12/04/00	
7740	SELENIUM (TOTAL)	2.0	U	ug/L	2.0	SM	12/04/00	
7841	THALLIUM (TOTAL)	1.0	U	ug/L	1.0	JAS	12/04/00	
200.7	ALUMINUM (TOTAL)	100	U	ug/L	100	SM	11/30/00	

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Florida Certification: #E83079
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ANALYTICAL REPORT

Submission Number: 11000676
Date Received: 11/29/00
Date Reported: 01/05/01
Client's P.O. Number: C11906W089
Project Number:
Project Name: LEC
Elab Report Name: Finalnew->Final2.RP1

Lab Sample Number: 0011676 3
Client Sample Number: 946
Sample Description: REPLICATE SAMPLE
Date Sampled: 11/28/00
Sample Matrix: GROUND WATER

Method	Analyte	Result	Q	Units	Reporting Limit	Analyst	Date Analyzed	Prepare
200.7	ARSENIC (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	BARIUM (TOTAL)	12		ug/L	10	EM	11/30/00	
200.7	BERYLLIUM (TOTAL)	1.0	U	ug/L	1.0	EM	11/30/00	
200.7	CADMIUM (TOTAL)	1.0	U	ug/L	1.0	EM	11/30/00	
200.7	CHROMIUM (TOTAL)	5.0	U	ug/L	5.0	EM	11/30/00	
200.7	COPPER (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	IRON (TOTAL)	75		ug/L	40	EM	11/30/00	
200.7	MANGANESE (TOTAL)	6.4		ug/L	5.0	EM	11/30/00	
200.7	NICKEL (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	SILVER (TOTAL)	10	U	ug/L	10	EM	11/30/00	
200.7	SODIUM (TOTAL)	759		mg/L	5.0	JAS	12/04/00	
200.7	ZINC (TOTAL)	20	U	ug/L	20	EM	11/30/00	

Data Qualifier Code Key:
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

CERTIFICATION: All analytical data reported above were obtained using the specified methods and were validated by our laboratory quality control system. This laboratory follows an approved quality assurance program.

Respectfully submitted:

Paul K Canevaro

Paul K. Canevaro
Laboratory Director

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APPENDIX G
PACKER TEST DRAWDOWN AND RECOVERY DATA

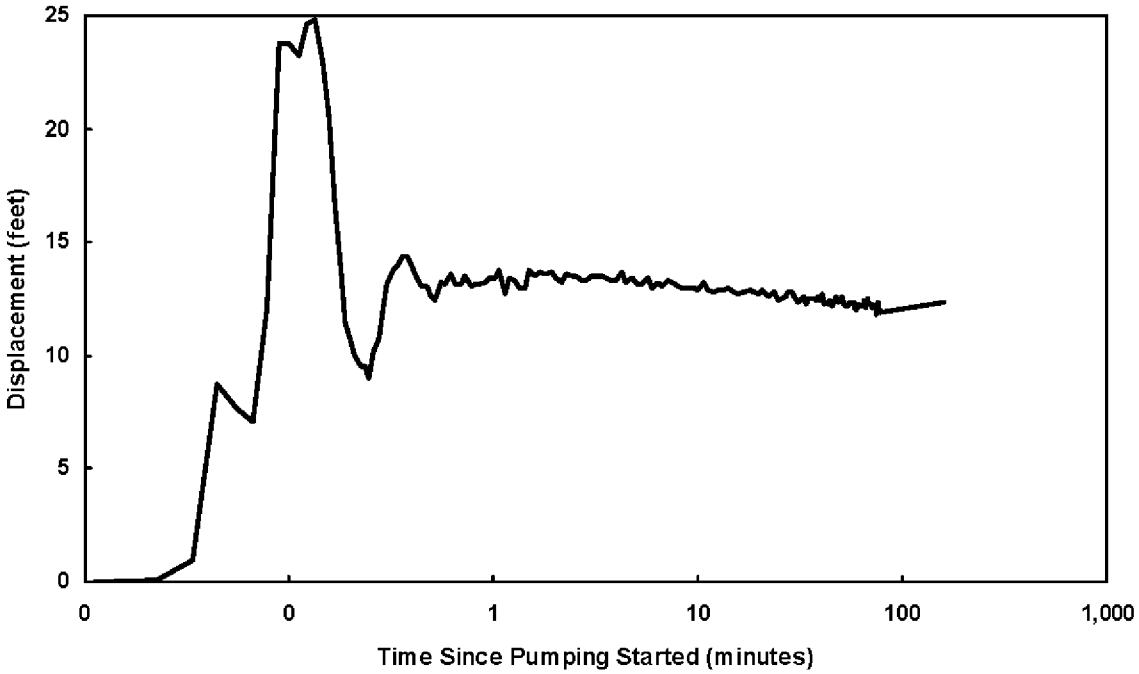

Figure G-1. EXW-1 Packer Test 1 during Drawdown from 1,160 to 1,225 bpl

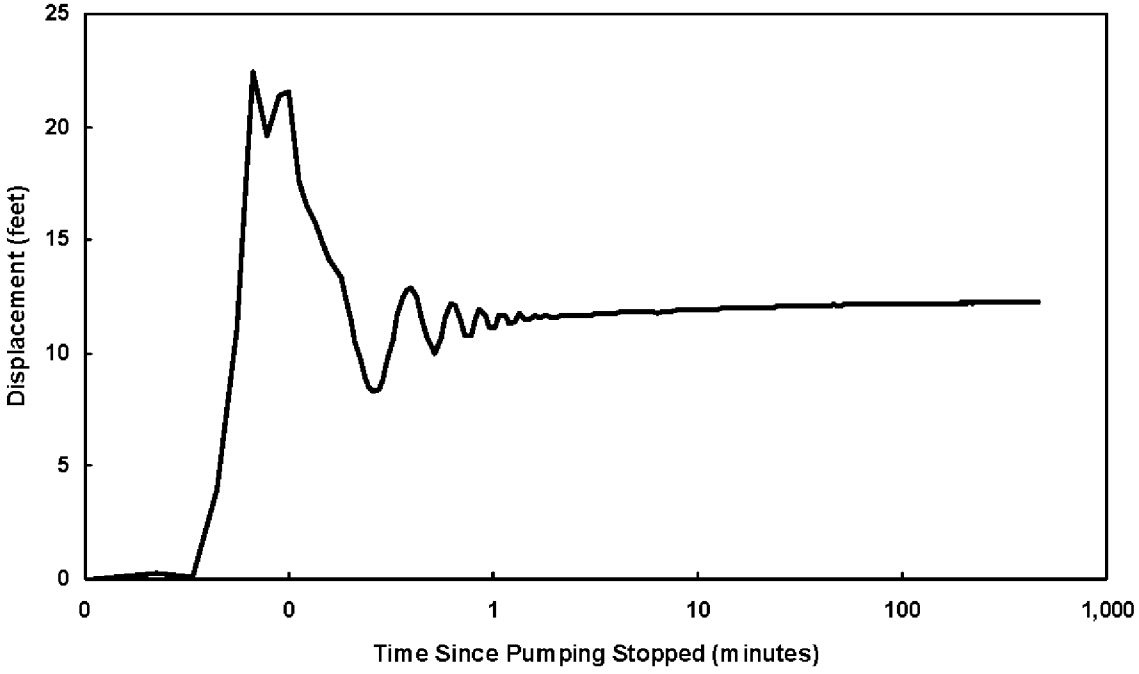

Figure G-2. EXW-1 Packer Test 1 during Recovery from 1,160 to 1,225 bpl

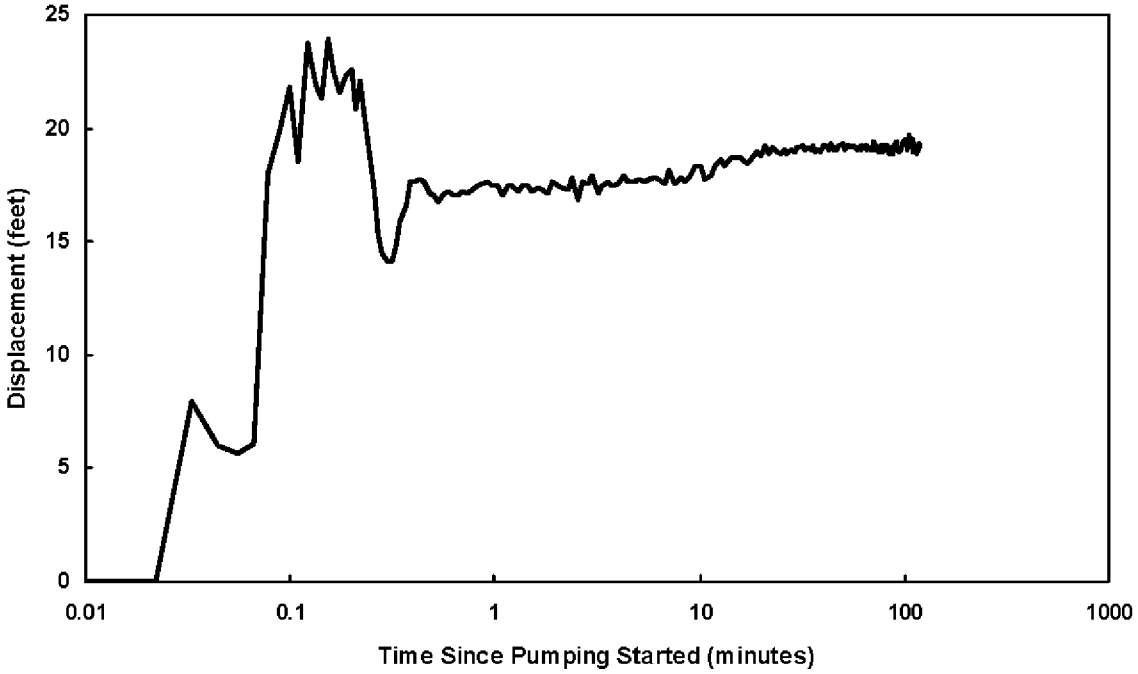

Figure G-3. EXW-1 Packer Test 2 during Drawdown from 1,015 to 1,150 bpl

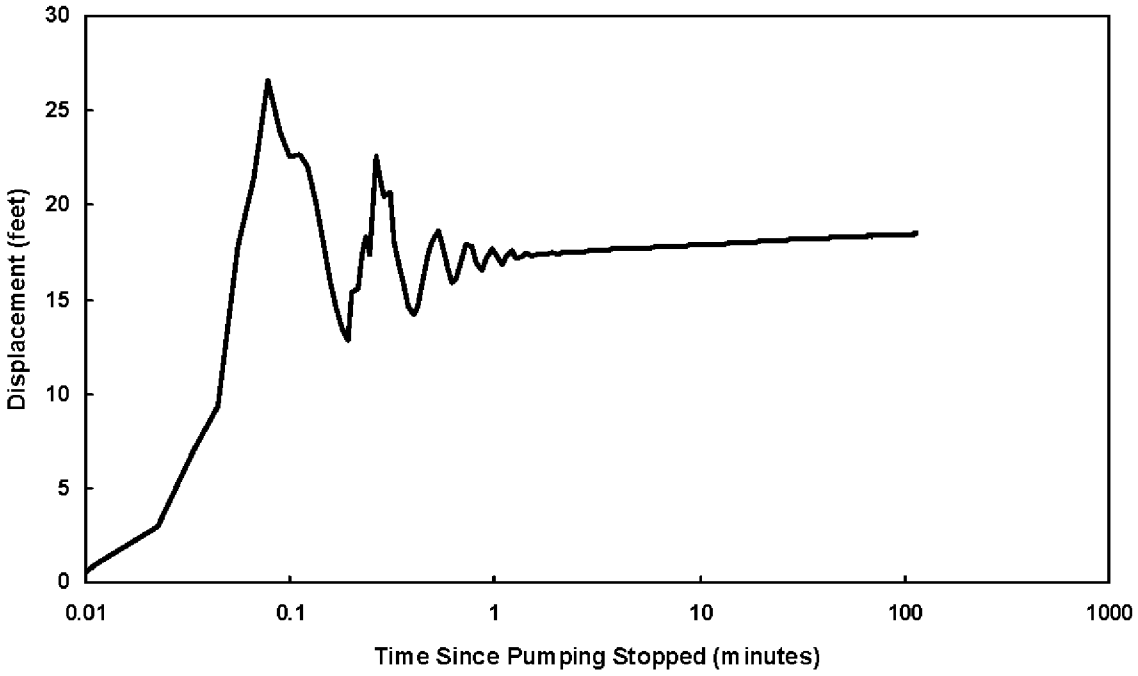

Figure G-4. EXW-1 Packer Test 2 during Recovery from 1,015 to 1,150 bpl