REPORT

Construction and Testing of Floridan Aquifer Wells FB-3 & FB-4

Fort Pierce Utilities Authority
Fort Pierce, Florida

February 1996

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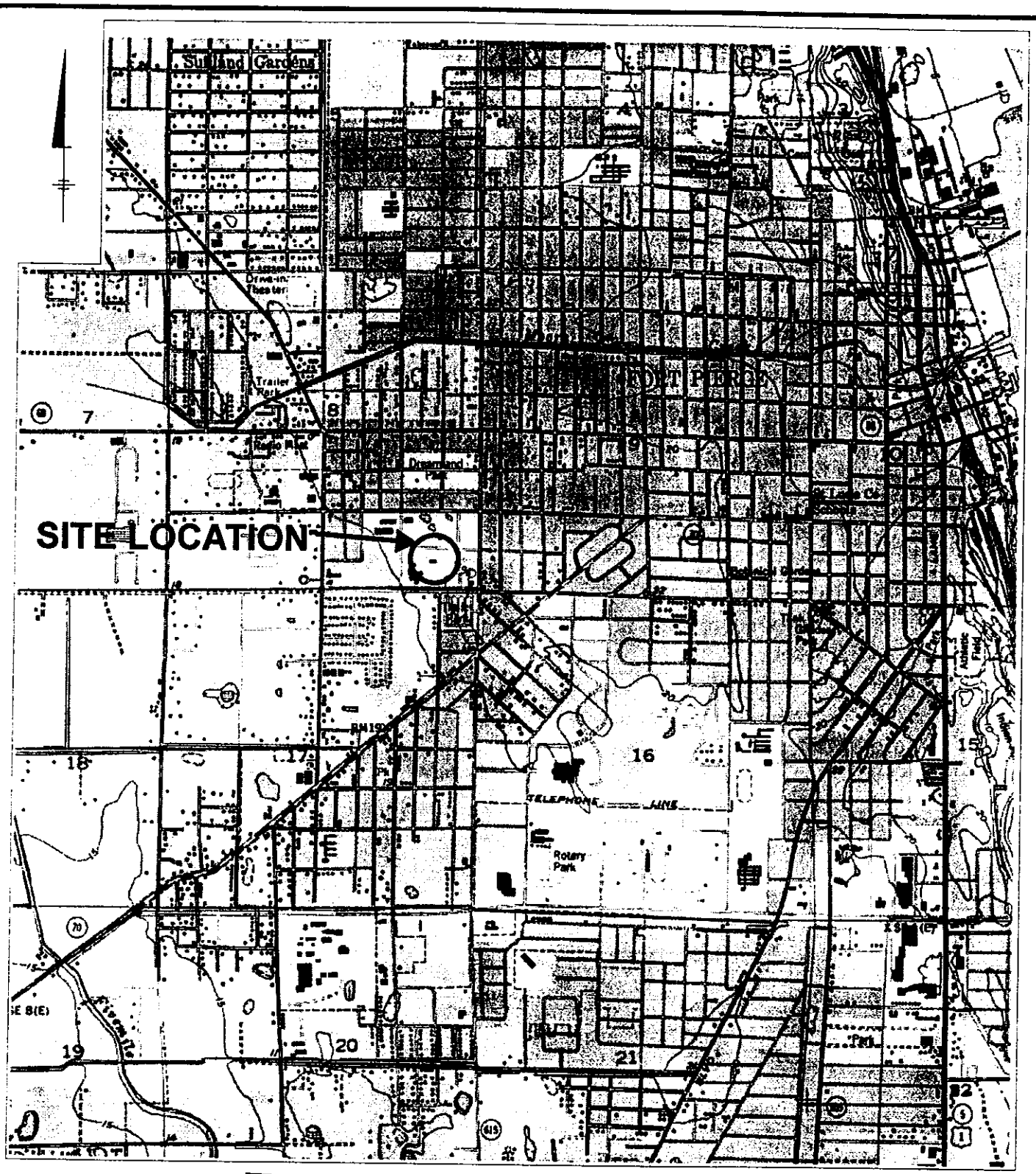

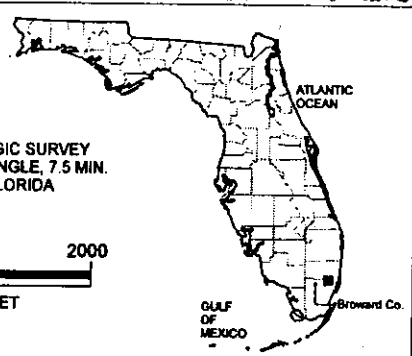

MAP SOURCE: UNITED STATES GEOLOGIC SURVEY
TOPOGRAPHIC QUADRANGLE, 7.5 MIN.
SERIES, BELLE GLADE, FLORIDA
photo-revised 1984.

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APPROXIMATE SCALE IN FEET

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499\04\49904 006 CDR

FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

LOCAL LAND USE MAP

BBL BLASLAND, BOUCK & LEE, INC.
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FIGURE 1

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Transmitted Via U.S. Mail

February 16, 1996

Mr. David Mellert
Senior Sanitary Engineer
Fort Pierce Utilities Authority
P.O. Box 3191
Fort Pierce, Florida 34948

Re: Final Report
Construction and Testing of Floridan Aquifer Wells FB-3 & FB-4
Project #: 499.04

Dear Dave:

Enclosed are two copies of the above-referenced final report. We are pleased that both wells were successfully completed within the designated budget. This was accomplished because all parties involved worked together to achieve the desired goals. I also would like to commend you for your efforts and careful management of this project. It was truly a pleasure to work with you and others at Fort Pierce.

I have enclosed a client survey questionnaire. To help us provide the best service possible, I would appreciate any comments that you may have. I will keep your comments confidential if you desire.

Again, it was a pleasure working with you on this project, and I look forward to working with the Authority in the future as your plans for additional Floridan aquifer supply expand with increasing demands.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Frederick W. Blickle, P.E.
Vice President

FWB/st
Enclosure
m:\499\04\09660689.wpd

cc: Mr. Richard Stenberg, FPUA
Mr. Vaughan C. Weaver, FPUA (ltr only)
Mr. Elie J. Bourdeaux, III, P.E., (ltr only)
Mr. Gary E. Eichler, P.G, BBL (ltr only)
Mr. John R. Menhennett, BBL (ltr only)

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BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Client Satisfaction Survey

Satisfaction - How satisfied are you with BB&L's service: 1-Very Satisfied; 2-Satisfied; 3-Dissatisfied; 4-Very Dissatisfied
Importance - How important is this attribute to you: 1-Critical Importance; 2-High Importance; 3-Low Importance; 4-No Importance
Rating - Please circle appropriate number.:

	• QUALITY •	SATISFACTION RATING	IMPORTANCE RATING
1.	Consistency of the quality of BB&L's reports, deliverables, engineering plans	1 2 3 4	1 2 3 4
2.	BB&L work products are delivered error free the first time	1 2 3 4	1 2 3 4
3.	Change orders are clearly and expediently defined and quantified	1 2 3 4	1 2 3 4
4.	Work products are delivered in accordance with mutually agreed upon schedules	1 2 3 4	1 2 3 4
5.	BB&L is able to accept and execute short turn-around requests	1 2 3 4	1 2 3 4
6.	Staff assigned to the project are technically capable	1 2 3 4	1 2 3 4
7.	Staff assigned to the project provide sound management	1 2 3 4	1 2 3 4
8.	Proposed project team members are maintained and used through-out critical project duration	1 2 3 4	1 2 3 4
9.	Commitments made by project team members are kept	1 2 3 4	1 2 3 4

	• VALUE •	SATISFACTION RATING	IMPORTANCE RATING
1.	BB&L services are priced competitively	1 2 3 4	1 2 3 4
2.	Project team focuses beyond project costs to overall program costs and potential long-term savings	1 2 3 4	1 2 3 4
3.	Subcontractors are managed to your advantage	1 2 3 4	1 2 3 4
4.	BB&L demonstrates ability to perform within the bounds of the project cost estimate	1 2 3 4	1 2 3 4
5.	BB&L project team provides creative solutions to problems	1 2 3 4	1 2 3 4
6.	BB&L acknowledges its weaknesses	1 2 3 4	1 2 3 4
7.	BB&L responds to client calls within one business day	1 2 3 4	1 2 3 4
8.	Location of BB&L staff to your project/offices	1 2 3 4	1 2 3 4
9.	Reputation of BB&L with regulatory agencies	1 2 3 4	1 2 3 4
10.	BB&L knows and understands your business and its organizational issues	1 2 3 4	1 2 3 4
11.	BB&L's commitment to do business with your Company	1 2 3 4	1 2 3 4
12.	Reputation of BB&L in the marketplace	1 2 3 4	1 2 3 4

• TECHNICAL COMPETENCE •	SATISFACTION RATING	IMPORTANCE RATING
1. BB&L demonstrates a "big picture" client-based perspective	1 2 3 4	1 2 3 4
2. BB&L demonstrates an in-depth knowledge and understanding of the ramifications of regulations being imposed on you	1 2 3 4	1 2 3 4
3. BB&L demonstrates ability to anticipate and proactively respond to issues, problems, or regulatory agency concerns	1 2 3 4	1 2 3 4
4. BB&L demonstrates ability to negotiate on your behalf	1 2 3 4	1 2 3 4
5. Project team technical performance meets or exceeds expectations	1 2 3 4	1 2 3 4
6. Public participation/community relations capability (if applicable)	1 2 3 4	1 2 3 4

• BUSINESS COMPETENCE •	SATISFACTION RATING	IMPORTANCE RATING
1. Ease of doing business with BB&L:		
• contracting	1 2 3 4	1 2 3 4
• invoicing	1 2 3 4	1 2 3 4
• changing orders	1 2 3 4	1 2 3 4
• proposals	1 2 3 4	1 2 3 4
2. BB&L invoices are clear and accurate and provide adequate detail	1 2 3 4	1 2 3 4
3. BB&L invoices are received in a timely fashion	1 2 3 4	1 2 3 4

Are there other issues of BB&L's quality, service, and responsiveness you would like to comment on?

_____

_____

_____

		Yes	No
1.	Would you hire BB&L again?	☐	☐
2.	Would you recommend BB&L to someone inside of your company?	☐	☐
3.	Would you recommend BB&L to someone outside of your company?	☐	☐
4.	Would you like to speak to someone concerning your response?	☐	☐

If yes, anyone in particular? _____

_____ _____

Person Filling Out Form Date

_____ _____

Title Company

TECHNICAL REPORT

Construction and Testing of Floridan Aquifer Wells FB-3 & FB-4

Fort Pierce Utilities Authority
Fort Pierce, Florida

February 1996

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

185 N.W. Spanish River Boulevard, Suite 110
Boca Raton, Florida 33431-4230
(407) 750-3733

Table of Contents

1. Executive Summary

Two 12-inch wells (FB-3 and FB-4) were constructed for the Fort Pierce Utilities Authority (FPUA) during the last quarter of 1995. These two new wells are part of a four-well system (FB-1, FB-2, FB-3, and FB-4) which provide water from the Floridan aquifer to the FPUA Water Treatment Plant (See Figure 1). The new production wells are each designed to produce approximately 1.4 million gallons per day (mgd). The Floridan aquifer in this area is slightly saline, and water from these wells contains chloride concentrations that are slightly higher than Drinking Water Standards. Consequently, the wells will be used to provide water that will supplement the surficial well field supply, which is fresh water. In the future, the Floridan aquifer wells may be used to supply water to a desalination plant.

Step drawdown tests and geophysical logging were conducted at each well upon completion of construction. The step drawdown tests were conducted at each well to determine the well's water-producing ability (expressed as specific capacity) so pumping and transmission systems can be properly designed, and to obtain water quality data. Geophysical logging was conducted to confirm formations, identify specific water production zones, and establish water quality for the production zones.

Wells FB-3 and FB-4 were successfully constructed and should be capable of producing design flow rates.

The water produced by FB-3 and FB-4 appears to be of similar acceptable quality to existing wells FB-1 and FB-2. Chloride, sodium total dissolved solids and odor exceeded the respective Drinking Water Standard. All other parameters tested were below the maximum contaminant levels (MCL) established in the National Interim Primary Drinking Water Regulations (NIPDWR), the Secondary Drinking Water Regulations, and the USEPA/Florida Priority Pollutant List. Well FB-3 free-flows at approximately 575 gallons per minute (gpm), while FB-4 free-flows at approximately 670 gpm.

Plans for future Floridan aquifer wells should include and consider information obtained during the construction of wells FB-3 and FB-4. Well construction techniques utilized were particularly successful. Chloride, sodium and total dissolved solids concentrations in well water, as well as the static piezometric surface should be monitored on a periodic basis to establish any trends that may occur. This data should be used to modify production schedules, if appropriate, and to form long-term estimations of Floridan aquifer supply potential and future desalination treatment techniques.

1. Introduction

The intent of this report is to describe the purpose for the installation of Floridan Aquifer wells FB-3 and FB-4 as well as the processes used during installation. Both wells were installed to supplement the water supply for the City of Fort Pierce. Through a blending process of fresh water from surficial aquifer wells and the slightly brackish water from the upper region of the Floridan aquifer, the potential volume of potable water available to the city will be increased.

Section 2 of this report will describe the various techniques used in the installation of water production wells FB-3 and FB-4. Blasland, Bouck & Lee (BBL) used two drilling techniques during the installation of wells FB-3 and FB-4: mud rotary and reverse air. A brief description of each drilling technique and the stages of drilling where they were used is described. Also described are the three phases of construction for each well: steel surface casing, PVC inner casing, and open hole.

There are many factors that contribute to the success of a well.

There are many factors that contribute to the success of a well. Using borehole geophysical logging, BBL was able to measure these factors quantitatively for wells FB-3 and FB-4. Section 3 discusses each geophysical logging technique and the results obtained.

Section 4 describes the Regional Geology, and specifically the site geology formations that were encountered during the installation of FB-3 and FB-4. This information is critical in determining depth locations for the setting of the steel surface casing and inner PVC casing. Of particular note is the Avon Park Formation which is the water bearing unit for wells FB-3 and FB-4.

Section 5 presents a description of the site hydrogeology. A careful analysis of the hydrogeology was necessary during the installation of wells FB-3 and B-4 to ensure that the quality of the water obtained could be used for the blending process.

Section 6 summarizes the water quality characteristics of FB-3 and FB-4. Finally, BBL's conclusions about FB-3 and FB-4 and recommendations for future well construction are presented in Section 7.

2. Well Construction

2.1 General Construction Plan for Wells FB-3 and FB-4

Installation of FB-3 and FB-4 began on September 20, 1995 and was completed on November 16, 1995. The wells were installed using a Midway 1500 rotary drill rig, which was operated by a minimum of three Drilling Services (DSI) personnel at all times. From 0 to 580 feet below land surface (BLS), the wells were installed by the mud-rotary, direct-circulation technique. From 580 feet to the final depth of each well, the reverse air drilling technique was used. The wells consist of an outer steel casing, an inner PVC casing, and an open hole section. The South Florida Water Management District Well Construction Permits (#SF080795D for FB-3 and #SF080795E for FB-4) and well completion reports are included in Appendix A.

The general construction plan used for the construction of wells FB-3 and FB-4 was as follows:

1. Drill 26-inch borehole by mud rotary method to an approximately 120 feet depth. Collect formation samples continuously in 10-foot increments.

2. Select appropriate depth at which to install the 20-inch diameter steel casing (ASTM A-53 Grade B).

3. Install and pressure-grout the 20-inch steel casing at the selected depth.

4. Drill 19-inch borehole to a depth of approximately 500 feet, or until hard Floridan limestone is encountered. Collect formation samples continuously in ten-foot increments.

5. Install and pressure grout the 12-inch casing (Certainteed SDR 17 PVCCerta-Lock, ASTM Specification F-480) to a depth of approximately 500 feet, or until hard limestone is reached.

6. Proceed with drilling the 12-inch open borehole to a depth of approximately 900 feet or until water quality begins to degrade. Collect formation samples continuously in 10-foot increments. Collect water quality samples for chlorides, sulfates, pH, temperature, and conductivity every 60 feet or until a production zone is encountered.

7. Perform geophysical logging after the well reaches complete depth in order to locate water production zones, production water quality, and formation locations.

8. Conduct and calculate specific capacity and step drawdown tests when the well reaches total depth. Collect water samples for primary, secondary, and priority pollutant drinking water standard analysis.

9. Cap well.

2.2 Steel Surface Casing

Steel surface casing was installed to a depth of 121 feet for FB-4 and 123 feet for FB-3 to prevent formation collapse during the installation of the inner PVC casing. The steel surface casing, which is 20-inches in diameter with one-quarter-inch thick walls, was installed in the 26-inch diameter borehole. The borehole was drilled using the mud-rotary, direct circulation method, with a staged tricone drill bit. The drill cuttings were placed in a rolloff dumpster, hauled offsite by St. Lucie Waste Services, and disposed of at the St. Lucie County landfill.

Steel surface casing was installed to:

- *123 feet BLS at FB-3*
- *121 feet BLS at FB-4*

The surface casing was set into the borehole in three 42-foot sections. After casing installation, there was two to five feet of stick-up above land surface depending on the depth of casing setting. The joints were arc-welded together as each section was lowered into the borehole. To ensure that the casing would be straight in the borehole, centralizers were welded onto the steel casing in sets of three at 120 degree intervals, every 60 feet starting from the bottom. Two-inch diameter PVC pipe was inserted inside of the casing to the bottom, and then used to pressure-grout the casing from bottom to land surface in one stage. ASTM C150 Type I cement was used with no curing additives. Following the curing of the cement (minimum of 8 hours), the plug was drilled through with a 19-inch diameter staged tricone drill bit to begin installation of the PVC inner casing.

2.3 PVC Inner Casing

A nominal 19-inch diameter staged tricone drill bit was used to extend the borehole from the bottom of the steel casing to the top of the Floridan aquifer, which occurs at approximately 500 feet below land surface. Once the top of the Floridan aquifer was encountered, the hole was advanced carefully into the rock approximately 1 to 3 feet. This allowed a precise casing set, which sealed off the clay confining strata completely, yet did not case out the upper most production zone of the Floridan aquifer. The drill cuttings were placed in a rolloff dumpster and hauled offsite by St. Lucie Waste Services and disposed of at the St. Lucie County landfill.

The inner casing consisted of Certainteed 12-inch diameter Certa-Lok SDR 17 PVC well casing, 20 feet in length, with a casing wall thickness was 0.750-inches.

Twenty-six sections were installed in each well. The sections were connected as they were lowered into the borehole by the insertion of a plastic spline through couplings located on the end of each section of pipe. The spline acts to hold the pipe in the coupling. To ensure that the casing would be set straight in the borehole, centralizers were strapped with 0.750-inch stainless steel banding at 120-degree intervals around the PVC pipe, every 60-feet starting from the bottom. For both wells, 503 feet of inner casing was installed. Inner casing was installed between October 2 and 3, 1995 at well FB-4, and between November 1 and 2, 1995 at well FB-3.

For the primary grouting stages, a PVC header was attached to the top of the casing and secured to the drilling rig to stabilize the casing in the borehole during grouting. The header was equipped with a pressure gauge so grout fill-up could be tracked.

The inner casing for FB-3 and FB-4 was pressure-grouted from 503 feet to a depth of approximately 100 feet BLS using the same technique and cement specifications used for the surface casing. During grouting of FB-4, the grout appeared to flash (i.e., set up quickly) at the end of the grouting stage. Although this did not affect the quality of the grouting, a cement curing inhibitor (WRC-79) was used for the first stage of pressure grouting for FB-3 to prevent flashing. The upper 100 feet was not grouted on the same day to avoid excessive heat of hydration which could damage the PVC casing. The remainder of the casing was grouted on the following day following the primary grouting by lowering a two-inch diameter PVC tremie line to a depth of approximately 100 feet BLS in the annular space between the inner and outer casings. Mud returns were observed throughout the grouting at both wells.

Following curing of the second stage, the cement plug inside the PVC casing was drilled out using a nominal 12-inch diameter tricone bit, which was also used to drill the open borehole in the Floridan aquifer. Once the drill bit passed the cement plug and entered the Floridan aquifer, drilling with direct mud rotary circulation continued until artesian conditions were encountered. At that point, the drilling method changed from direct mud rotary to the reverse air circulation method. Reverse air drilling, which creates a suction lift through the drill bit, allows water quality samples to be collected and drill cuttings to be brought rapidly to the surface, and creates low pressure in the borehole, thus developing the well as drilling proceeds. This method also provides a more rapid drilling rate in limestone than does mud rotary.

2.4 Open Borehole

The open borehole extended from:

- *503 to 890 feet BLS at FB-3*
- *503 to 890 feet BLS at FB-4*

The open borehole section of the FB-3 and FB-4 was drilled using the reverse air circulation method into the upper Floridan aquifer extending from 503 to 890 feet BLS. A nominal 12-inch diameter tricone bit was used for this portion of the drilling.

The drill cuttings and formation water produced during drilling were directed into a rolloff dumpster, which was used to allow sediment to settle out of suspension. After the material settled to the bottom of the dumpster, the water was pumped into the storm drain, which was lined with a silt screen to catch any additional material present in the effluent. The storm sewer drain ran east to South 25th Street and then south to a drainage canal along Georgia Avenue, behind the FPUA Water Plant.

- *FB-3 free-flowed at 575 gpm*
- *FB-4 free-flowed at 670 gpm*

As drilling progressed, samples were taken every 60 feet or whenever a production zone was encountered (evident by an increase in flow). The first sampling point for FB-4 was 580 feet BLS because this was the first area where the well flowed naturally (artesian conditions). As drilling progressed, samples were taken approximately every 20 feet and analyzed for temperature, pH, conductivity, chlorides, and sulfates. This sampling program was designed to detect undesirable increases in salinity, which commonly increases with depth. The various sampling intervals and analytical results are presented in Table 1 for FB-4, and Table 2 for FB-3. At the end of the open hole drilling, FB-3 was estimated to be free-flowing

at approximately 575 gpm and FB-4 at approximately 670 gpm using flow estimation procedures provided by Driscoll (1986).

TABLE 1

FLORIDAN AQUIFER WELL FB-4
WELL CONSTRUCTION WATER QUALITY RESULTS
FORT PIERCE UTILITIES AUTHORITY

Date Analyzed by Laboratory	Time	Depth (ft. BLS)	pH	Temperature (oC)*	Conductivity[1] (umhos/cm)	Chloride[1] (mg/L)	Sulfates[1] (mg/L)
10/06/95	12:50	580	8.83	26.9	13.2	230	294
10/13/95	15:12	580[2]	7.43	26.0	1450	274	225
10/06/95	16:56	640	7.50	20.7	1572	250	356
10/13/95 [2]	15:00	680[2]	7.41	27.0	1450	308	273
10/09/95	18:20	700	7.60	20.9	1496	260	265
10/10/95	10:23	760	7.60	22.7	1414	265	232
10/13/95 [2]	14:37	760[2]	7.40	27.5	1448	300	263
10/10/95	12:15	780	7.70	22.3	1370	265	200
10/10/95	15:08	820	7.70	25.0	1360	265	185
10/10/95	16:52	840	7.00	24.9	1520	330	188
10/11/95	12:00	860	7.64	28.0	1502	323	222
10/11/95	13:11	880	7.60	25.4	1502	320	166
10/13/95 [2]	14:15	889[2]	7.36	28.0	1385	295	248
10/11/95	15:03	890	7.65	25.6	1485	320	278

[1]Analyzed by FPUA water treatment plant laboratory
[2]Point sample taken by depth sampler during geophysical logging
BLS - Below Land Surface

mg/L - Milligrams per liter
umhos/cm - micromhos per centimeter
* - Obtained by BBL personnel in the field

TABLE 2

FLORIDAN AQUIFER WELL FB-3
WELL CONSTRUCTION WATER QUALITY RESULTS
FORT PIERCE UTILITIES AUTHORITY

Date Analyzed by Laboratory	Time	Depth (ft. BLS)	pH	Temperature (oC)*	Conductivity[1] (umhos/cm)	Chloride[1] (mg/L)	Sulfates[1] (mg/L)
11/14/95	13:56	560	7.30	24.5	1434	284	162
11/08/95	08:55	584	8.35	25.0	1502	250	284
11/08/95	11:25	640	8.28	25.2	1512	266	258
11/14/95 [2]	13:44	650[2]	7.30	24.5	1420	288	162
11/08/95	14:50	700	7.74	25.5	1528	260	247
11/09/95	08:30	760	7.81	23.8	1418	272	174
11/09/95	09:58	784	7.78	24.8	1390	268	221
11/09/95	11:56	821	7.80	25.0	1390	264	198
11/14/95 [2]	13:30	830[2]	7.20	24.5	1430	293	140
11/09/95	13:06	841	7.68	25.0	1394	268	209
11/09/95	14:18	862	7.65	25.0	1470	298	158
11/09/95	15:23	881	7.71	25.5	1474	300	296
11/10/95	10:86	890	7.49	25.4	1364	262	200
11/14/95 [2]	13:17	890[2]	7.40	24.5	1360	254	174

[1]Analyzed by FPUA water treatment plant laboratory
[2]Point sample taken by depth sampler during geophysical logging
BLS - Below Land Surface

mg/L - Milligrams per liter
umhos/cm - micromhos per centimeter
* - Obtained by BBL personnel in the field

3. Well Characteristics Analyses

3.1 Borehole Geophysical Logging

Borehole geophysical well logging is the measurement of physical properties that can be interpreted in terms of the hydrogeologic characteristics of the strata penetrated by the well. Geophysical logging surveys conducted on FB-3 and FB-4 consisted of:

- electric - spontaneous potential resistivity
- natural gamma ray
- borehole temperature while flowing
- fluid resistivity while flowing
- caliper
- borehole fluid velocity

All logs were run under natural, artesian flowing conditions.

3.1.1 Description of Geophysical Methods

An electric log is a record of the apparent resistivities of the subsurface formations and the spontaneous potentials generated in the borehole. Both are plotted against depth. These two properties are related to the lithology and to the quality of water found within each formation.

Natural gamma ray logging measures the emission of gamma rays from certain very low level radioactive elements that occur in very small, varying amounts in different lithologies. By measuring the emitted radiation, it is possible to identify and correlate subsurface formations penetrated by the well. Typically, due to the presence of phosphoritic material, clay formations produce a noticeably higher amount of gamma ray emissions, which in turn are associated with zones of low permeability.

The temperature log is a record of water temperature within the borehole versus its depth. Temperature logs run during flowing conditions may be used to locate zones of water entry into the borehole, to locate casing cement based on the heat of hydration, to determine the direction of borehole flow, and to identify geothermal gradients. Production zones may be identified from a temperature log if the producing zones water temperature is measurably different from the water upgradient in the borehole.

The fluid resistivity log run under flowing conditions is used to identify zones of water entry into the borehole. Similar to the temperature log, different production zones frequently posses different water quality which can be detected by the fluid resistivity log.

The caliper log is a record of the wells inside diameter versus depth. Caliper logs locate cavities, confirm casing diameters and lengths, and are necessary for quantitative interpretation of fluid velocity logs. Fluid velocity or flowmeter logs measure vertical flow of water in the well. Flows at various depths are measured by means of a propeller flowmeter that is lowered into the well at a known, constant

velocity. Data obtained from the fluid velocity logs are used to calculate the quantities of water released from, or accepted by, an aquifer at different production zones.

3.1.2 Results of Geophysical Logging

Geophysical logging is an important component of the proper development of the Floridan aquifer at Fort Pierce. The techniques used for FB-3 and FB-4 allowed for the optimization of flow, which is directly related to the quantity of water which can ultimately be developed, as well as optimization of water quality which directly impacts treatment costs. The geophysical logs and well construction details for FB-3 and FB-4 are illustrated on Figures 2 and 3. A complete set of the geophysical logs is included in Appendix B.

The gamma ray log was run to correlate stratigraphy with that recorded in the field from the well cuttings. This log was also useful in correlating geologic and geophysical logs from FB-2. A zone of high gamma ray emission occurs at the base of the Hawthorn formation. Underlying the lower Hawthorne formation beds is the Ocala Group, an Eocene limestone unit, which indicates the top of the Floridan aquifer. The Ocala formation is denoted by a marked decrease in gamma ray emission. This decrease indicates a formation change from a predominantly clay unit to a limestone unit, as was observed in the well cuttings.

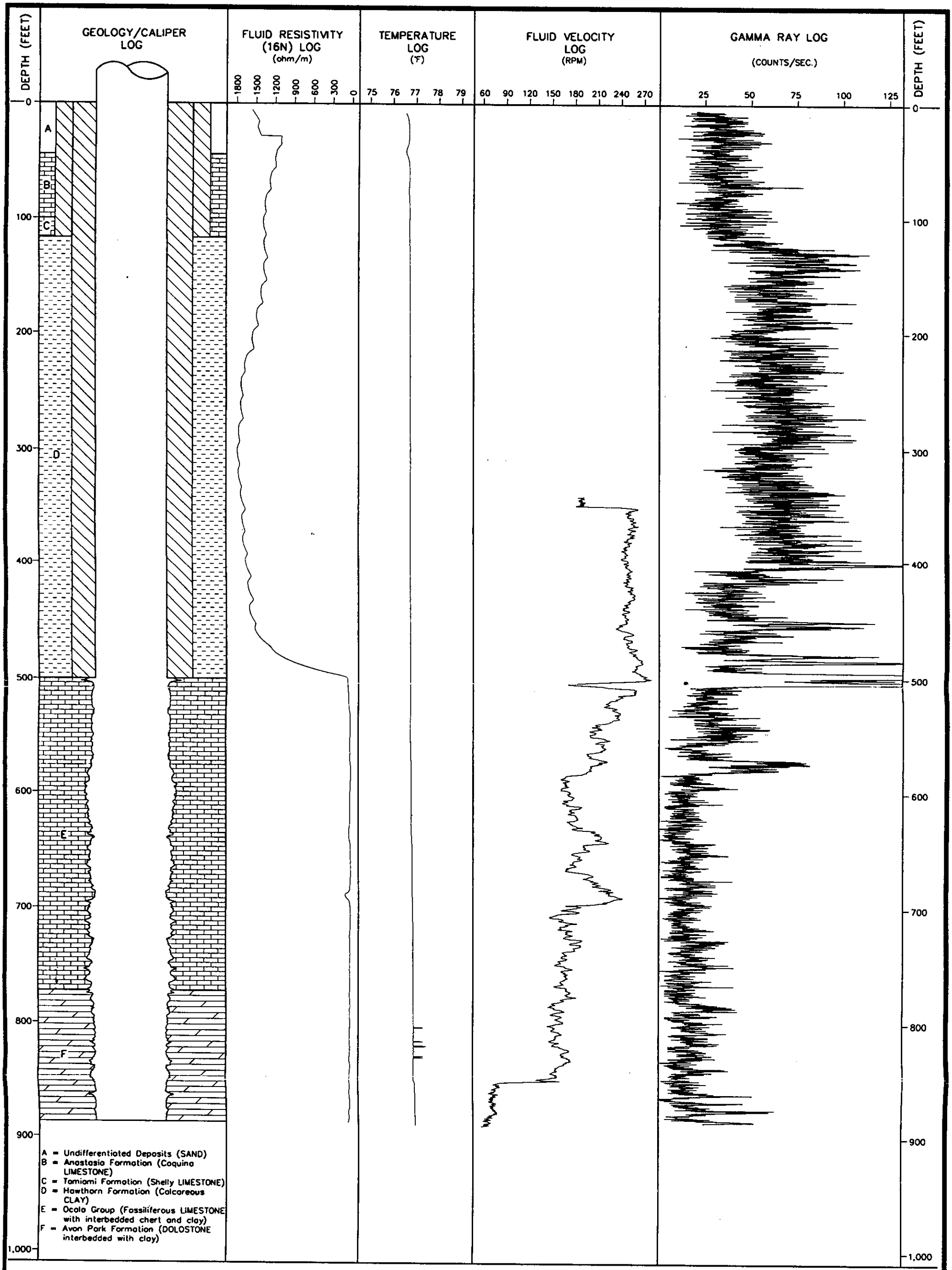
The temperature log shows little variation throughout the borehole. The lack of variation is due to the large percentage of water entering at the bottom of the borehole. The temperature changed very little throughout the borehole because the major component of well flow originates near the bottom of the borehole and blends rapidly with water entering from shallower depths.

Four major production zones were identified at both wells.

FB-3
- *640-700 feet BLS*
- *760-784 feet BLS*
- *841-862 feet BLS*
- *880-890 feet BLS*

FB-4
- *580-630 feet BLS*
- *640-700 feet BLS*
- *760-840 feet BLS*
- *860-890 feet BLS*

The fluid resistivity log indicates little change in fluid resistivity for reasons to those similar discussed for the temperature log results. The log results correspond to the field resistivity measurements collected during the reverse air drilling phase, which consistently ranged from 1300 to 1600 micromhos/cm. The caliper log is best used in conjunction with the flow log to determine production zones. FB-3 and FB-4 have fairly uniform borehole diameters. The diameter of the borehole at the interface of the PVC inner casing and the limestone appears to be the largest anomaly of the borehole. The remainder of the borehole from 505 to 770 feet (Ocala Group) is relatively uniform, with areas of minor variations in diameter. These minor variations are expected because the drilling and development process can loosen and remove sections of rock material from the outer edge of the borehole. The borehole diameter narrows and shows fewer variations from 770 to 890 feet (Avon Park Formation) due to the increased hardness of the formation. This narrowing of the borehole correlates with the flow increase experienced in this section of the borehole.



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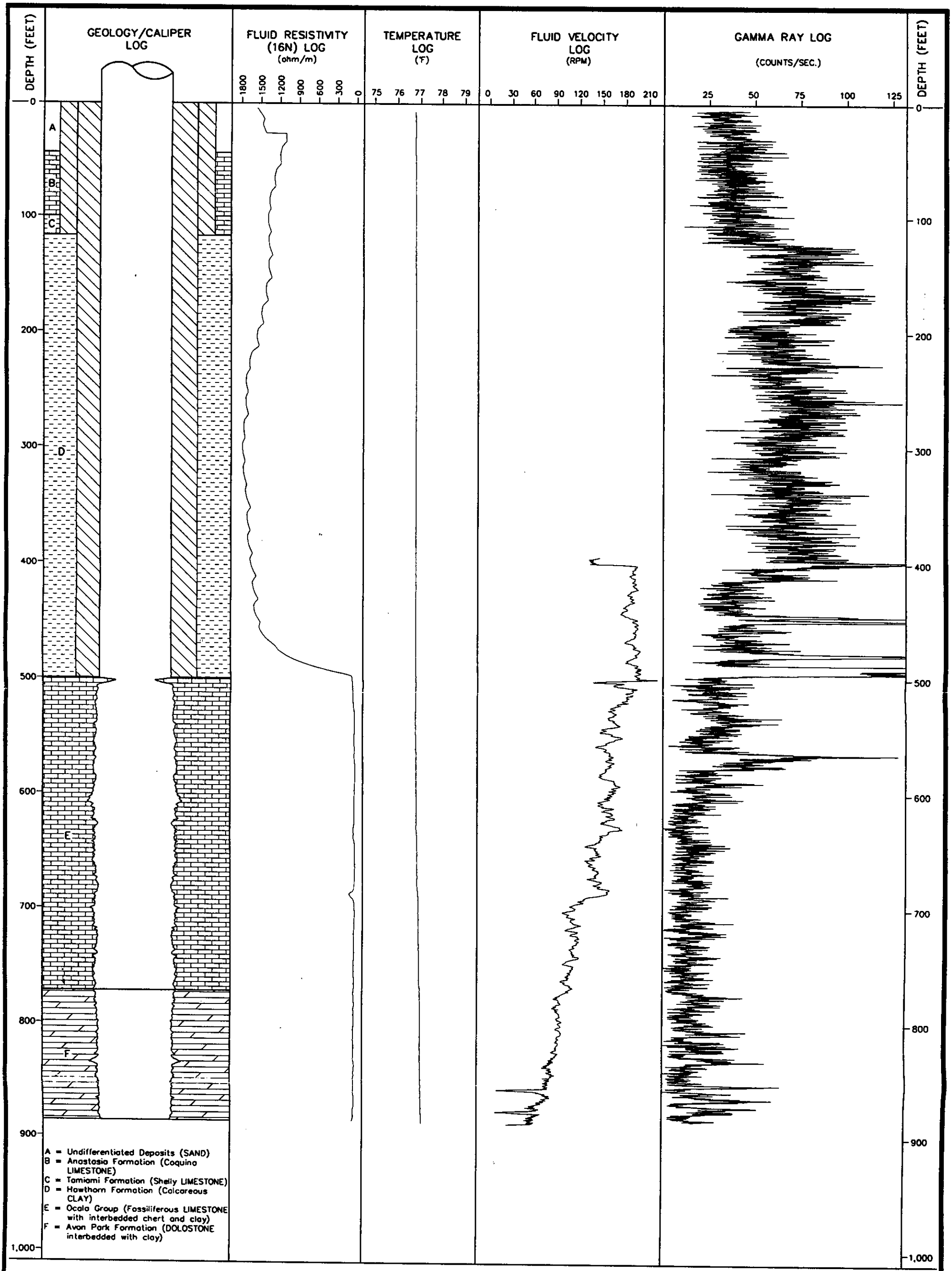
49904005/49904N01.DWG

FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

GEOPHYSICAL LOGGING WELL SUMMARY FB-3

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

FIGURE 2



VERTICAL SCALE:
0 80' 160'

FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

GEOPHYSICAL LOGGING WELL SUMMARY FB-4

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

FIGURE 3

FILE NO: 499.04
PCP: DJB/MVB
12/18/95 S4-PGL.DWG
49904005/49904N02.DWG

The fluid velocity log illustrates the approximate location of four major producing zones for FB-3 and FB-4, which are (feet BLS).

FB-3	FB-4
640 to 700	580 to 630
760 to 784	640 to 700
841 to 862	760 to 840
880 to 890	860 to 890

The production zones are indicated by significant increases in borehole flow rate.

3.2 Step Drawdown Tests

On October 19, 1995 and November 16, 1995, step drawdown tests were performed on FB-4 and FB-3, respectively. The tests were run to determine the specific capacities of each well and to provide information for proper pump design and optimal pumping rates. Three steps were run during the test for FB-4: step 0 at 444 gpm; step 1 at 680 gpm; and step 2 at 1007 gpm. Each of the first two steps were run for approximately 120 minutes, while the third step was run for 160 minutes. After step 2 was completed, water level recovery data was collected until static conditions were re-established (93 minutes). Three steps were also run during the test for FB-3: step 0 at 421 gpm; step 1 at 596; and step 2 at 892 gpm. Each of the three steps was run for 120 minutes. After step 2 was completed, water level recovery data was collected until static conditions were re-established (116 minutes). Water levels were recorded with an In-Situ Hermit 2000 data logger. The well performance characteristics can be seen in Table 3. The results of each step and the recovery data are presented in Appendix C.

The specific capacity values calculated indicate that the wells are productive and lose little efficiency with increased well turbulence. As flow and drawdown increase, the specific capacity will decrease. This is evident in the fact that water levels in both wells rapidly stabilized after pumping rate steps.

TABLE 3

FLORIDAN AQUIFER WELL FB-3 AND FB-4
WELL PERFORMANCE CHARACTERISTICS
FORT PIERCE UTILITIES AUTHORITY

Well	Date	Test Step (#)	Pump Rate (gpm)	Maximum Drawdown (ft.)	Specific Capacity (gpm/ft.)	Well Efficiency (%)
FB-3	11/16/95	0	421	10.00	42	79
FB-3	11/16/95	1	596	16.50	36	68
FB-3	11/16/95	2	892	27.00	33	62
FB-4	11/19/95	0	444	15.28	29	79
FB-4	11/19/95	1	680	25.28	27	70
FB-4	11/19/95	2	1007	42.31	24	63

4. Geology

4.1 Regional Geology

The regional geology of Southeastern Florida consists primarily of interlayered sands, limestone, and clay formations. These formations were deposited primarily in a shallow sea environment.

The upper 100 to 200 feet consists of interlayered sand, sandy limestone, limestone and coquina limestone. Beneath that is the Hawthorn Formation, which consists of approximately 400 feet of calcareous clay. Underlying the clay is several thousand feet of carbonates (limestones and dolostones) comprising the Lake City, Avon Park, Ocala, and Suwannee Formations.

4.2 Site Geology

The major stratigraphic units encountered in FB-3 and FB-4 are presented in Figure 4. The units encountered were the Avon Park Formation, Ocala Group, Hawthorn Formation, Tamiami Formation, Anastasia Formation, and undifferentiated deposits which range in age from middle Eocene to recent. The units are described below in order of deposition, from oldest to youngest. Lithologic logs for FB-3 and FB-4 can be found in Appendix F.

4.2.1 Avon Park Formation

The Avon Park Formation is of middle to late Eocene age (approximately 45 million years ago). It was encountered between 770 and 880 feet BLS. At FB-3 and FB-4, the Avon Park consists of white/gray/tan limestone and dolostone with interbedded clay. Various shell fragments occur continuously between 770 and 840 feet BLS with no dolostone. Below 840 feet BLS there are little or no shell fragments and dolostone is interbedded with limestone from 850 to 880 feet BLS.

4.2.2 Ocala Group

The Ocala Group is of late Eocene age (approximately 40 million years ago). It was encountered between 500 and 770 feet BLS. At FB-3 and FB-4, the Ocala Group consists primarily of gray/tan fossiliferous limestone. Interbedded throughout the Ocala Group are minor layers of chert and clay. Also found scattered throughout the formation are sharks teeth and coral fragments. Black phosphatic nodules occur near the top of the formation. Some of the fossils present are indistinguishable shell fragments, however, many of the shells are distinguishable as Lepidocyclina ocalana. Also present are Heterostegina ocalana and Nummulites ocalanus. Dolostone occurs in minor amounts between 590 and 700 feet BLS.

4.2.3 Hawthorn Formation

The Hawthorn formation is of Miocene age (approximately 15 million years ago). It was encountered between 120 and 500 feet BLS. At FB-3 and FB-4, it consists predominantly of green calcareous clay with minor shell fragments intermixed. From 360 to 450 feet BLS, the clay contains varying amounts of interbedded chert, limestone/dolostone and black phosphatic nodules. Chert is also interbedded between 450 and 500 feet BLS.

4.2.4 Tamiami Formation

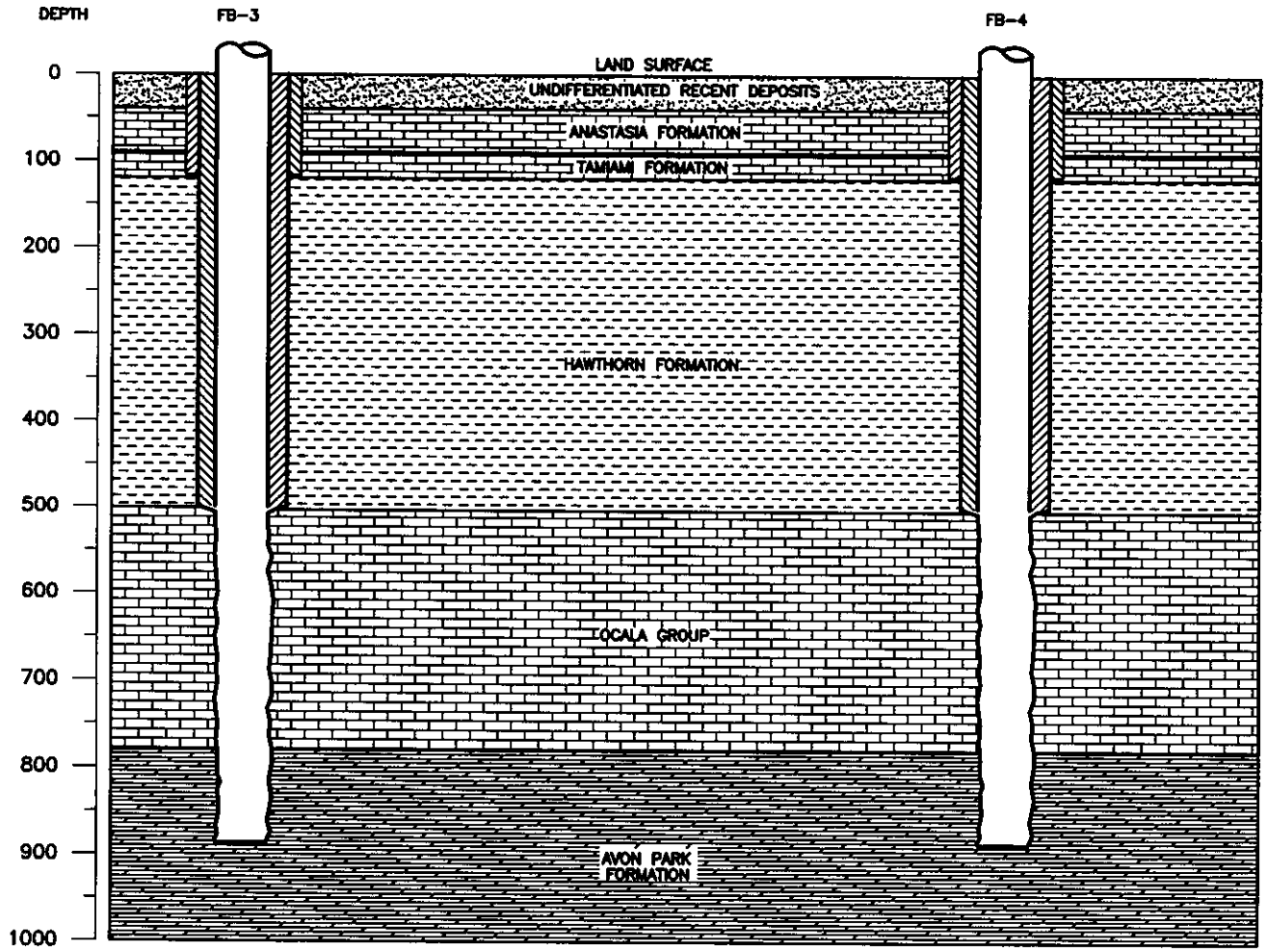
The Tamiami formation is of Pliocene age (approximately 4 million years ago). It was encountered between 90 and 120 feet. At FB-3 and FB-4, it consists of gray/tan silty, shelly limestone.

4.2.5 Anastasia Formation

The Anastasia formation is of Pleistocene age (approximately 1 million years ago). It was encountered between 40 and 90 feet BLS. At FB-3 and FB-4, it consists of gray/tan silty coquina interbedded with varying percentages of limestone.

4.2.6 Undifferentiated Recent Deposits

The upper 40 feet of FB-3 and FB-4 consist of fine to medium grained, moderately sorted, angular to sub-angular, rounded to sub-rounded quartzose sand. it has been deposited during the Holocene (the past 10,000 years).



FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

MAJOR STRATIGRAPHIC UNITS FB-3 AND FB-4

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

FIGURE 4

2.12.96 boc-54 APD
499\04\49904 005 DWG

5. Hydrogeology

5.1 Regional Hydrogeology

The regional hydrogeology consists of three units. The Floridan Aquifer System, the Intermediate Confining System, and the Surficial Aquifer System. The Floridan aquifer as defined by Parker, et al. (1955), includes all or parts of the Lake City Limestone, Avon Park Limestone, Ocala Group, Suwannee Limestone, and permeable parts of the Hawthorne Formation that are in hydrologic contact with the rest of the aquifer.

The terminology used in this report coincides with that of the Florida Geological Survey Special Publication No. 28 on Hydrogeological Units of Florida (1986). In this publication, the Floridan aquifer system is defined as a thick carbonate sequence which includes all or part of the Paleocene and early Miocene Series and functions regionally as a water-yielding hydraulic unit. The top of the aquifer system coincides with the top of the Suwannee Limestone, where present, or the top of the Ocala Group. The publication also allows for the designation of one or more aquifers within the Floridan aquifer system based on vertical variations in water bearing properties.

5.1.1 Upper Floridan Aquifer

The occurrence of a less permeable carbonate unit of sub-regional extent found particularly in south Florida separates the system into the two aquifers. The less permeable units may be very leaky to virtually non-leaky, depending upon the lithologic character of the rock comprising the unit (Miller, 1986). Meyer (1989) describes the Upper Floridan aquifer in southern Florida as consisting chiefly of permeable zones in the Tampa, Suwannee, Ocala Limestone and the upper part of the Avon Park Formation. The ground water is brackish, and the salinity generally increases with increasing depth and with distance downgradient and southward from central Florida.

The most significant ground-water movement occurs at or near the top of each formation. Ground-water movement is generally southward from the area of highest head near Polk City in central Florida to the Gulf of Mexico and to the Atlantic Ocean.

5.1.2 Intermediate Confining Unit

Overlying the Upper Floridan aquifer is a thick sequence of clastic rocks of much lower permeability. The confining unit is up to 700 feet thick (400 feet locally) and retards the vertical movement of water between the surficial aquifer and the Floridan aquifer systems. An additional benefit of this thick confining unit is that contaminants found in the surficial aquifer cannot migrate to the Upper Floridan aquifer. The low permeability beds are Miocene in age and consist primarily of clays and clayey sands of the Hawthorn formation.

5.1.3 Surficial Aquifer System

A surficial aquifer, which contains water under confined conditions is present throughout the region. The surficial aquifer in the region is comprised of a number of Plio-Pleistocene aged Units. These vary in thickness from 0 to greater than 200 feet thick. The bottom of the surficial aquifer is denoted by the presence of fine grained clastic material of Miocene age.

5.2 Site Hydrogeology

The hydrogeology of the area consists of three units, the upper Floridan aquifer, the intermediate Hawthorn confining formation, and the surficial aquifer. The units are described below in order of deposition, from oldest to youngest.

5.2.1 Floridan Aquifer System

The Floridan artesian aquifer is up to 3,000 feet thick in this region. The aquifer is highly productive, but water quality degrades with depth. FB-3 and FB-4 were drilled 380 feet into the upper Floridan aquifer, which contains the highest quality water in the aquifer. The water production zones in the Floridan aquifer are characteristically narrow zones and occur at formation contacts known as non-conformities. Weathering processes at the tops of formations creates a secondary permeability which often produce highly transmissive zones of narrow thickness relative to overlying and underlying strata, which are much lower in permeability. Well FB-3 produces the majority of its water from four zones, namely:

- 640 to 700
- 760 to 784
- 841 to 862
- 880 to 890

Well FB-4 produces the majority of its water from four zones, namely:

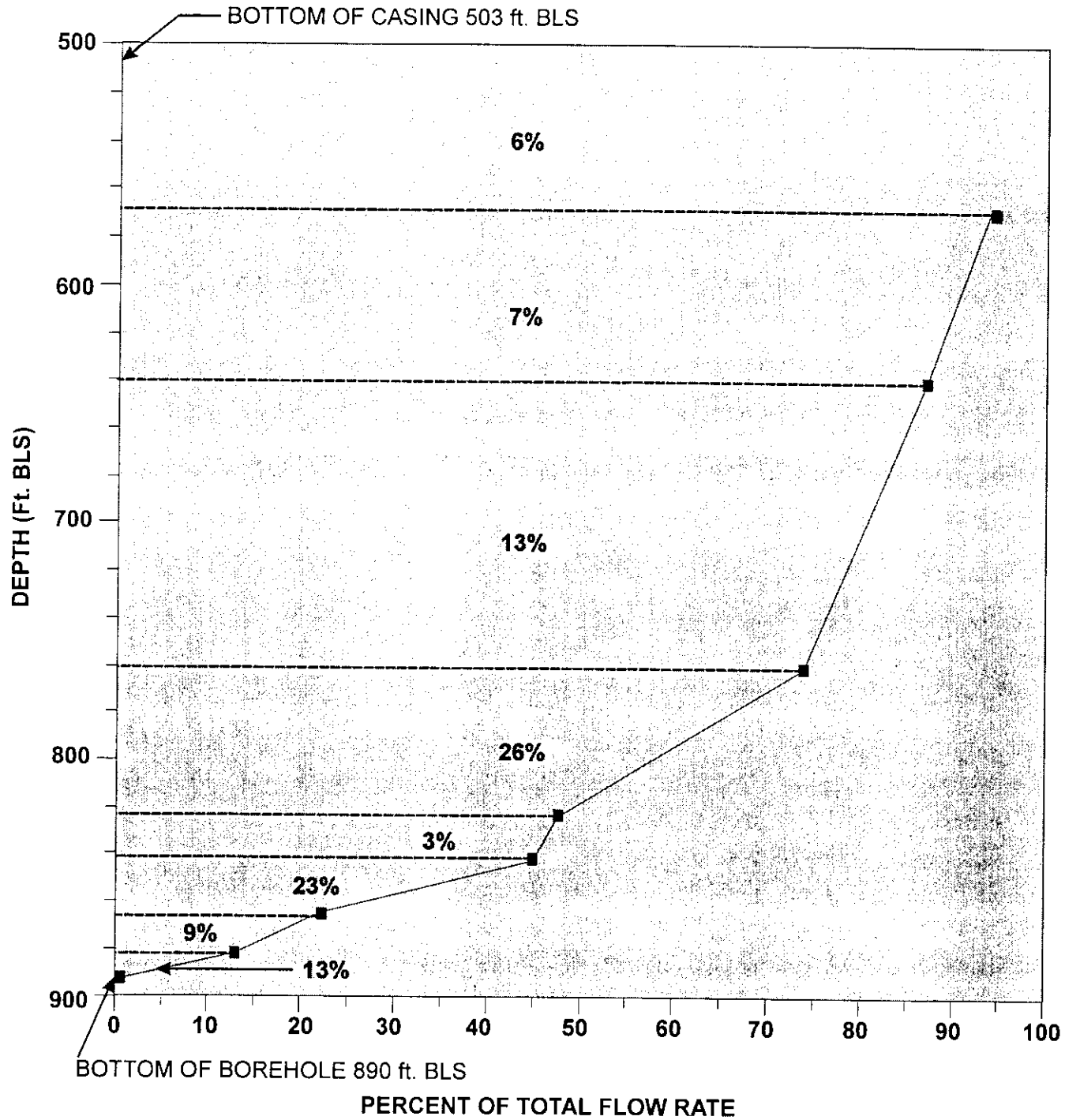
- 580 to 630
- 640 to 700
- 760 to 840
- 860 to 890

Approximately 75 percent of the total flow from FB-3 originates from four production zones, which comprises just 30 percent of the open borehole.

Approximately 75 percent of the total flow from FB-3 originates from these zones, which comprises just 30 percent of the well's open hole length of 387 feet (See Figure 5). Well FB-4 produces approximately 85 percent of its water from the four major production zones, which comprises 60 percent of the well's open hole length of 387 feet (See Figure 6).

Approximately 85 percent of the total flow from FB-4 originates from four production zones, which comprises 60 percent of the open borehole.

The specific capacity of a production well drilled into the Floridan aquifer can vary significantly from well to well due to natural variations of the producing zones (i.e. formation contacts). At FB-3 the specific capacity based on the step drawdown test was 36 gpm/ft at 596 gpm. The specific capacity of FB-4 based on the step drawdown test is 27 gpm/ft at 680 gpm. A complete listing of the specific capacities based on pumping rates can be seen in Table 1. It is difficult to estimate transmissivity, storativity, or leakance for Well FB-3 and FB-4 since a pumping test was not performed. The step drawdown test does not adequately stress the aquifer to the point that valuable information regarding its characteristics can be obtained. Any attempt to estimate additional aquifer characteristics from a step drawdown would not be scientifically sound. The step drawdown test calculations and formulas for this report can be seen in Appendix D.



NOTE: Percentages listed indicate the percent of the total flow provided by the specific interval. For example, 6% of the total flow was provided by the interval between 503 and 570 feet BLS.

FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

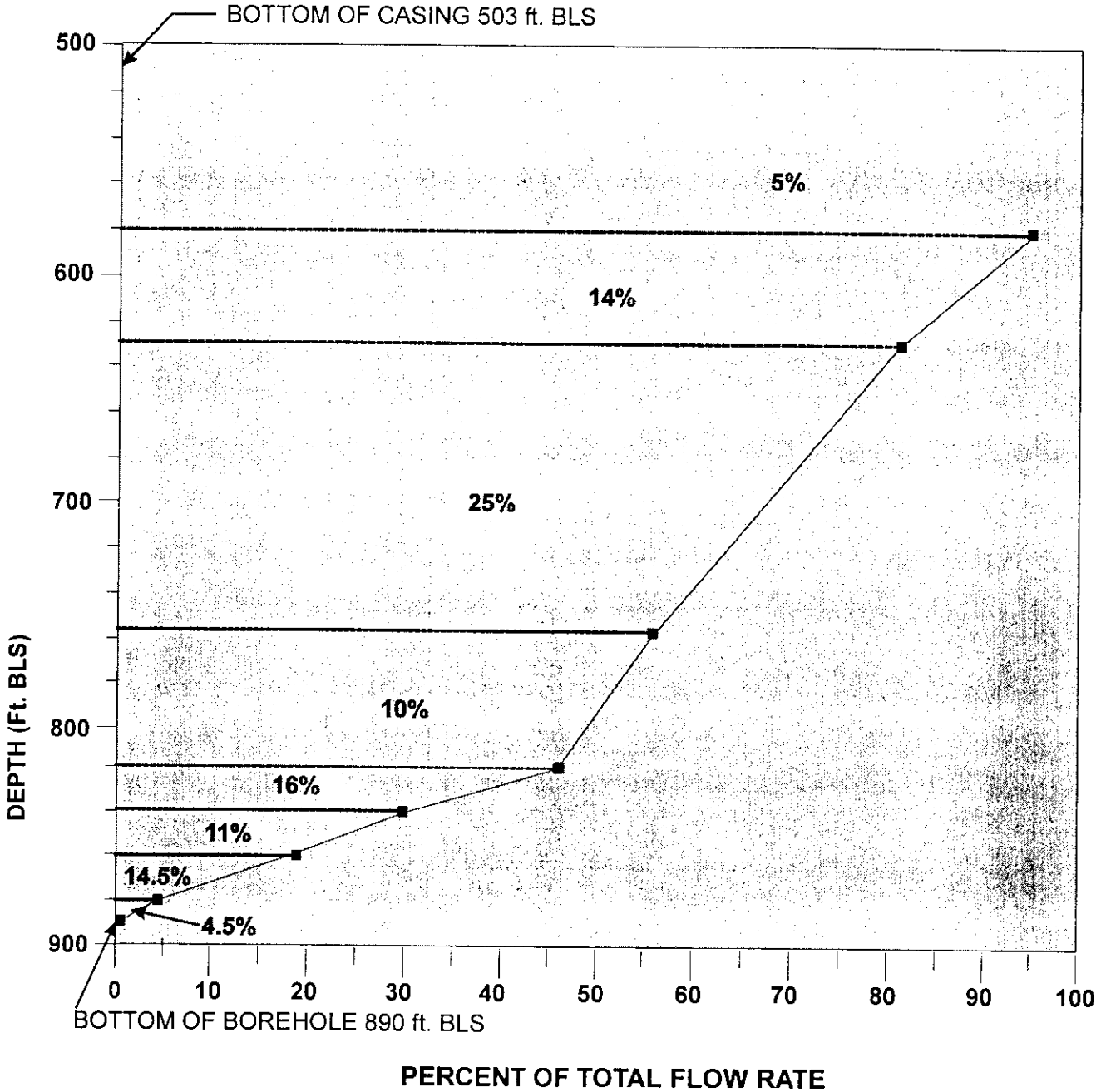
WELL CONSTRUCTION

PERCENT FLOW CONTRIBUTION
FB-3

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

FIGURE **5**

1.16.96 (54) APD
499\04\49904 02a CDR



NOTE: Percentages listed indicate the percent of the total flow provided by the specific interval. For example, 5% of the total flow was provided by the interval between 503 and 570 feet BLS.

FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

WELL CONSTRUCTION

PERCENT FLOW CONTRIBUTION
FB-4

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 6

1 16 96 (54) APD
499\04\49904 01a CDR

5.2.2 Intermediate Confining Unit

The Hawthorn clay formation separates the Floridan aquifer and surficial aquifers, and is known as the Floridan Aquiclude. Due to its thickness (380 feet at FB-3 and FB-4) and low permeability (several orders of magnitude lower than the aquifer), the formation serves as a confining unit between the two aquifers. Due to its low permeability, the Hawthorn formation excludes the movement of water from the surficial aquifer to the Floridan aquifer, thus protecting the Floridan aquifer from surface sources of contamination.

5.2.3 Surficial Aquifer System

The surficial aquifer contains an upper sand unit and a lower, highly transmissive sand and shell zone which is used extensively for private and municipal production wells. The FPUA develops most of its present water supply from this aquifer.

6. Water Quality

6.1 General Characteristics

The water quality of the Floridan aquifer generally worsens with depth. Therefore, it is necessary to periodically monitor water quality during the installation of a Floridan well. Water quality was monitored at least every 60 feet during the installation of FB-3 and FB-4. Water quality was also monitored during the step-drawdown test.

Water-quality parameters analyzed in the field consisted of pH and temperature. Water samples collected for chlorides, sulfates, and conductivity analysis were delivered to the FPUA water plant laboratory. Analyses conducted for primary and secondary drinking water standards were performed by Envirometrics Incorporated at the request of FPUA. The laboratory analytical results from this sampling can be found in Appendix E.

6.2 Water Construction Water Quality

As drilling progressed in the Floridan aquifer, water quality was monitored every 60 feet from 580 feet to 820 feet BLS, and every 20 feet thereafter. Water samples were collected form the reverse air discharge pipe and analyzed for pH, temperature, conductivity, chlorides, and sulfates. Drilling was stopped for 5 to 10 minutes at each sampling point to allow the well to clear, after which time a representative sample was obtained from each depth.

Water quality did not vary significantly with depth at either well.

The water quality results (Tables 1 and 2) indicated that water quality did not vary significantly with depth in FB-3 and FB-4. The range of values recorded for pH, temperature, and conductivity in FB-3 were 7.49 to 8.35, 23.8°C to 25.5°C, and 1364 to 1528 umhos/cm respectively. Chloride concentrations ranged from 250 to 300 mg/l, and sulfates ranged from 158 to 296 mg/l. Graphs showing chloride concentrations with depth for FB-3 and FB-4 are shown in Figures 7 and 8. The range of values recorded for pH, temperature, and conductivity in FB-4 were 7.00 to 7.70, 20.7°C to 25.6° C, and 1312 to 1572 umhos/cm respectively. Chloride concentrations ranged from 230 to 330 mg/L, and sulfates were 166 to 356 mg/L. On October 13, 1995 and November 16, 1995 water quality grab samples were obtained during the geophysical logging of each well and analyzed for the same parameters as during the open hole construction. Results for these samples are also included in Tables 1 and 2.

Water samples from both wells were analyzed for Primary and Secondary Drinking Water Standards.

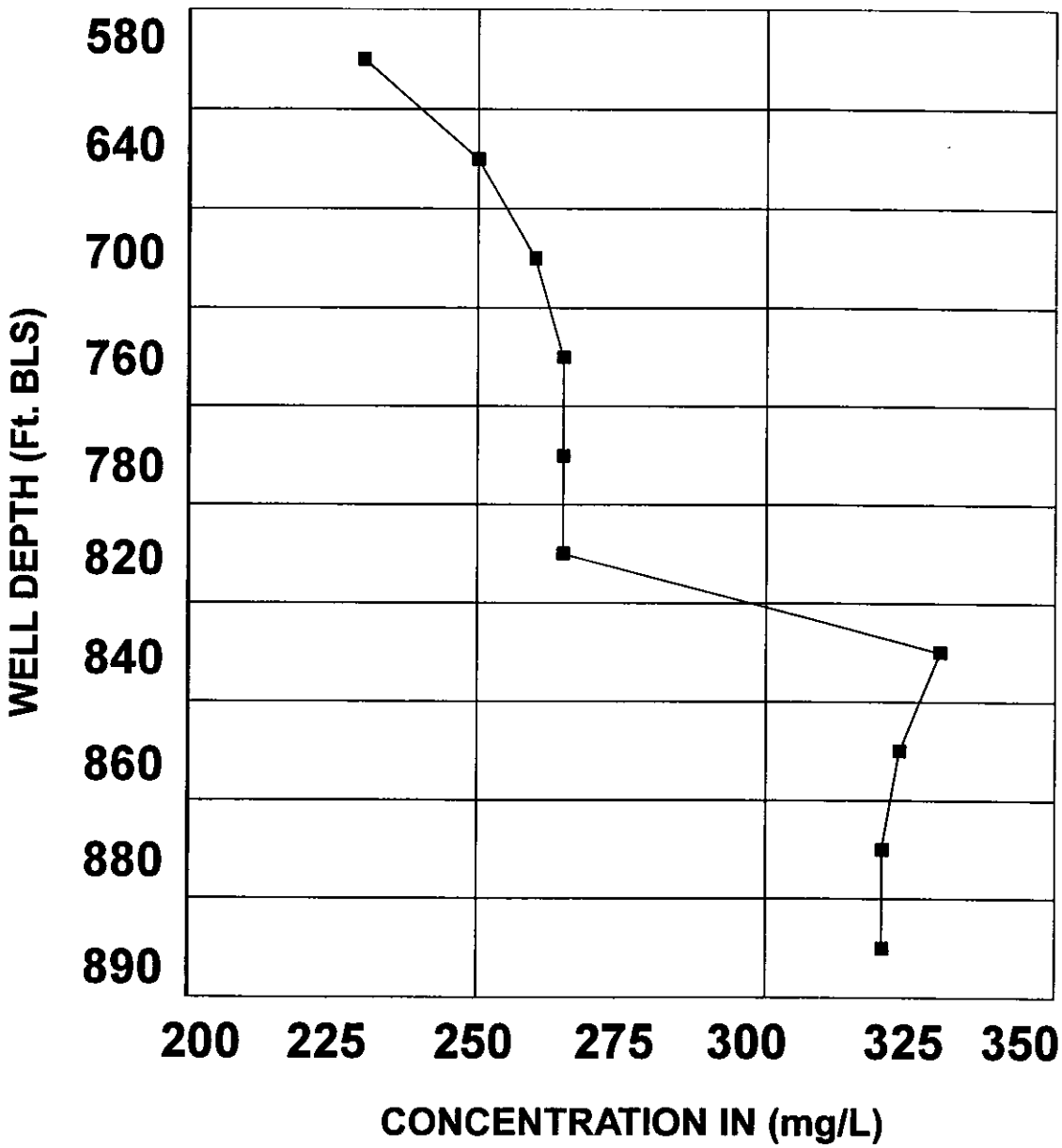
Samples were obtained for analysis of Primary and Secondary Drinking Water Standards. All of the constituents tested were below the Maximum Contaminant Levels (MCL) as published in DEP 17-550.310 (primary) and DEP 15-550.320 (secondary) with the exception of those listed in Table 4. Accordingly, water from FB-3 and FB-4 should be used for blending with fresh water or treated to remove sodium, chloride, and totally dissolved solids.

TABLE 4

FLORIDAN AQUIFER WELLS FB-3 AND FB-4
CONSTITUENTS ABOVE MAXIMUM CONCENTRATION LEVELS
FORT PIERCE UTILITIES AUTHORITY

Constituent	Units	FB-3 11/16/95	FB-4 10/19/95	MCL
Sodium	mg/L	192	209	160
Chlorides	mg/L	282	261	250
Odor	mg/L	24	100	3
Totally Dissolved Solids	mg/L	866	866	500

NA - None Available
mg/L - milligrams per liter
MCL - Florida Department of Environmental Protection Maximum Concentration Level



FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

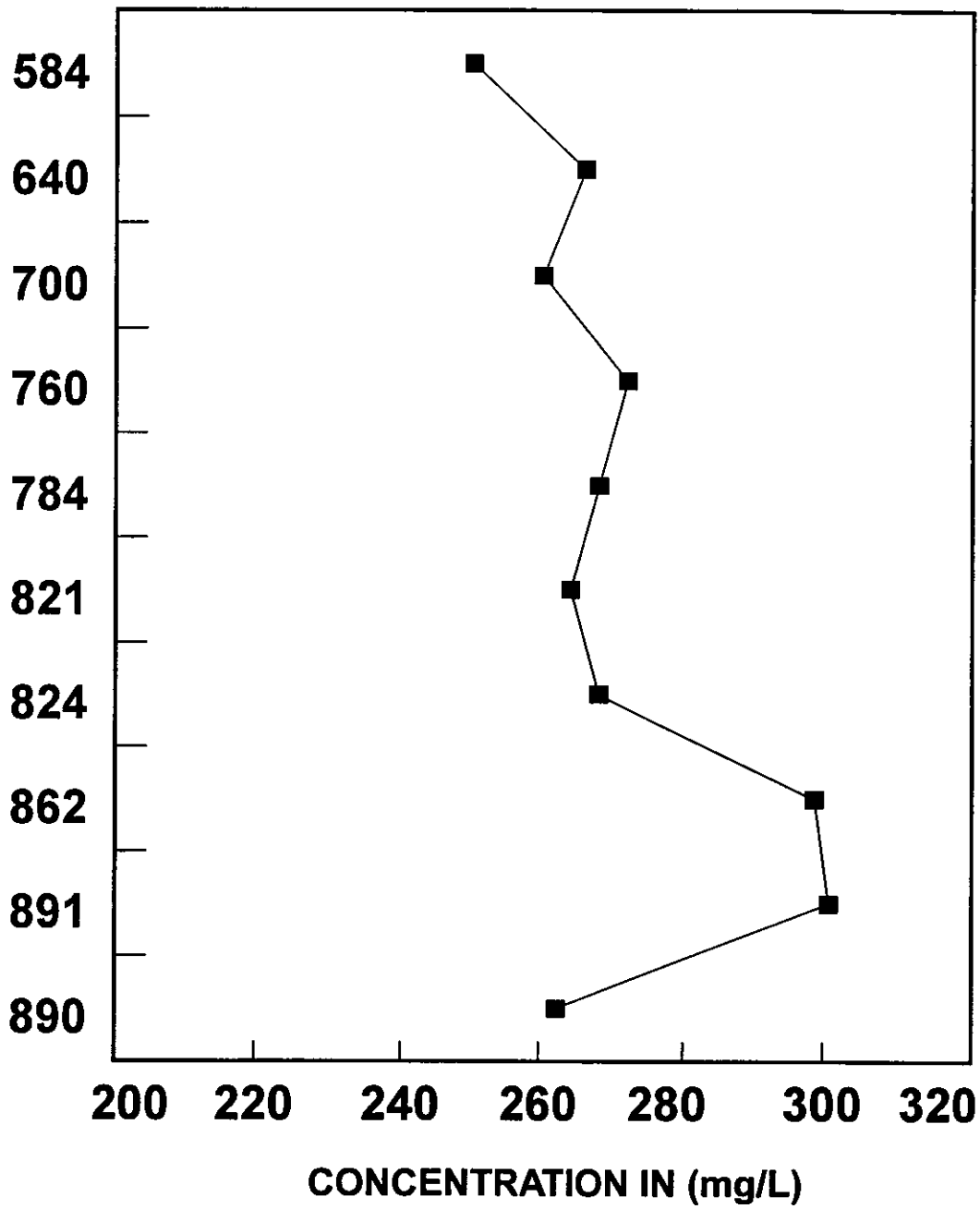
WELL CONSTRUCTION

CHLORIDE CONCENTRATIONS
FB-3

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

FIGURE
7

1.09.96 (54) APD
499\04149904 003 CDR



FORT PIERCE UTILITIES AUTHORITY
FORT PIERCE, FLORIDA

WELL CONSTRUCTION

CHLORIDE CONCENTRATIONS
FB-4

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

FIGURE 8

1.09.96 (54) APD
499\04\49904 004 CDR

7. Conclusions

Floridan aquifer wells FB-3 and FB-4 were successfully completed.

Based on the information gathered during construction and testing of FB-3 and FB-4, the following conclusions are provided:

- Floridan aquifer wells FB-3 and FB-4 were successfully constructed with a nominal 12-inch diameter (11.070)-inch inside diameter) final inner PVC casing. Summary completion information is as follows:

WELL	INNER CASING DEPTH (Ft BLS)	OPEN HOLE DEPTH (FT BLS)	NATURAL(ARTESIAN) FLOW RATE (gpm)
FB-3	503	890	575
FB-4	503	890	670

- Water quality for both wells is acceptable for blending with surficial aquifer supply wells. Chloride, sodium, TDS, and odor were the only constituents that exceeded the respective Drinking Water Standard.

- Chloride, sodium, and TDS, as well as the static piezometric surface should be monitored at each well on a periodic basis in order to provide data that can be used to evaluate any changes in water quality or quantity. The data will also be needed for long-term projections of Floridan aquifer supply potential and future desalination treatment techniques. Short-term wellfield management decisions will also require this type of data.

- Well construction techniques used for these wells, especially geophysical logging, should be considered for future well constructions.

8. References

Blasland, Bouck & Lee, Inc. "Pre-Design Investigation Floridan Aquifer Wellfield Development." *For Ft. Pierce Utilities Authority*, (1990).

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"Hydrogeological Units of Florida." *Florida Geological Society*, (1986).

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Meyer, F.W. "Hydrogeology, Ground Water Movement, and Subsurface Storage in the Floridan Aquifer System in Southern Florida." 1403-G,: U.S. Geological Survey Professional Paper, 1989.

Miller, J.A. "Hydrogeologic Framework of the Floridan Aquifer System in Florida and in Parts of Georgia, Alabama, and South Carolina." 1403-B, U.S. Geological Survey Professional Paper, 1986.

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APPENDIX A
PERMITS

South Florida Water Management District

3301 Gun Club Road, West Palm Beach, Florida 33406 • (407) 686-8800 • FL WATS 1-800-432-2045

CON 24-06

August 14, 1995

PERMITTEE
FORT PIERCE UTILITIES AUTHORITY
P.O. BOX 3191
FT PIERCE, FL 34948

CONTRACTOR
WEBB, DAVID E.
3504 INDUSTRIAL 33RD ST.
FT. PIERCE, FL 34946
LICENSE NO:2145

WATER WELL CONSTRUCTION PERMIT # SFO80795D
EXPIRATION DATE: February 14, 1996

PROJECT: FORT PIERCE UTILITIES FLORIDAN AQUIFER WELL FB-3
TYPE OF USE: PUBLIC WATER SUPPLY
COUNTY: ST LUCIE SEC: 8 TWP: 35 RGE: 40

WELL CONSTRUCTION SPECIFICATIONS:	INNER	OUTER
CASING DIAMETER:	12"	20"
CASING DEPTH:	500.00'	115.00'
SCREENED INTERVAL:	-	
OPEN HOLE INTERVAL:	500' - 900'	
TOTAL DEPTH OF WELL:	900.00'	

GROUT REQUIREMENT:
Inner casing shall be grouted bottom to top.
Outer casing shall be grouted bottom to top.

See additional conditions of permit on attached sheet.

We appreciate your assistance and cooperation in better managing the water resources of the District. If you have any questions on this matter, please call Ann-Marie Superchi at extension 6929.

Sincerely,

Steve D. Anderson, P.G., Supervising Professional
Water Use Division, Regulation Department

Attachment: Additional Conditions of Permit
c: MR. WES UPHAM-DEP
MR. BOB CALLINO-HRS
BLASLAND, BOUCK & LEE

South Florida Water Management District

3301 Gun Club Road, West Palm Beach, Florida 33406 • (407) 686-8800 • FL WATS 1-800-432-2045

CON 24-06

August 14, 1995

PERMITTEE
FORT PIERCE UTILITIES AUTHORITY
P.O. BOX 3191
FT PIERCE, FL 34948

CONTRACTOR
WEBB, DAVID E.
3504 INDUSTRIAL 33RD ST.
FT. PIERCE, FL 34946
LICENSE NO:2145

WATER WELL CONSTRUCTION PERMIT # SF080795E
EXPIRATION DATE: February 14, 1996

PROJECT: FORT PIERCE UTILITIES FLORIDAN AQUIFER WELL FB-4
TYPE OF USE: PUBLIC WATER SUPPLY
COUNTY: ST LUCIE SEC: 8 TWP: 35 RGE: 40

WELL CONSTRUCTION SPECIFICATIONS:	INNER	OUTER
CASING DIAMETER:	12"	20"
CASING DEPTH:	500.00'	115.00'
SCREENED INTERVAL:	-	
OPEN HOLE INTERVAL:	500' - 900'	
TOTAL DEPTH OF WELL:	900.00'	

GROUT REQUIREMENT:
Inner casing shall be grouted bottom to top.
Outer casing shall be grouted bottom to top.

See additional conditions of permit on attached sheet.

We appreciate your assistance and cooperation in better managing the water resources of the District. If you have any questions on this matter, please call Ann-Marie Superchi at extension 6929.

Sincerely,

Steve D. Anderson, P.G., Supervising Professional
Water Use Division, Regulation Department

Attachment: Additional Conditions of Permit
c: MR. WES UPHAM-DEP
MR. BOB CALLINO-HRS
BLASLAND, BOUCK & LEE

JBM 14904

WELL COMPLETION REPORT *SOUTH FLORIDA WATER MANAGEMENT DISTRICT*

Owner Fort Pierce Utilities Authority
P.O.Box 3191
Ft. Pierce, FL 34946

RECEIVED
DEC 04 1995
LASLAND, BOUCK & LEE
BOCA RATON FL

Permit No SF080795E
DER N/A
Completed 11/17/95
Well Use Public Supply
Well ID FB-3
Casing Depth 503 Ft
Well Depth 890 Ft
Type of work Construct
Method Rotary Mud

DRILLING SERVICES, INC.
Driller Lenny Crocco
Contractor David E. Webb Licence No. DER 2145

David L
Contractor's Signature

ATERIALS

Casing	Diam.	Type	From (Ft)	To
ater	20	Steel	0	121
ner	12	PVC	0	503
Screen				

GROUT

Annulus	From (Ft)	To	Bags	
3	0	121	145	Portland
3"	0	503	380	Portland

Slot size .

DRILL CUTTINGS LOG

Depth (Ft)	Type	Color	Grain Size
0.0	See Attach		

ATER
Static Water Level +17 ft. below top of casing. Water: Clear
Pumping Water Level ft. after 8 hrs. at 1000 gpm
mp Size 109 h.p. Capacity 1200 gpm Conductivity 1400
mp Type Turbine Intake Depth 50 ft. Chlorides 280 mg/l
Flowing 550 gpm

ELL LOCATION
reamland Park
N. 25 St.
ubdivision Lot Block
unty St. Lucie
se 1/4 of the se 1/4 of Section 8 Twp. 35 Range 40
Lat. Long.

Cuttings sent to the District? No

JRM 44904

WELL COMPLETION REPORT *SOUTH FLORIDA WATER MANAGEMENT DISTRICT*

Owner Fort Pierce Utilities Authority
P.O.Box 3191
Ft. Pierce, FL 34946

DRILLING SERVICES, INC.
Driller Lenny Crocco
Contractor David E. Webb Licence No. DER 2145

Contractor's Signature

Permit No SF080795E
DER N/A
Completed 10/18/95
Well Use Public Supply
Well ID FB-4
Casing Depth 503 Ft
Well Depth 890 Ft
Type of work Construct
Method Rotary Mud

==========

ATERIALS

	Diam.	Type	From (Ft)	To
asing	20	Steel	0	121
ater	12	PVC	0	503
reen				

GROUT

Annulus	From (Ft)	To	Bags	
3	0	121	145	Portland
3"	0	503	380	Portland

Slot size .

DRILL CUTTINGS LOG

Depth (Ft)	Type	Color	Grain Size
0.0	See Attach		

ATER

atic Water Level +19 ft. below top of casing. Water: Clear
mping Water Level ft. after 8 hrs. at 1000 gpm
mp Size 109 h.p. Capacity 1200 gpm Conductivity 1400
mp Type Turbine Intake Depth 50 ft. Chlorides 280 mg/l
eving 550 gpm

ELL LOCATION

reamland Park
. 25 St.
ubdivision Lot Block
unty St. Lucie
e 1/4 of the se 1/4 of Section 8 Twp. 35 Range 40
at. Long.

Cuttings sent to the District? No

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

Appendix B

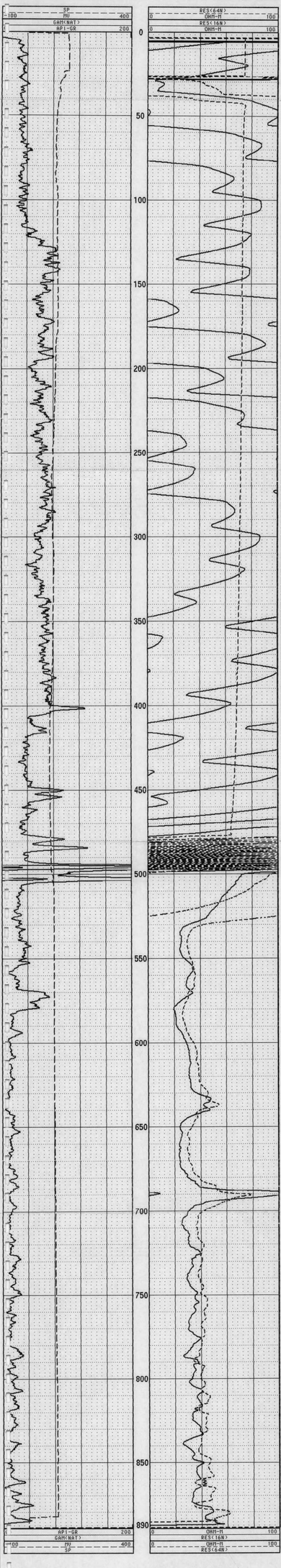
Southern Resource Exploration Inc.

P.O. Box 14311
Gainesville, Florida 32604
Phone 904-372-5950

GAM, RES (16-64), SP

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-3				
LOCATION/FIELD	: 25TH ST./CITRUS AVE				
COUNTY	: ST. LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 11/14/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 898'	ELEV. PERM. DATUM	:	KB	:
LOG BOTTOM	: 889.00	LOG MEASURED FROM	: GL	DF	:
LOG TOP	: 1.00	DRL MEASURED FROM	: GL	GL	:
CASING DRILLER	: 503	LOGGING UNIT	: BHT		
CASING TYPE	: ST.	FIELD OFFICE	: GVL		
CASING THICKNESS	: -	RECORDED BY	: M. FRIED		
BIT SIZE	: 11.875	BOREHOLE FLUID	: water	FILE	: ORIGINAL
MAGNETIC DECL.	:	RM	:	TYPE	: 9841A
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG	: 4
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT	: 90-400 0
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH	: 5000
REMARKS	:				

LOGS RUN WITH WELL FLOWING at 570 gpm



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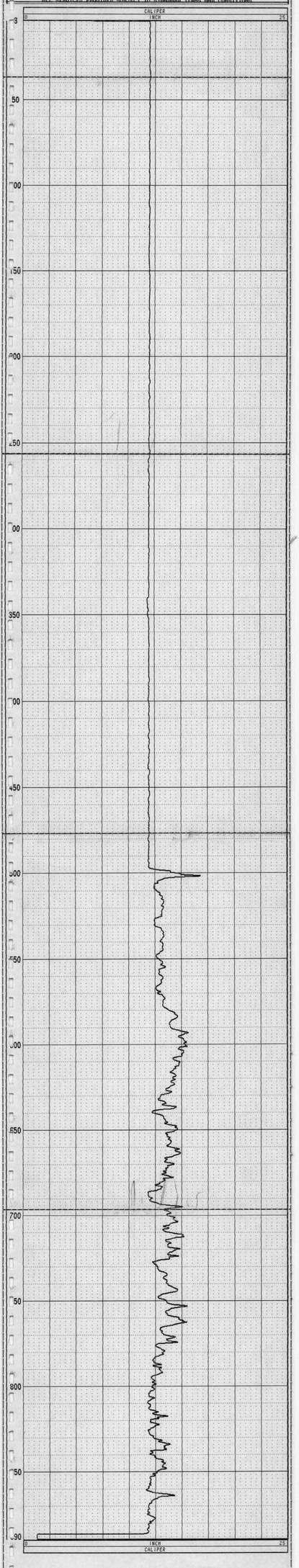
Gainesville, Florida 32604
Phone 904-372-5950

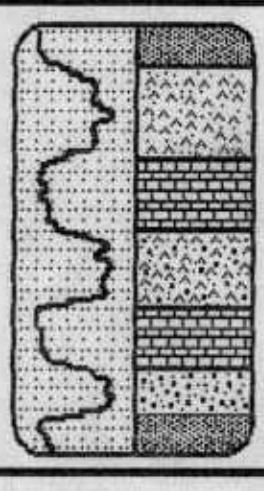
CALIPER LOG

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-3				
LOCATION/FIELD	: 25TH ST./CITRUS AVE				
COUNTY	: ST. LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE :	
DATE	: 11/14/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 898'	ELEV. PERM. DATUM:		KB :	
LOG BOTTOM	: 898.00	LOG MEASURED FROM:	GL	DF :	
LOG TOP	: 4.00	DRL MEASURED FROM:	GL	GL :	
CASING DRILLER	: 583	LOGGING UNIT	: BHT		
CASING TYPE	: ST.	FIELD OFFICE	: GVL		
CASING THICKNESS	: -	RECORDED BY	: M. FRIED		
BIT SIZE	: 11.875	BOREHOLE FLUID	: water	FILE	: PROCESSED
MAGNETIC DECL.	:	RM	:	TYPE	: AMIMC
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG	: 3
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT	: CALIPER 2
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH:	5000
REMARKS	:				

LOGS RUN WITH WELL FLOWING at 570 gpm

ALL SERVICES EQUIPMENT SUBJECT TO STANDARD TERMS AND CONDITIONS





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TEMPERATURE-FLUID RES

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-3				
LOCATION/FIELD	: 25TH ST./CITRUS AVE				
COUNTY	: ST. LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 11/14/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 890'	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 889.80	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 1.00	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 503	LOGGING UNIT	: BHT		
CASING TYPE	: ST.	FIELD OFFICE	: GVL		
CASING THICKNESS:	-	RECORDED BY	: M. FRIED		
BIT SIZE	: 11.875	BOREHOLE FLUID	: water	FILE	: ORIGINAL
MAGNETIC DECL.	:	RM	:	TYPE	: 9041A
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG	: 4
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT	: TEMP-FR 0
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH:	5000

REMARKS :
LOGS RUN WITH WELL FLOWING at 570 gpm

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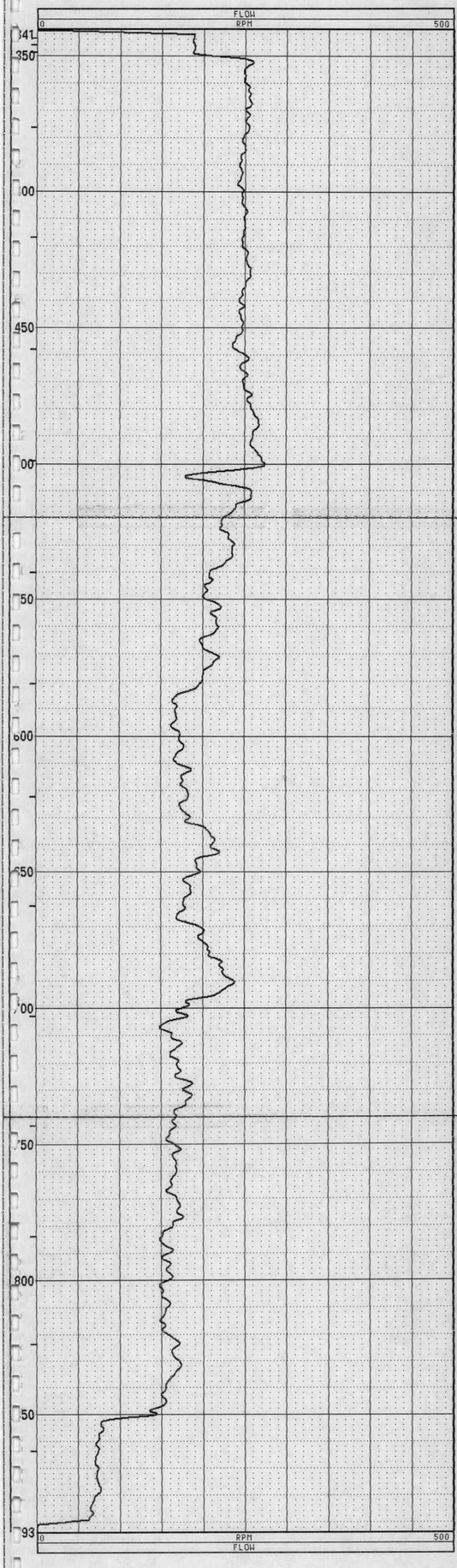
FLOWMETER LOG

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-3				
LOCATION/FIELD	: 25TH ST./CITRUS AVE				
COUNTY	: ST. LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE :	
DATE	: 11/14/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 880'	ELEV. PERM. DATUM:		KB :	
LOG BOTTOM	: 893.60	LOG MEASURED FROM:	GL	DF :	
LOG TOP	: 340.80	DRL MEASURED FROM:	GL	GL :	
CASING DRILLER	: 503	LOGGING UNIT	: BHT		
CASING TYPE	: ST.	FIELD OFFICE	: GVL		
CASING THICKNESS:	-	RECORDED BY	: M. FRIED		
BIT SIZE	: 11.875	BOREHOLE FLUID	: water	FILE : ORIGINAL	
MAGNETIC DECL.	:	RM	:	TYPE : ANIMF	
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG : 5	
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT : FLOW 11	
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH: 5000	

REMARKS
LOGS RUN WITH WELL FLOWING at 570 gpm
FLOW LOG RUN AT 40'/MIN DOWN.



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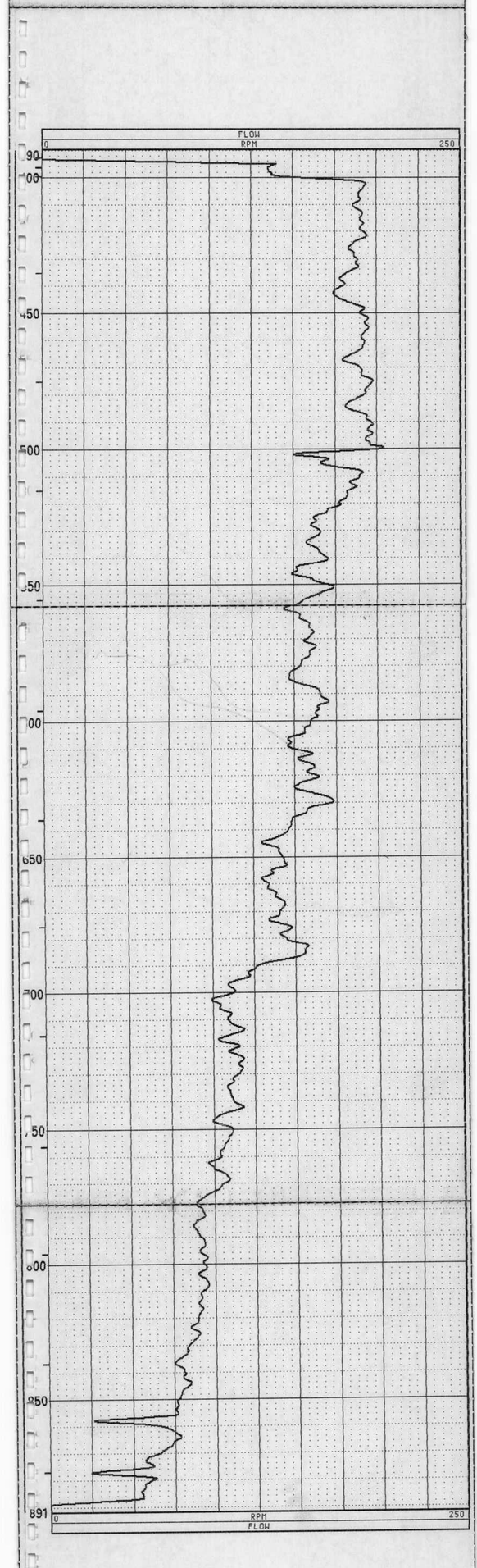
FLOWMETER LOG

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-4				
LOCATION/FIELD	: 25TH ST				
COUNTY	: ST LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 10/13/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 890	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 891.60	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 390.20	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 503	LOGGING UNIT	: BHT		
CASING TYPE	: ST	FIELD OFFICE	: GVL		
CASING THICKNESS:	.375	RECORDED BY	: M.FRIED		
BIT SIZE	: 15	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	:	RM	:	TYPE	: ANIMF
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG	: 2
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT	: FLOW 11
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH:	5000

REMARKS :
FLOW LOG RUN DOWN AT 40 FT. MIN.



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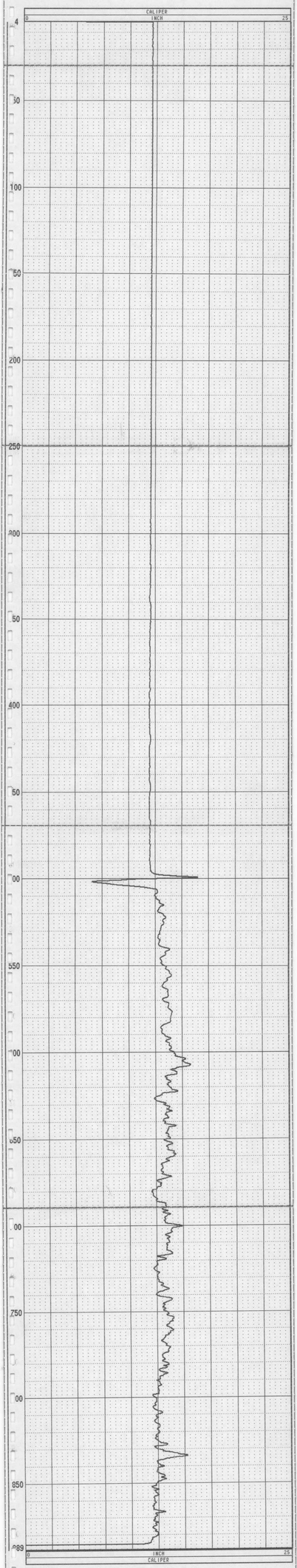
CALIPER LOG

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-4				
LOCATION/FIELD	: 25TH ST				
COUNTY	: ST LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE :	
DATE	: 10/13/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 890	ELEV. PERM. DATUM:		KB :	
LOG BOTTOM	: 889.88	LOG MEASURED FROM:	GL	DF :	
LOG TOP	: 4.48	DRL MEASURED FROM:	GL	GL :	
CASING DRILLER	: 583	LOGGING UNIT	: BHT		
CASING TYPE	: PVC	FIELD OFFICE	: GVL		
CASING THICKNESS:	.375	RECORDED BY	: M.FRIED		
BIT SIZE	: 15	BOREHOLE FLUID	: WATER	FILE : PROCESSED	
MAGNETIC DECL.	:	RM	:	TYPE : RNIMC	
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG : 0	
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT : CALIPER 2	
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH: 5000	
REMARKS	:				



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GAM, RES (16-64), SP

COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FR-4				
LOCATION/FIELD	: 25TH ST				
COUNTY	: ST LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 10/13/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 890	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 888.00	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 0.00	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 583	LOGGING UNIT	: BHT		
CASING TYPE	: PVC	FIELD OFFICE	: GVL		
CASING THICKNESS	: .375	RECORDED BY	: M.FRIED		
BIT SIZE	: 15	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	:	RM	:	TYPE	: 9041A
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG	: 1
FLUID DENSITY	: 1	MATRIX DELTA T	: 58	PLOT	: 0.40B 0
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH:	5000
REMARKS	:				

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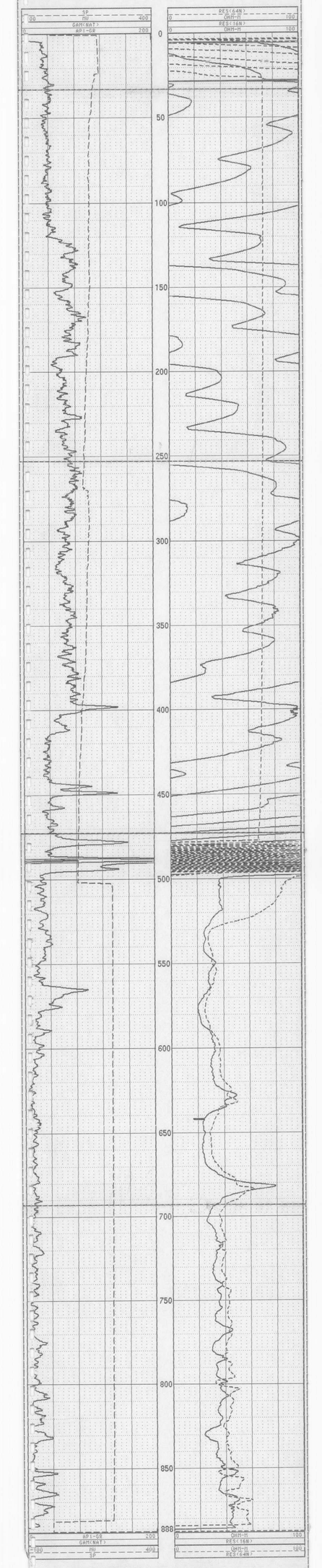

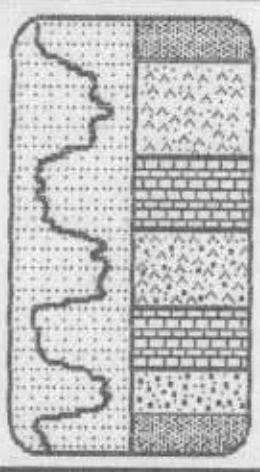

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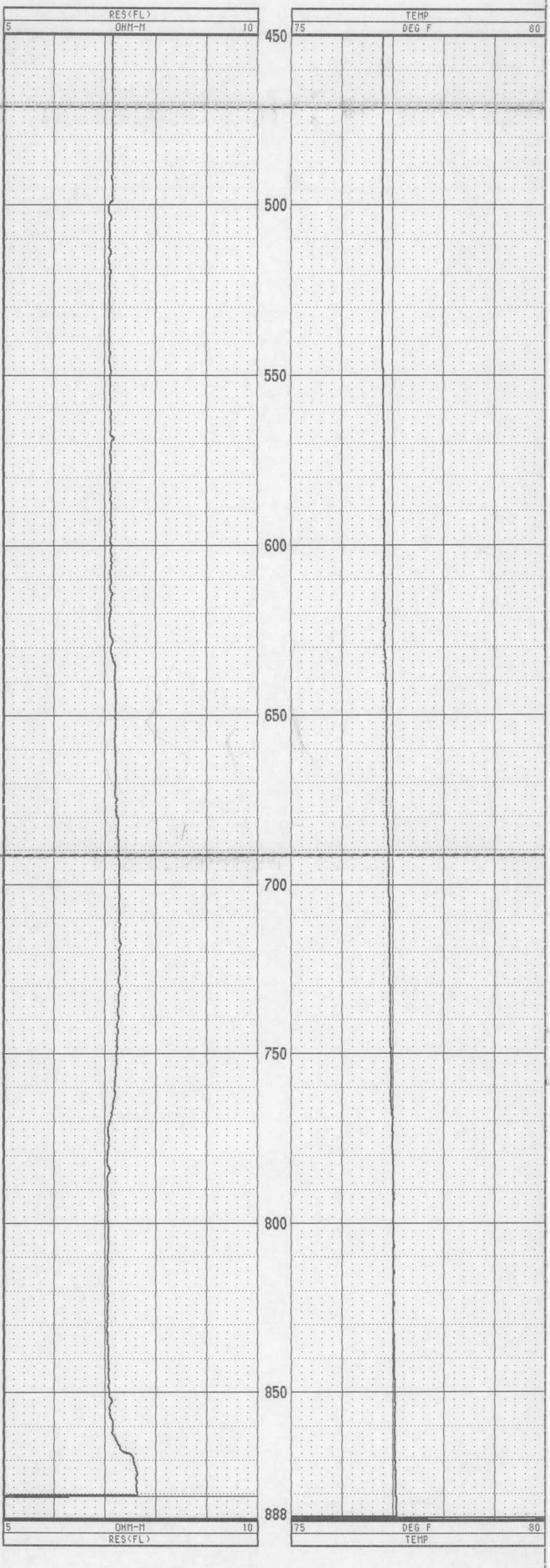
TEMPERATURE-FLUID RES

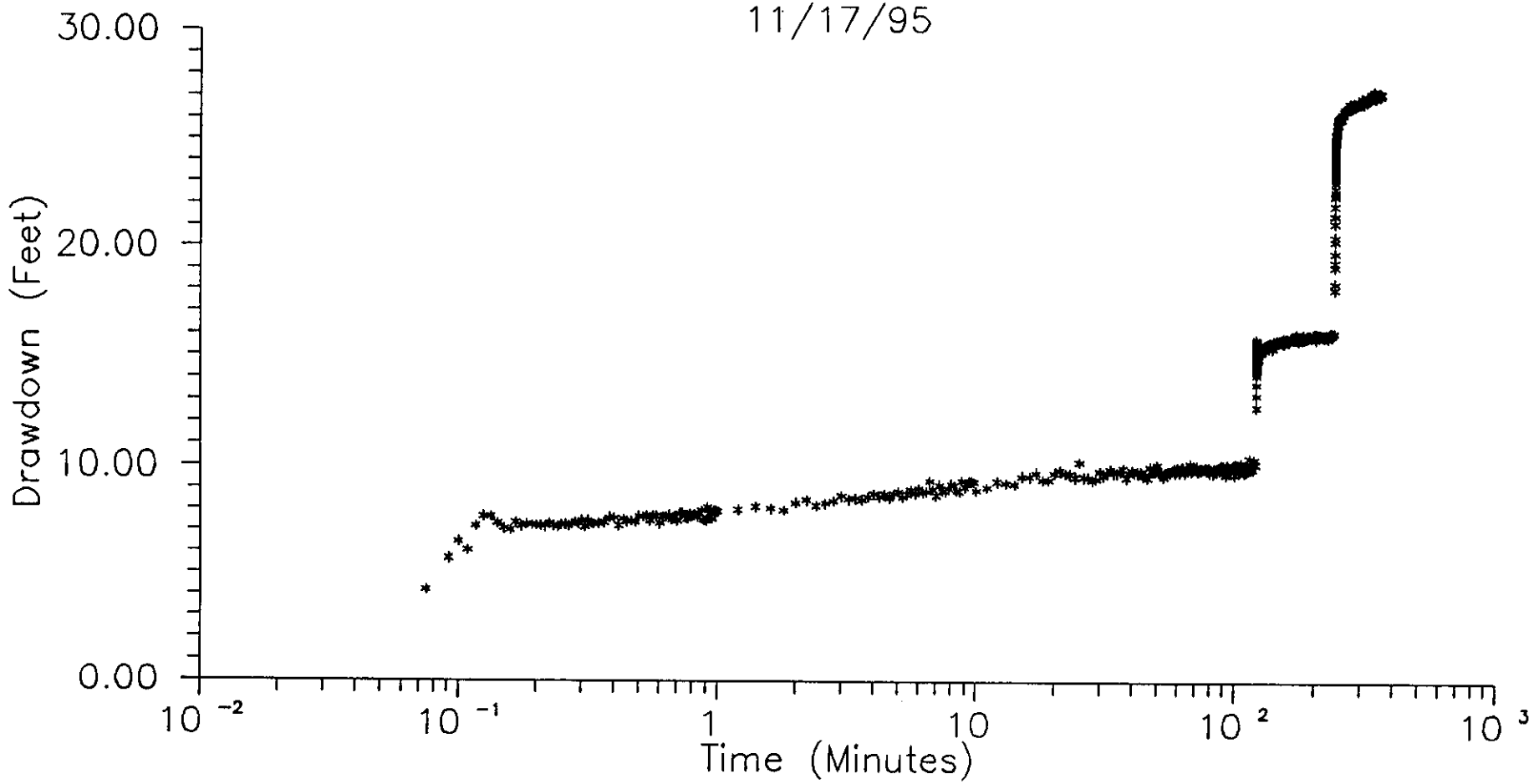
COMPANY	: DRILLING SERVICES			OTHER SERVICES:	
WELL	: FB-4				
LOCATION/FIELD	: 25TH ST				
COUNTY	: ST LUCIE				
STATE	: FL				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 10/13/95	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 890	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 888.00	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 0.60	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 503	LOGGING UNIT	: BWT		
CASING TYPE	: PVC	FIELD OFFICE	: GVL		
CASING THICKNESS:	.375	RECORDED BY	: M.FRIED		
BIT SIZE	: 15	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	:	RM	:	TYPE	: 9041A
MATRIX DENSITY	:	RM TEMPERATURE	:	LOG	: 1
FLUID DENSITY	: 1	MATRIX DELTA T	: 50	PLOT	: TEMP-FR 0
NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH:	5000
REMARKS	:				

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

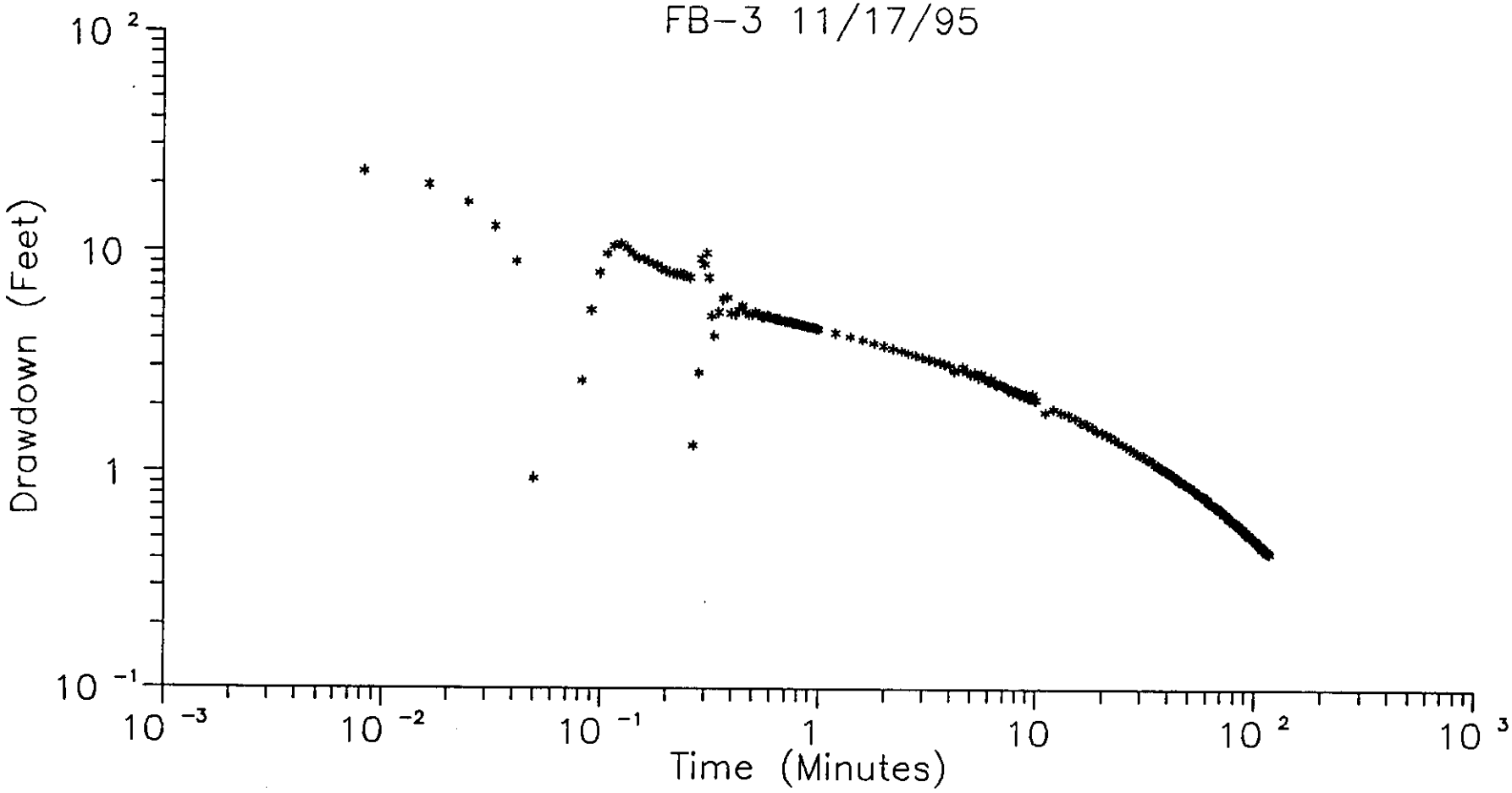


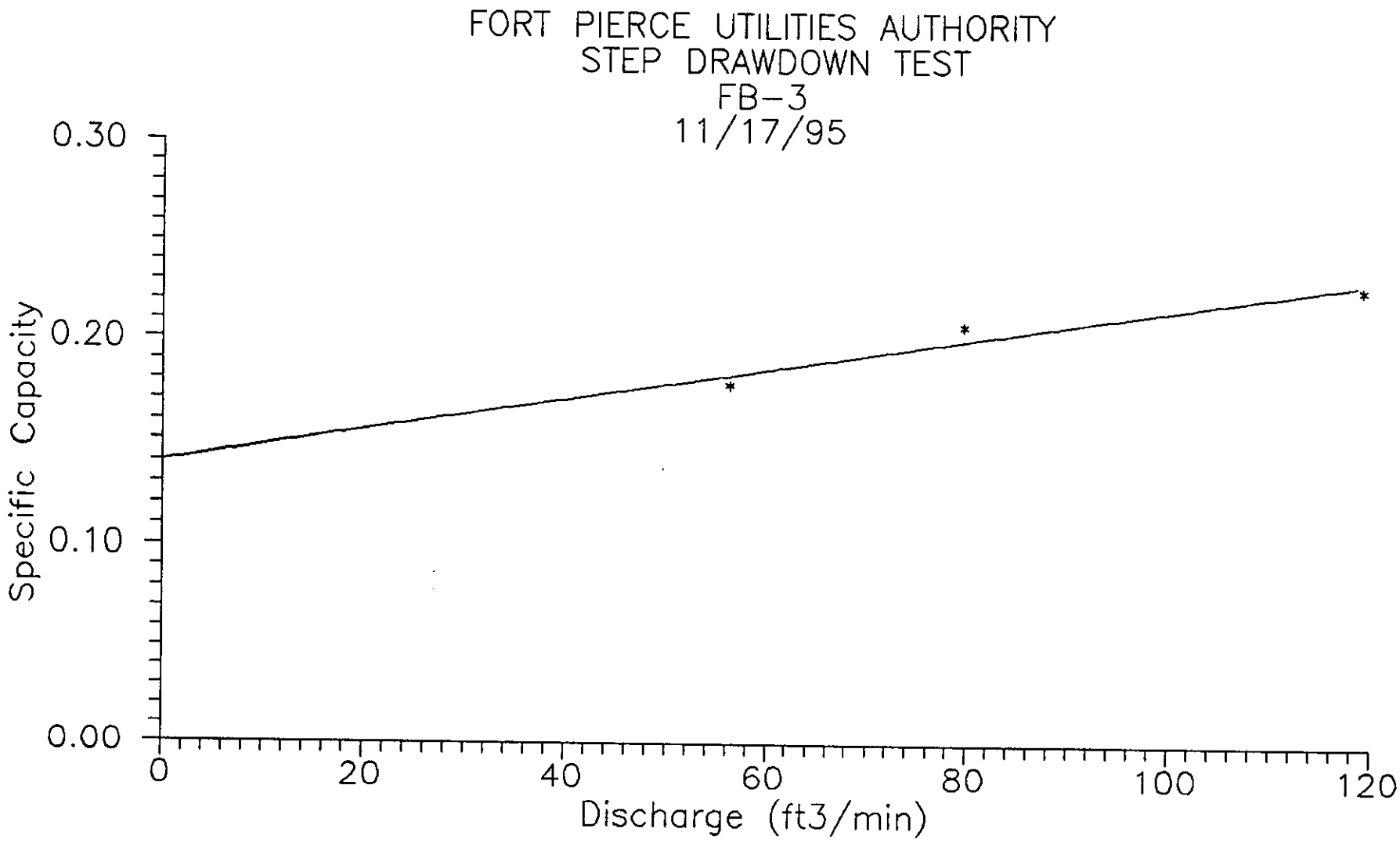
APPENDIX C
STEP DRAWDOWN TEST AND RECOVERY RESULTS

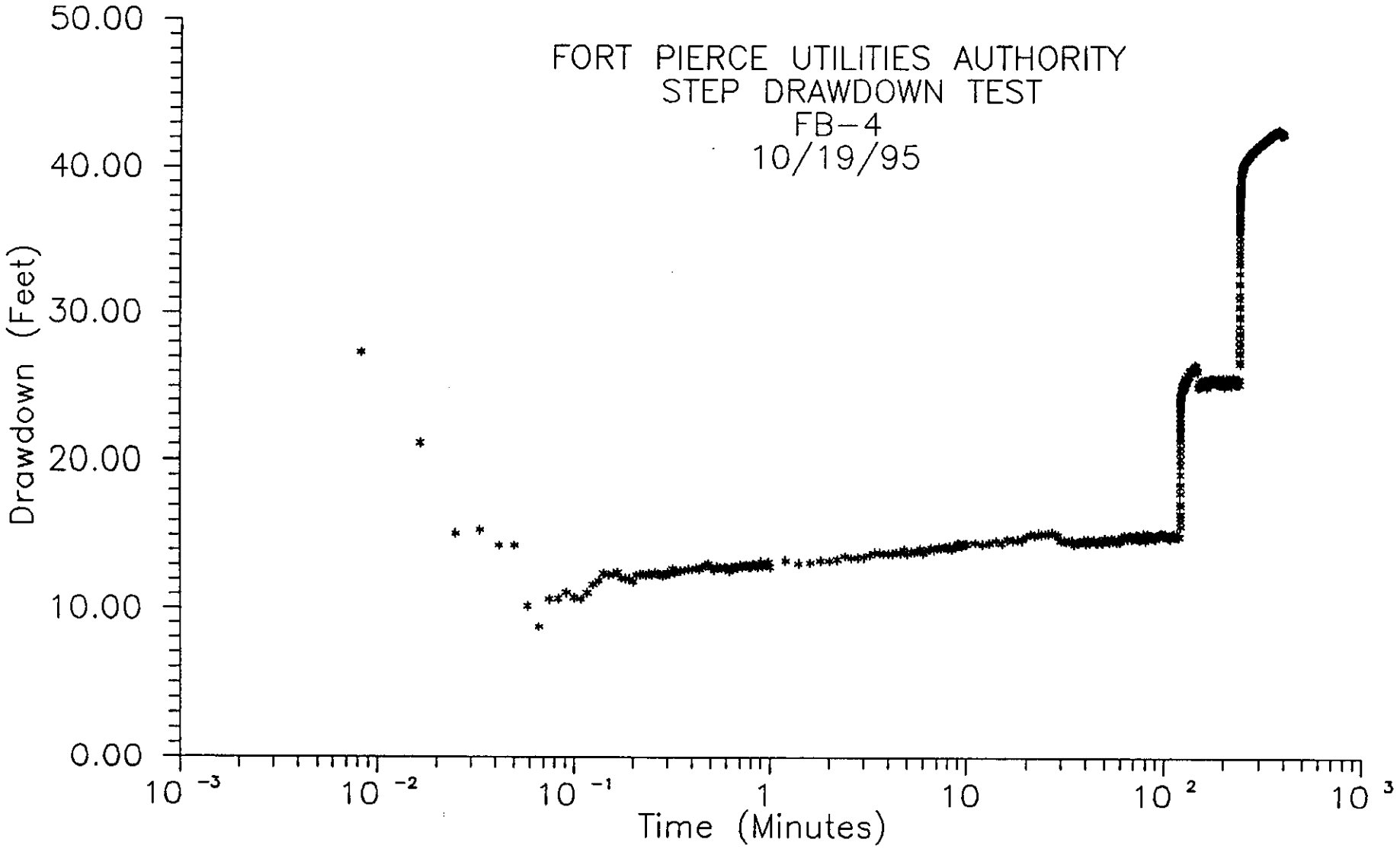
FORT PIERCE UTILITIES AUTHORITY
STEP DRAWDOWN TEST
FB-3
11/17/95



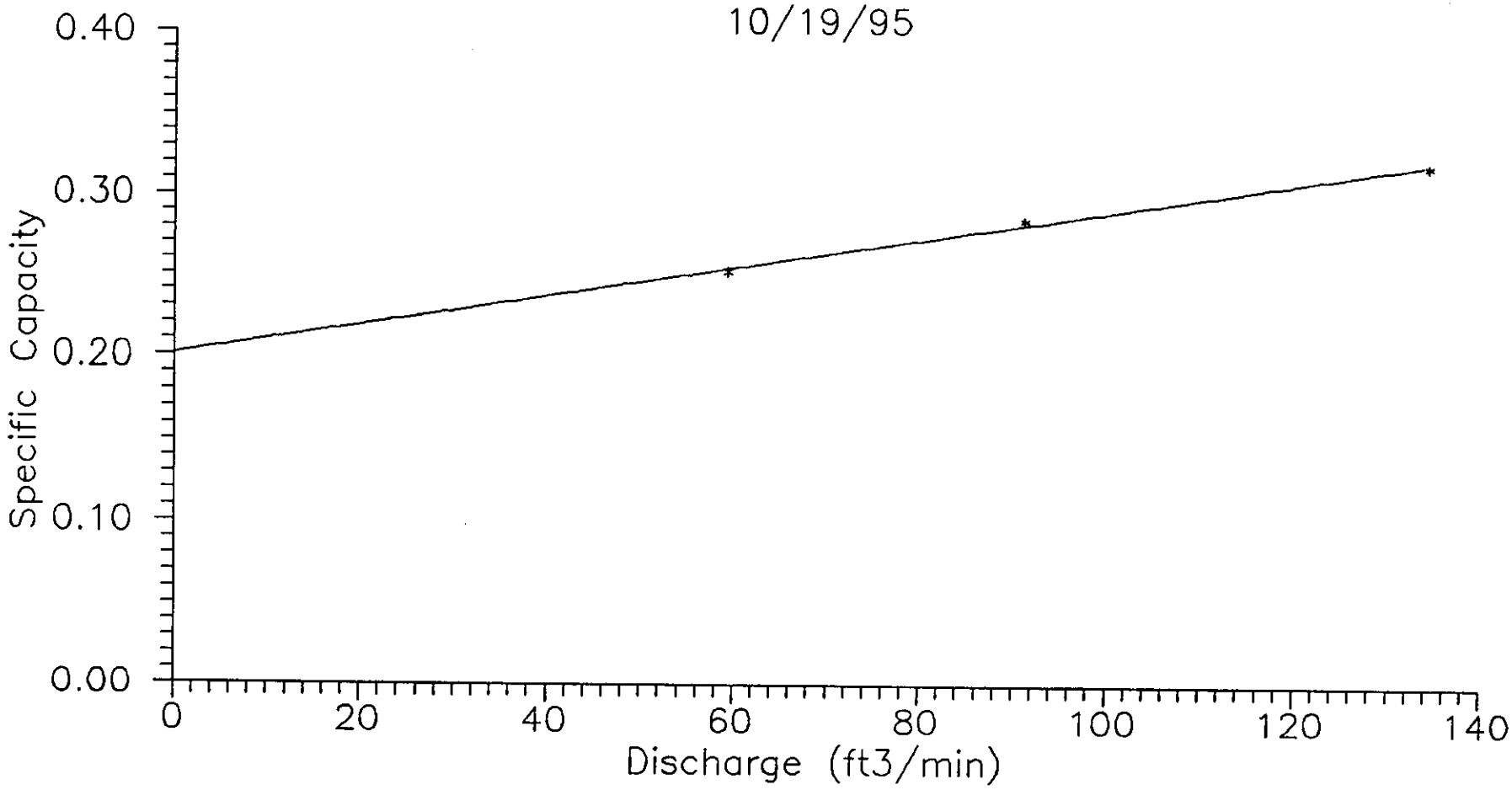
FORT PIERCE UTILITIES AUTHORITY
STEP DRAWDOWN TEST
RECOVERY CURVE
FB-3 11/17/95

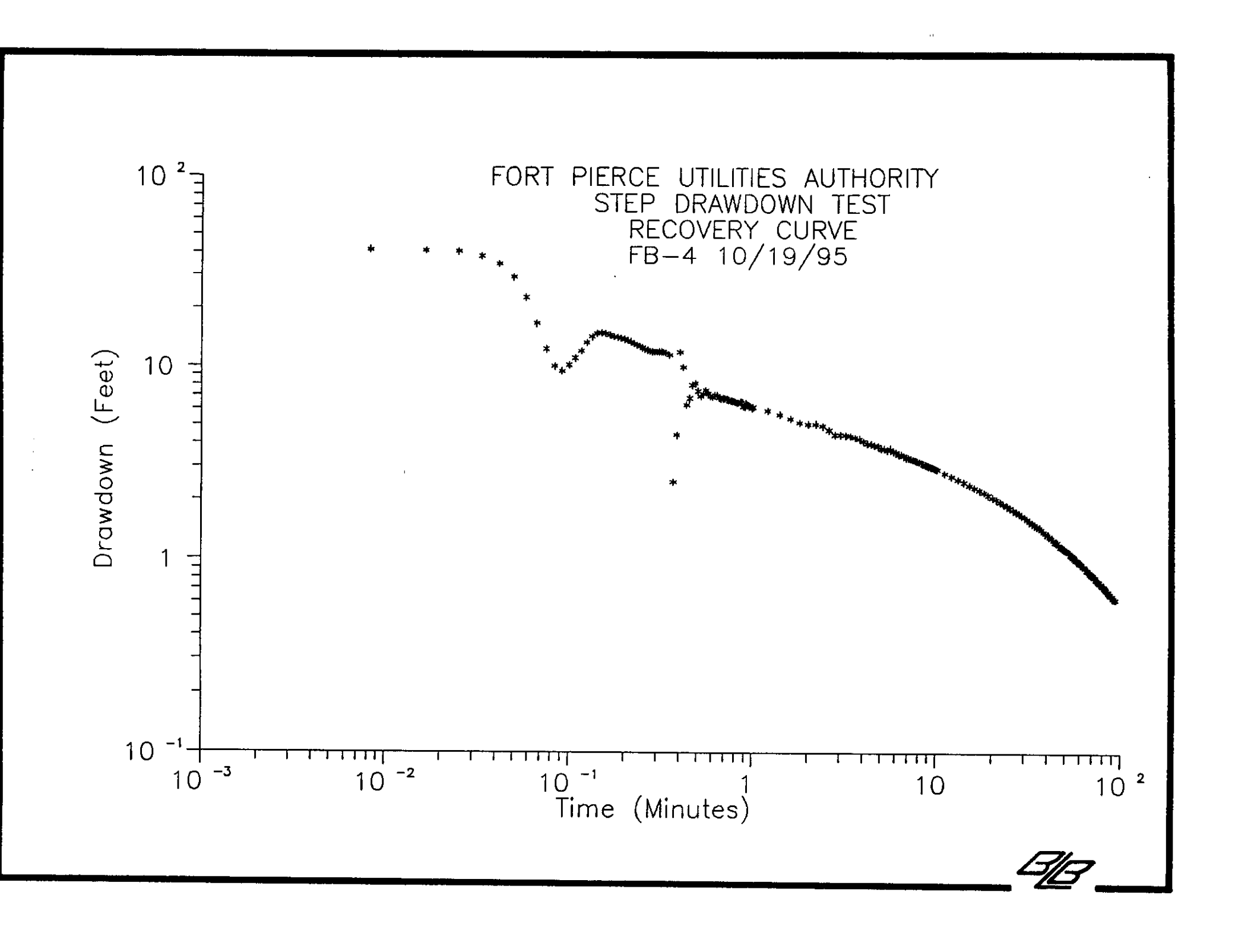



FORT PIERCE UTILITIES AUTHORITY
STEP DRAWDOWN TEST
FB-3
11/17/95
Specific Capacity
0.30
0.20
0.10
0.00
0
20
40
60
80
100
120
Discharge (ft3/min)


FORT PIERCE UTILITIES AUTHORITY
STEP DRAWDOWN TEST
FB-4
10/19/95
Drawdown (Feet)
50.00
40.00
30.00
20.00
10.00
0.00
10 -3
10 -2
10 -1
1
10
10 2
10 3
Time (Minutes)

FORT PIERCE UTILITIES AUTHORITY
STEP DRAWDOWN TEST
FB-4
10/19/95




FORT PIERCE UTILITIES AUTHORITY
STEP DRAWDOWN TEST
RECOVERY CURVE
FB-4 10/19/95
Drawdown (Feet)
Time (Minutes)
10 2
10
1
10 -1
10 -3
10 -2
10 -1
1
10
10 2

APPENDIX D
EQUATIONS

STEP DRAWDOWN TEST EQUATIONS*

FORT PIERCE UTILITIES AUTHORITY

EQUATIONS USED:

SPECIFIC CAPACITY

The actual specific capacity is calculated as:

$$\frac{Q}{S} = \text{specific capacity}$$

Where:

Q = Discharge as determined during the step drawdown test (gpm).
s = Maximum drawdown in well

WELL EFFICIENCY*

$$Ew = \frac{100\ B\ Q_n}{Sw_{(n)}}$$

Ew = Well efficiency (%)
B = Specific capacity (min/ft^2)
Q_n = Discharge as determined during the step drawdown test (ft^3/min).
$Sw_{(n)}$ = Cummulative drawdown

* Method used to analyze the test was the Hantush-Bierschenk's method, "Analysis and Evaluation of Pumping Test Data", 1994.

APPENDIX E
LITHOLOGIC LOGS

640-650	same as above, but less hard.
650-660	same as above with abundant microfossils and shellrock traces.
660-670	5Y 8/2(pale yellow) limestone(hard) with microfossil traces and abundant shellrock.
670-680	same as above.
680-690	5Y 8/2(pale yellow) limestone(very hard), with shellrock and microfossil traces.
690-700	same as above.
700-710	same as above.
710-720	same as above.
720-730	same as above.
730-740	N9(white) limestone with traces of micrpfossils and shellrock.
740-750	5Y 8/2(pale yellow) limestone with traces of microfossils.
750-760	N9(white) limestone(hard) with microfossil traces.
760-770	same as above.
770-780	5Y 8/2 limestone with N9(white) limestone traces, microfossils and shellrock present.
780-790	same as above.
790-800	same as above, but with N9(white) clay nodules.
800-810	same as above.
810-820	N9(white) limestone(very hard).
820-830	5Y 8/2(pale yellow) and N7(light gray) limestone with microfossil and shellrock fragments.
830-840	5Y 8/2(pale yellow), N7(light gray), N4(medium dark gray) limestone with traces of N9(white) clay.
840-850	same as above.
850-860	N8(very light gray) limestone with shellrock and microfossil traces.

LITHOLOGIC LOG FOR FB-3

DEPTH(ft)	DESCRIPTION
0-10	10YR 3/2(very dark grayish brown), fine to medium grained quartzose sand, moderately sorted, subangular(clear quartz is present).
10-20	10YR 5/1(grayish brown), medium grained quartzose sand, moderately sorted, subangular(some clear quartz present).
20-30	2.5Y 3/2(very dark grayish brown), medium grained quartzose sand with fines, moderately sorted, subangular to subrounded (some clear quartz present).
30-40	2.5Y 4/2(dark grayish brown), medium grained quartzose sand with abundant fines, moderately sorted, subangular to sub rounded(some clear quartz present).
40-50	5YR 3/3(dark reddish brown) fine to medium grained quartzose sand, moderately sorted, subrounded.
50-60	7.5YR 4/3(brown), fine grained quartzose sand, moderately sorted, subrounded.
60-70	N4(medium dark gray), N6(medium light gray), N8(very light gray), and N9(white) calcareous shellrock layer. organics present.
70-80	N2(grayish black), N4(white) to N5(medium gray) calcareous shellrock, small amount of organics present.
80-90	10YR 6/2(pale yellowish brown), N4(medium dark gray) to N6(medium light gray) calcareous shellrock. varying sizes present with no organics.
90-100	same as above.
100-110	same as above, without 10YR 6/2(pale yellowish brown) calcareous shellrock.
110-120	10YR 6/2(pale yellowish brown), N4(white) to N6(medium light gray) calcareous shellrock.
120-130	same as above.

130-140	5GY 3/2(grayish olive green) clay with 10YR 6/2(pale yellowish brown), N4(medium dark gray) to N6(medium light gray) and N9(white) calcareous shellrock fragments.same as above.
140-150	same as above, but less shellrock.
150-160	same as above, but with more abundant calcareous shellrock.
160-170	same as above.
170-180	same as above.
180-190	same as above, but less shellrock.
190-200	same as above, but less calcareous shellrock.
200-210	5GY 3/2(grayish olive green) clay, silt size particles.
210-220	same as above.
220-230	same as above.
230-240	same a above.
240-250	same as above.
250-260	same as above.
260-270	same as above.
270-280	same as above.
280-290	same as above.
290-300	same as above.
300-310	same as above.
310-320	same as above.
320-330	same as above.
330-340	same as above.
340-350	same as above.
350-360	same as above.
360-370	same as above.

370-380	same as above.
380-390	same as above.
390-400	same as above.
400-410	10Y 4/1(dark greenish gray) clay.
410-420	10Y 5/1(greenish gray) clay.
420-430	same as above.
430-440	same as above.
440-450	same as above.
450-460	same as above.
460-470	same as above.
470-480	same as above.
480-490	same as above.
490-500	same as above, with 5Y 8/1(white) limestone fragments
500-510	5Y 8/1(white) limestone with traces of 5GY 3/2(grayish olive green) clay.
510-520	5Y 8/1(white)-very soft with traces of hard rock and shellrock.
520-530	same as above, but less hard rock.
530-540	same as above.
540-550	same as above.
550-560	same as above.
560-570	same as above, with more hard rock.
570-580	same as above.
580-590	5Y 8/1(white) soft limestone, with some clay nodules and shellrock and microfossil traces.
590-600	5Y 8/1(white) limestone with shellrock traces and 1GLEY 8/1 clay traces.
600-610	same as above, hard limestone.

610-620	same as above, but shellrock present.
620-630	5Y 8/1(white) limestone(hard) with shellrock and traces of microfossils.
630-640	5Y 8/2(pale yellow) limestone(hard) with shellrock and microfossils.
640-650	same as above, but less hard.
650-660	same as above with abundant microfossils and shellrock traces.
660-670	5Y 8/2(pale yellow) limestone(hard) with microfossil traces and abundant shellrock.
670-680	same as above.
680-690	5Y 8/2(pale yellow) limestone(very hard), with shellrock and microfossil traces.
690-700	same as above, but soft limestone.
700-710	same as above.
710-720	same as above, limestone is hardening.
720-730	same as above.
730-740	N9(white) limestone with traces of microfossils and shellrock.
740-750	5Y 8/2(pale yellow) and N9(white) limestone with traces of microfossils.
750-760	N9(white) limestone(hard) with microfossil traces.
760-770	same as above.
770-780	5Y 8/2 limestone with N9(white) limestone traces, microfossils and shellrock present.
780-790	same as above, less shellrock.
790-800	same as above, but with N9(white) clay nodules.
800-810	same as above.
810-820	N9(white) limestone(very hard).

820-830	5Y 8/2(pale yellow) and N7(light gray) limestone with microfossils.
830-840	5Y 8/2(pale yellow), N7(light gray), N4(medium dark gray) limestone with traces of N9(white) clay.
840-850	same as above, with N7(light gray) clay.
850-860	N8(very light gray) limestone with shellrock and microfossil traces.
860-870	5Y 8/2 limestone(very hard) with shellrock and microfossils.
870-880	N8(very light gray) limestone with shellrock and microfossils.
880-890	same as above.

*Source- Munsell Soil Color Chart, 1994.
Rock Color Chart, Geological Society of America, 1991.

LITHOLOGIC LOG FOR FB-4

DEPTH(ft)	DESCRIPTION
0-10	10YR 3/2(very dark grayish brown), medium grained quartzose sand, moderately sorted, subangular(clear quartz is present).
10-20	10YR 3/1(very dark gray), medium grained quartzose sand, moderately sorted, subangular(some clear quartz present).
20-30	2.5Y 3/2(very dark grayish brown), medium grained quartzose sand with fines, moderately sorted, subangular to subrounded (some clear quartz present).
30-40	2.5Y 4/2(dark grayish brown), medium grained quartzose sand with abundant fines, moderately sorted, subangular to sub rounded(some clear quartz present).
40-50	10YR 8/2(very pale orange) and 10YR 6/2(pale yellowish brown) calcareous shellrock layer, large and small pieces, organics present.
50-60	same as above.
60-70	N4(medium dark gray), N6(medium light gray), N8(very light gray), and N9(white) calcareous shellrock layer. organics present.
70-80	N2(grayish black) to N5(medium gray) calcareous shellrock, small amount of organics present.
80-90	10YR 6/2(pale yellowish brown), N4(medium dark gray) to N6(medium light gray) calcareous shellrock. varying sizes present with no organics.
90-100	same as above.
100-110	same as above.
110-120	same as above, but traces of 5GY 3/2(grayish olive green) clay.
120-130	5GY 3/2(grayish olive green) clay with 10YR 6/2(pale yellowish brown), N4(medium dark gray) to N6(medium light gray) and N9(white) calcareous shellrock fragments.
130-140	same as above.
140-150	same as above.

150-160	same as above, but with more abundant calcareous shellrock.
160-170	same as above.
170-180	same as above.
180-190	same as above.
190-200	same as above, but less calcareous shellrock.
200-210	5GY 3/2(grayish olive green) clay, silt size particles.
210-220	same as above.
220-230	same as above.
230-240	same a above.
240-250	same as above.
250-260	same as above.
260-270	same as above.
270-280	same as above.
280-290	same as above.
290-300	same as above.
300-310	same as above.
310-320	same as above.
320-330	same as above.
330-340	same as above.
340-350	same as above.
350-360	same as above.
360-370	same as above.
370-380	same as above.
380-390	same as above.
390-400	same as above.
400-410	same as above.

410-420	same as above.
420-430	same as above.
430-440	same as above.
440-450	same as above.
450-460	same as above.
460-470	same as above.
470-480	same as above.
480-490	same as above.
490-500	same as above, with 5Y 8/1(white) limestone fragments
500-510	5Y 8/1(white) limestone with traces of 5GY 3/2(grayish olive green) clay.
510-520	5Y 8/1(white)-very soft with traces of hardrock and shellrock.
520-530	same as above, but less hard rock.
530-540	same as above.
540-550	same as above.
550-560	same as above, with more hard rock.
560-570	same as above.
570-580	same as above.
580-590	1GLEY 8/1(light greenish gray) clay with shellrock and traces of 5Y 8/1(white) soft limestone.
590-600	5Y 8/1(white) limestone with shellrock traces and 1GLEY 8/1 clay traces.
600-610	same as above, no clay present.
610-620	same as above, but shellrock present.
620-630	5Y 8/1(white) limestone(hard) with shellrock and traces of microfossils.
630-640	5Y 8/2(pale yellow) limestone(hard) with shellrock and microfossils.

860-870	5Y 8/2 limestone(very hard) with shellrock and microfossils.
870-880	N8(very light gray) limestone with shellrock and microfossils.
880-890	same as above.

APPENDIX F
PRIMARY AND SECONDARY DRINKING WATER LABORATORY RESULTS

PUBLIC DRINKING WATER ANALYSIS REPORTING FORMAT

RECEIVED
FEB 09 1996
BLASLAND, BOUCK & LEE
BOCA RATON, FL

PUBLIC WATER SYSTEM INFORMATION (to be completed by system or lab)

System Name: Ft. Pierce Utilities I.D. #: 456 0490

Address: 206 South 6th St. Phone #: (407) 466-1600

Type (check one): ( ) Community ( ) Nontransient Noncommunity ( ) Noncommunity

SAMPLE INFORMATION (to be completed by sampler)

Sample Date (MMDDYY): 11/16/95 Sample Time: 1500

Sample Location (be specific): FB-3 WELL

Sampler Name and Phone: B. Austin (407) 466-1600

Sampler's Signature: _____ Title: Field sampler/Lab Tech

Check Type(s): ( ) Distribution ( ) Recheck of MCL ( ) Resample of Lab Invalidated Sample
( ) Clearance ( ) Thm Max Res Time ( ) Plant Tap
( ) Distrib entry pt (✓) Raw ( ) Composite of Multiple Sites--Attach a format for each site

LABORATORY CERTIFICATION INFORMATION (to be completed by lab) – ATTACH HRS ANALYTE SHEET

Lab Name: ENVIROMETRICS HRS #: 83214 Expiration Date: 6-30-96

Address: 683. SW 27TH AVE, VERO BEACH, FL Phone #: (407) 562-1968

Subcontracted Lab Name & HRS #: Karr to Southern 84269 – ATTACH HRS ANALYTE SHEET FOR SUBCONTRACTED LAB –

ANALYSIS INFORMATION (to be completed by lab) – SAMPLE NUMBER: 9512170 (Enviro) Southern 08525-01 Karr ID: 95110129-1

Date Sample(s) Received: 11/16/95 Group(s) Analyzed & Results attached for compliance with 62-550, F.A.C.:

( ) Nitrate Only ( ) Nitrite Only ( ) Asbestos Only ( ) Trihalomethanes

Inorganics-- w/o ASBESTOS
( ) All 17 (✓) Partial

Volatile Organics--
(✓) All 21 ( ) Partial

Secondaries--
(✓) All 14 ( ) Partial

Pesticide/PCBs--
(✓) All 30 ( ) Partial

Group I Unregulated--
(✓) All 13 ( ) Partial

Group II Unregulated--
(✓) All 23 ( ) Partial

Group III Unregulated--
(✓) All 11 ( ) Partial

Radiochemicals--
( ) Single Sample
( ) Qtrly Composite*

*Provide radiochemical sample dates & locations for each quarter

I, GRACE TREADWAY, do HEREBY CERTIFY that all attached analytical data are correct.

Signature _____

Title CHEMIST Date 12/04/95

COMPLIANCE INFORMATION (to be completed by State)

Sample Collection Satisfactory: _____ Sample Analysis Satisfactory: _____

Resample Requested for: _____ Reason: _____

Person notified to resample: _____ Date Notified: _____

DEP/HRS Reviewing Official: _____

Effective September 1994

Turbidity Analysis
62-550.310(3)
(PWS026)

South County Utilities
POE

Parameter ID	Name	Sample #	Result mg/l	Analytical Method	Det.Lt. Used	Analysis Date
0100	Turbidity	9512170	0.56	180.1	0.1	11/16

Inorganic Analysis
17-550.310(1)
(PWS030)

Parameter ID	Name	MCL mg/l	Sample #	Anal. Result mg/l	Method	MDL	Date
1005	Arsenic	.05	9512170	< 0.001	206.2	.001	11/29
1010	Barium	2	9512170	< 0.002	SM3113B	.002	11/21
1015	Cadmium	.005	9512170	< 0.0001	SM3113B	.0001	11/20
1020	Chromium	0.1	9512170	< 0.001	SM3113B	.001	11/28
1024	Cyanide	0.2	9512170	< 0.02	SN4500CNE	.02	11/27
1025	Fluoride	4	9512170	1.11	SM4500FC	0.1	12/01
1030	Lead	0.015	9512170	0.004	SM3113B	.001	11/20
1035	Mercury	0.002	9512170	< 0.0002	245.1	.0002	11/30
1036	Nickel	0.1	9512170	< 0.001	SM3113B	.001	11/28
1040	Nitrate,N	10	9512170	< 0.05	353.2	0.05	11/22
1041	Nitrite,N	1	9512170	< 0.05	354.1	0.05	11/17
1045	Selenium	0.05	9512170	0.002	SM3113B	.001	11/29
1052	Sodium	160	9512170	192	SM3111B	1.0	11/21
1074	Antimony	0.006	9512170	< 0.003	SM3113B	.003	11/17
1075	Beryllium (per HRS 84269)	0.004	9512170	LT 0.002	200.7	0.002	11/29
1085	Thallium	0.002	9512170	< 0.0007	200.9	.0007	11/17
1094	Asbestos	7 MFL	----	----	----	----	----

D-10

Secondary Chemical Analysis
62-550.320
(PWS031)

Ft. Pierce Utilities
Well FB-3

Parameter ID	Name	MCL mg/l	Sample #	Anal. Result mg/l	Method	MDL	Date
1002	Aluminum	0.2	9512170	0.063	SM3113B	0.001	11/28
1017	Chloride	250	9512170	282	SM4500CLB	1.0	11/21
1022	Copper	1	9512170	0.004	SM3113B	0.001	11/20
1025	Fluoride	2.0	9512170	1.1	SM4500FC	0.1	12/01
1028	Iron		9512170	0.017	SM3113B	0.001	11/20
1032	Manganese	0.05	9512170	< 0.001	SM3113B	0.001	11/20
1050	Silver	0.1	9512170	0.0002	SM3113B	0.0002	11/29
1055	Sulfate	250	9512170	167	375.4	1.0	11/20
1095	Zinc	5	9512170	0.03	289.1	0.001	11/17
1905	Color, PCU Color Units	15	9512170	0	SM2121B	0	11/16
1920	Odor,(total odor #)	3	9512170	24	SM2150	1.0	11/16
1925	pH, Lab (6.5-8.5)		9512170	7.65	150.1	0.01	11/16
1930	Total Dissolved Solids	500	9512170	866	160.1	0.1	11/20
2905	Foaming agents	0.5	9512170	0.06	425.1	0.05	11/17

KARR Environmental Inc.

1495 South Volusia Ave. Suite 101
Orange City, Florida 32763
904-775-0144 Fax 904-775-4470

LAB FORMAT FOR REPORTING DRINKING WATER ANALYSES
PUBLIC WATER SYSTEM INFORMATION (to be completed by system or lab)

System Name: H. Pierce Utilities I.D. #: 4560490

Address: _____ Phone #: 407-466-1600

Type (check one): (✓) Community ( ) Nontransient Noncommunity ( ) Noncommunity

SAMPLE INFORMATION (to be completed by sampler)

Sample Date (MMDDYY): 11/16/95 Sample Time: 1500

Sample Location (be specific): Well FB-3

Sampler Name and Phone: Bob Austin 407-466-1600

Sampler's Signature: _____ Title: Field Sampler / Lab Tech

Check Type(s): ( ) Distribution ( ) Recheck of MCL ( ) Resample of Lab Invalidated Sample
( ) Clearance ( ) Thm Max Res Time ( ) Plant Tap
( ) Distrib entry pt ( ) Raw ( ) Composite of Multiple Sites–Attach a format for each site

LABORATORY CERTIFICATION INFORMATION (to be completed by lab) – ATTACH HRS ANALYTE SHEET*

Lab Name: KARR Environmental , Inc. HRS #: 82472 Expiration Date: June 31, 1996

Address: 1495 S. Volusia Ave., Orange City Phone #: 904-775-0144

Subcontracted Lab HRS #: 84269 –ATTACH HRS ANALYTE SHEET FOR SUBCONTRACTED LAB, TOO *

ANALYSIS INFORMATION (to be completed by lab) – SAMPLE NUMBER: 95110129-1 (Southern 08525)
Date Sample (s) Received: 11-20-95 Group (s) Analyzed & Results attached for compliance with 62-550,F.A.C.:

( ) Nitrate Only	( ) Nitrite Only	( ) Asbestos Only	( ) Trihalomethanes
Inorganics– ( ) All 17 (✓) Partial	Volatile Organcis– (✓) All 21 ( ) Partial	Secondaries– ( ) All 14 ( ) Partial	Pesticide/PCBs– (✓) All 30 ( )Partial
Group I Unregulateds– (✓) All 13 ( ) Partial	Group II Unregulateds– (✓) All 23 ( ) Partial	Group III Unregulateds– (✓) All 11 ( ) Partial	Radiochemicals– ( ) Single Sample ( ) Qtrly Composite**

** Provide radiochemical sample dates & location for each quarter

I, Robert L. Sullivan, do HEREBY CERTIFY that all attached analytical data are correct.

Signature _____

Title Laboratory Manager Date 12-20-95

COMPLIANCE INFORMATION (to be completed by State)

Sample Collection Satisfactory: _____ Sample Analysis Satisfactory: _____

Resample Requested for: _____ Reason: _____

Person notified to resample: _____ Date Notified: _____

DEP/HRS Reviewing Official: _____

* All HRS lab # s and their HRS Analyte Sheet for labs performing the attached water analyses must be provided. Failure to do so will result in rejection of the analyses and possible enforcement against the public water system for failure to sample.

Effective January 1995

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FLORIDA 34677 813-855-1844

KARR Environmental
1495 South Volusia Avenue
Orange City, Florida 32774-1008

December 11, 1995
Project No. 08525

LABORATORY REPORT

Project Description: KARR Project No. 9511-129
Sample Description: 01 - Water, KARR No. 9511-129-1, sampled 11/16/95
Date Received: 11/21/95, 1315

- DEP Report Forms Attached

FHRS Environmental Lab No. E84129
FHRS Drinking Water Lab No. 84269
Comprehensive QA Plan No. 870317G

Francis I. Daniels
Laboratory Director

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

RADIOLOGICAL ANALYSIS

Public Water System I.D. Number: 4560490

Laboratory Sample Number: 4129

Contam. ID	PARAMETER	Analysis Results (pCi/L)	Analysis Error	Analytical Method	Analysis Date
4000	Gross Alpha	0.0	1.0	900.0	11/18/9

NOTE: Methods are from "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," USEPA, EPA-600/4-80-032, unless noted.

OFFICE OF RADIATION CONTROL • P.O. BOX 680069 • ORLANDO, FLORIDA

Southern Analytical
Project No. 08525
December 11, 1995

PESTICIDE & PCB CHEMICAL ANALYSIS
62-550.310(2)(c)
(PWS029)

Parameter ID	NAME (MCL ug/l)	Sample Number	Analysis Result(ug/l)	Analyt. Method	Analysis Date	MDL	Lab ID
2005	Endrin (2)	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2010	Lindane (.2)	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2015	Methoxychlor (40)	08525-01	0.2 U	EPA 508	11/22/95	0.2	84269
2020	Toxaphene (3)	08525-01	2 U	EPA 508	11/22/95	2	84269
2031	Dalapon (200)	08525-01	1 U	EPA 515.1	11/28/95	1	84269
2032	Diquat (20)	08525-01	4 U	EPA 549.1	11/22/95	4	84269
2033	Endothall (100)	08525-01	20 U	EPA 548	11/22/95	20	84269
2034	Glyphosate (700)	08525-01	10 U	EPA 547	11/29/95	10	84269
2035	Di(2-ethylhexyl)adipate (400)	08525-01	5 U	EPA 506	11/22/95	5	84269
2036	Oxamyl (Vydate) (200)	08525-01	1 U	EPA 531.1	11/29/95	1	84269
2037	Simazine (4)	08525-01	0.2 U	EPA 507	11/22/95	0.2	84269
2039	Di(2-ethylhexyl)phthalate (6)	08525-01	5 U	EPA 506	11/22/95	5	84269
2040	Picloram (500)	08525-01	0.2 U	EPA 515.1	11/28/95	0.2	84269
2041	Dinoseb (7)	08525-01	0.2 U	EPA 515.1	11/28/95	0.2	84269
2042	Hexachlorocyclopentadiene (50)	08525-01	0.1 U	EPA 505	11/27/95	0.1	84269
2046	Carbofuran (40)	08525-01	1 U	EPA 531.1	11/29/95	1	84269
2050	Atrazine (3)	08525-01	0.2 U	EPA 507	11/22/95	0.2	84269
2051	Alachlor (2)	08525-01	1 U	EPA 507	11/22/95	1	84269
2065	Heptachlor (.4)	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2067	Heptachlor epoxide (.2)	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2105	2,4-D (70)	08525-01	0.5 U	EPA 515.1	11/28/95	0.5	84269
2110	2,4,5-TP (Silvex) (50)	08525-01	0.05 U	EPA 515.1	11/28/95	0.05	84269
2274	Hexachlorobenzene (1)	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2306	Benzo(a)pyrene (.2)	08525-01	0.01 U	EPA 550	11/22/95	0.01	84269
2326	Pentachlorophenol (1)	08525-01	0.05 U	EPA 515.1	11/28/95	0.05	84269
2383	PCBs (.5)	08525-01	0.5 U	EPA 508	11/22/95	0.5	84269
2931	Dibromochloropropane (.2)	08525-01	0.005 U	EPA 504	11/27/95	0.005	84269
2946	Ethylene dibromide (.02)	08525-01	0.005 U	EPA 504	11/27/95	0.005	84269
2959	Chlordane (2)	08525-01	2 U	EPA 508	11/22/95	2	84269

U - Analyte was not detected; indicated concentration is method detection limit.

Southern Analytical
Project No. 08525
December 11, 1995

VOLATILE ORGANIC ANALYSIS
62-550.310(2)(b)
(PWS028)

Parameter ID	NAME (MCL ug/l)	Sample Number	Analysis Result(ug/l)	Analyt. Method	Analysis Date	MDL	Lab ID
2378	1,2,4-Trichlorobenzene (70)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2380	cis-1,2-Dichloroethene (70)	08525-01	0.2 U	EPA 502.2	11/27/95	0.2	84269
2955	Xylenes (Total) (10,000)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2964	Dichloromethane (5)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2968	o-Dichlorobenzene (600)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2969	p-Dichlorobenzene (75)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2976	Vinyl chloride (1)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2977	1,1-Dichloroethene (7)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2979	trans-1,2-Dichloroethene (100)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2980	1,2-Dichloroethane (3)	08525-01	0.2 U	EPA 502.2	11/27/95	0.2	84269
2981	1,1,1-Trichloroethane (200)	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2982	Carbon tetrachloride (3)	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2983	1,2-Dichloropropane (5)	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2984	Trichloroethene (3)	08525-01	0.2 U	EPA 502.2	11/27/95	0.2	84269
2985	1,1,2-Trichloroethane (5)	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2987	Tetrachloroethene (3)	08525-01	0.2 U	EPA 502.2	11/27/95	0.2	84269
2989	Monochlorobenzene (100)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2990	Benzene (1)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2991	Toluene (1,000)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2992	Ethylbenzene (700)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2996	Styrene (100)	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269

U - Analyte was not detected; indicated concentration is method detection limit.

Southern Analytical
Project No. 08525
December 11, 1995

UNREGULATED GROUP I ANALYSIS
62-550.405
(PWS035)

Parameter ID	NAME (MCL ug/l)	Sample Number	Analysis Result (ug/l)	Analyt. Method	Analysis Date	MDL	Lab ID
2021	Carbaryl	08525-01	1 U	EPA 531.1	11/29/95	1	84269
2022	Methomyl	08525-01	1 U	EPA 531.1	11/29/95	1	84269
2043	Aldicarb sulfoxide	08525-01	0.5 U	EPA 531.1	11/29/95	0.5	84269
2044	Aldicarb sulfone	08525-01	0.5 U	EPA 531.1	11/29/95	0.5	84269
2045	Metolachlor	08525-01	1 U	EPA 507	11/22/95	1	84269
2047	Aldicarb	08525-01	0.5 U	EPA 531.1	11/29/95	0.5	84269
2066	3-Hydroxycarbofuran	08525-01	1 U	EPA 531.1	11/29/95	1	84269
2077	Propachlor	08525-01	0.5 U	EPA 508	11/22/95	0.5	84269
2356	Aldrin	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2364	Dieldrin	08525-01	0.1 U	EPA 508	11/22/95	0.1	84269
2440	Dicamba	08525-01	0.05 U	EPA 515.1	11/28/95	0.05	84269
2595	Metribuzin	08525-01	0.5 U	EPA 507	11/22/95	0.5	84269

U - Analyte was not detected; indicated concentration is method detection limit.

Southern Analytical
Project No. 08525
December 11, 1995

UNREGULATED GROUP II ANALYSIS
62-550.410
(PWS034)

Parameter ID	NAME (MCL ug/l)	Sample Number	Analysis Result(ug/l)	Analyt. Method	Analysis Date	MDL	Lab ID
2210	Chloromethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2212	Dichlorodifluoromethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2214	Bromomethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2216	Chloroethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2218	Trichlorofluoromethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2251	Methyl-tert-butyl-ether	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2408	Dibromomethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2410	1,1-Dichloropropene	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2412	1,3-Dichloropropane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2413	1,3-Dichloropropene	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2414	1,2,3-Trichloropropane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2416	2,2-Dichloropropane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2941	Chloroform	08525-01	0.2 U	EPA 502.2	11/27/95	0.2	84269
2942	Bromoform	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2943	Bromodichloromethane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2944	Dibromochloromethane	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2965	o-Chlorotoluene	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2966	p-Chlorotoluene	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2967	m-Dichlorobenzene	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269
2978	1,1-Dichloroethane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2986	1,1,1,2-Tetrachloroethane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2988	1,1,2,2-Tetrachloroethane	08525-01	0.3 U	EPA 502.2	11/27/95	0.3	84269
2993	Bromobenzene	08525-01	0.5 U	EPA 502.2	11/27/95	0.5	84269

U - Analyte was not detected; indicated concentration is method detection limit.

Southern Analytical
Project No. 08525
December 11, 1995

UNREGULATED GROUP III ANALYSIS
62-550.415
(PWS036 & 037*)

Parameter ID	NAME (MCL ug/l)	Sample Number	Analysis Result(ug/l)	Analyt. Method	Analysis Date	MDL	Lab ID
2262	Isophorone	08525-01	5 U	EPA 609	11/22/95	5	84269
2270	2,4-Dinitrotoluene	08525-01	1 U	EPA 609	11/22/95	1	84269
2282	Dimethylphthalate	08525-01	5 U	EPA 506	11/22/95	5	84269
2284	Diethylphthalate	08525-01	5 U	EPA 506	11/22/95	5	84269
2290	Di-n-butylphthalate	08525-01	5 U	EPA 506	11/22/95	5	84269
2294	Butyl benzyl phthalate	08525-01	5 U	EPA 506	11/22/95	5	84269
9089	Di-n-octylphthalate	08525-01	5 U	EPA 506	11/22/95	5	84269
9108*	2-Chlorophenol	08525-01	5 U	EPA 604	11/22/95	5	84269
9112*	2-Methyl-4,6-dinitrophenol	08525-01	20 U	EPA 604	11/22/95	20	84269
9115*	Phenol	08525-01	5 U	EPA 604	11/22/95	5	84269
9116*	2,4,6-Trichlorophenol	08525-01	10 U	EPA 604	11/22/95	10	84269

U - Analyte was not detected; indicated concentration is method detection limit.

Southern Analytical
Project No. 08525
December 11, 1995

INORGANIC ANALYSIS
62-550.310(1)
(PWS030)

Parameter ID	NAME (MCL mg/l)	Sample Number	Analysis Result (mg/l)	Analyt. Method	Analysis Date	MDL	Lab ID
1075	Beryllium (0.004)	08525-01	0.002 U	EPA 200.7	11/29/95	0.002	84269

U - Analyte was not detected; indicated concentration is method detection limit.

SAFE DRINKING WATER ANALYTE SHEET

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

LABORATORY: SOUTHERN ANALYTICAL LABORATORY

CERTIFICATION NUMBER: 84269

DATE: MARCH 04, 1994

Supersedes previous analyte sheet dated: MARCH 2, 1993

X Indicates ANALYTE CERTIFIED

MICROBIOLOGY	METHODS
X Membrane Filter	SM909A
X Multiple tube Fermentation	SM908A
X HPC MUG	HPC-MUG
P/A	____
X Fecal/E.Coli	SM908C

PRIMARY INORGANIC	AA(FL)	AA(FUR)	ICP	OTHER
1. METALS				
X ANTIMONY	____	204.2	____	____
X ARSENIC	____	206.2	____	____
X BARIUM	208.1	____	200.7	____
X BERYLLIUM	____	210.2	200.7	____
X CADMIUM	____	213.2	200.7	____
X CHROMIUM	____	218.2	200.7	____
X LEAD	____	239.2	____	____
X MERCURY	____	____	____	245.1
X NICKEL	249.1	____	200.7	____
X SELENIUM	____	270.2	____	____
X SODIUM	273.1	____	200.7	____
X THALLIUM	____	279.2	____	____
2. LEAD AND COPPER				
X LEAD	____	239.2	____	____
X COPPER	220.1	____	200.7	____
3. NITRATE AND NITRITE				
X NITRATE	____	____	____	353.2
X NITRITE	____	____	____	353.2/354.1
X TOTAL NO2-NO3	____	____	____	353.2
4. CYANIDE				
X CYANIDE	____	____	____	335.2
5. FLUORIDE				
X FLUORIDE	____	____	____	340.2
6. ASBESTOS				
ASBESTOS	____	____	____	____

SECONDARY INORGANIC	AA(FL)	AA(FUR)	ICP	OTHER
X ALUMINUM	202.1	202.2	200.7	____
X CHLORIDE	____	____	____	325.2
X COLOR	____	____	____	SM204A
X COPPER	220.1	____	200.7	____
X FLUORIDE	____	____	____	340.2
X FOAMING AGENTS	____	____	____	SM512B
X IRON	236.1	____	200.7	____
X MANGANESE	243.1	____	200.7	____
X ODOR	____	____	____	SM207
X pH	____	____	____	150.1
X SILVER	272.1	272.2	200.7	____
X SULFATE	____	____	____	375.4
X TDS	____	____	____	160.1
X ZINC	289.1	____	200.7	____

PESTICIDES AND PCB'S	GC	GC/MS	HPLC
1. INSECTICIDES			
X ALACHLOR	507	____	____
X ATRAZINE	507	____	____
X CHLORDANE	508	____	____
X ENDRIN	508	____	____
X HEPTACHLOR	508	____	____
X HEPTACHLOR EPOXIDE	508	____	____
X LINDANE	508	____	____
X METHOXYCHLOR	508	____	____
X TOXAPHENE	508	____	____
X HEXACHLOROBENZENE	508	____	____
X HEXACHLOROCYCLOPENTADIENE	505	____	____
X SIMAZINE	507	____	____
2. HERBICIDES			
X 2,4-D	515.1	____	____
X PENTACHLOROPHENOL	515.1	____	____
X 2,4,5-TP (SILVEX)	515.1	____	____
X DALAPON	515.1	____	____
X DINOSEB	515.1	____	____
X PICLORAM	515.1	____	____
3. CARBAMATES			
X CARBOFURAN	____	____	531.1
X OXAMYL (VYDATE)	____	____	531.1
4. DISINFECTANT BY-PRODUCTS/VOC'S			
X 1,2-DIBROMO-3-CHLOROPROPANE	504		
X ETHYLENE DIBROMIDE	504		
5. MISCELLANEOUS SOC'S			
X DIQUAT	____	____	549
X ENDOTHALL	548	____	____
X GLYPHOSATE	____	____	547
6. PCB'S			
X DECACHLOROBIPHENYL	508	____	____
7. ADIPATES AND PHTHALATES			
X DI(2-ETHYLHEXYL) ADIPATE	506	____	____
X DI(2-ETHYLHEXYL) PHTHALATE	506	____	____
8. PAH			
X BENZO(a)PYRENE	____	____	550/.1

SAFE DRINKING WATER ANALYTE SHEET

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

LABORATORY: SOUTHERN ANALYTICAL LABORATORY

CERTIFICATION NUMBER: 84269

DATE: MARCH 04, 1994

Supersedes previous analyte sheet dated: MARCH 2, 1993

X indicates ANALYTE CERTIFIED

OTHER REGULATED CONTAMINANTS

1. VOLATILE ORGANIC COMPOUNDS	GC	GC/MS
X TRICHLOROETHYLENE	502.2	____
X TETRACHLOROETHYLENE	502.2	____
X CARBON TETRACHLORIDE	502.2	____
X VINYL CHLORIDE	502.2	____
X 1,1,1-TRICHLOROETHANE	502.2	____
X 1,2-DICHLOROETHANE	502.2	____
X BENZENE	502.2	____
X p-DICHLOROBENZENE	502.2	____
X 1,1-DICHLOROETHYLENE	502.2	____
X cis-1,2-DICHLOROETHYLENE	502.2	____
X 1,2-DICHLOROPROPANE	502.2	____
X ETHYLBENZENE	502.2	____
X CHLOROBENZENE	502.2	____
X o-DICHLOROBENZENE	502.2	____
X STYRENE	502.2	____
X TOLUENE	502.2	____
X trans-1,2-DICHLOROETHYLENE	502.2	____
X TOTAL XYLENES	502.2	____
X DICHLOROMETHANE	502.2	____
X 1,2,4-TRICHLOROBENZENE	502.2	____
X 1,1,2-TRICHLOROETHANE	502.2	____

2. TRIHALOMETHANES		
X BROMODICHLOROMETHANE	502.2	____
X BROMOFORM (TRIBROMOMETHANE)	502.2	____
X CHLORODIBROMOMETHANE	502.2	____
X CHLOROFORM (TRICHLOROMETHANE)	502.2	____
X TOTAL TRIHALOMETHANES	502.2	____

GROUP I UNREGULATED CONTAMINANTS

1. CARBAMATES	GC	GC/MS	HPLC
X ALDICARB	____	____	531.1
X ALDICARB SULFOXIDE	____	____	531.1
X ALDICARB SULFONE	____	____	531.1
X CARBARYL	____	____	531.1
X 3-HYDROXYCARBOFURAN	____	____	531.1
X METHOMYL	____	____	531.1

2. HERBICIDES			
X ALDRIN	508	____	____
X BUTACHLOR	507	____	____
X DICAMBA	515.1	____	____
X DIELDRIN	508	____	____
X METOLACHLOR	507	____	____
X METRIBUZIN	507	____	____
X PROPACHLOR	508	____	____

GROUP II UNREGULATED CONTAMINANTS

1. PURGEABLES	GC	GC/MS
X BROMOBENZENE	502.2	____
X BROMODICHLOROMETHANE	502.2	____
X BROMOFORM	502.2	____
X BROMOMETHANE	502.2	____
X CHLOROETHANE	502.2	____
X CHLOROFORM	502.2	____
X CHLOROMETHANE	502.2	____
X DIBROMOCHLOROMETHANE	502.2	____
X DICHLORODIFLUOROMETHANE	502.2	____
X p-CHLOROTOLUENE	502.2	____
X DIBROMOMETHANE	502.2	____
X 1,1-DICHLOROETHANE	502.2	____
X trans-1,3-DICHLOROPROPENE	502.2	____
X 1,3-DICHLOROPROPENE	502.2	____
X 1,3-DICHLOROPROPANE	502.2	____
X cis-1,3-DICHLOROPROPENE	502.2	____
X 2,2-DICHLOROPROPANE	502.2	____
X TRICHLOROFLUOROMETHANE	502.2	____
X 1,2,3-TRICHLOROPROPANE	502.2	____
X m-DICHLOROBENZENE	502.2	____
X 1,1,1,2-TETRACHLOROETHANE	502.2	____
X 1,1,2,2-TETRACHLOROETHANE	502.2	____
X METHYL tert-BUTYL ETHER	502.2	____
X 1,1-DICHLOROPROPENE	502.2	____
X o-CHLOROTOLUENE	502.2	____

2. BASE/NEUTRAL EXTRACTABLES		
X BUTYL BENZYL PHTHALATE	506	____
X DI-n-BUTYL PHTHALATE	506	____
X DIETHYL PHTHALATE	506	____
X DIMETHYL PHTHALATE	506	____
X 2,4-DINITROTOLUENE	609	____
X DI-n-OCTYL PHTHALATE	506	____
X ISOPHORONE	609	____

3. ACID EXTRACTABLES		
X 2-CHLOROPHENOL	604	____
X 2-METHYL-4,6-DINITROPHENOL	604	____
X PHENOL	604	____
X 2,4,6-TRICHLOROPHENOL	604	____

DIOXIN

____2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN ____ ____

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

LABORATORY: ENVIROMETRICS

CERTIFICATION NUMBER: 83214 EPA: FL00208
DATE: JULY 21, 1998
SUPERSEDES PREVIOUS ANALYTE SHEET DATED: JUNE 9, 1998

OTHER REGULATED CONTAMINANTS

1. VOLATILE ORGANIC COMPOUNDS

		GC	GC/MS
X	TRICHLOROETHYLENE	502.2	
X	TETRACHLOROETHYLENE	502.2	
X	CARBON TETRACHLORIDE	502.2	
X	VINYL CHLORIDE	502.2	
X	1,1,1-TRICHLOROETHANE	502.2	
X	1,2-DICHLOROETHANE	502.2	
X	BENZENE	502.2	
X	p-DICHLOROBENZENE	502.2	
X	1,1-DICHLOROETHYLENE	502.2	
X	cis-1,2-DICHLOROETHYLENE	502.2	
X	1,2-DICHLOROPROPANE	502.2	
X	ETHYLBENZENE	502.2	
X	CHLOROBENZENE	502.2	
X	o-DICHLOROBENZENE	502.2	
X	STYRENE	502.2	
X	TOLUENE	502.2	
X	trans-1,2-DICHLOROETHYLENE	502.2	
X	TOTAL XYLENES	502.2	
X	DICHLOROMETHANE	502.2	
X	1,2,4-TRICHLOROBENZENE	502.2	
X	1,1,2-TRICHLOROETHANE	502.2	

2. TRIHALOMETHANES

X	BROMODICHLOROMETHANE	502.2	
X	BROMOFORM	502.2	
X	CHLORODIBROMOMETHANE	502.2	
X	CHLOROFORM	502.2	
X	TOTAL TRIHALOMETHANES	502.2	

GROUP I UNREGULATED CONTAMINANTS

1. CARBAMATES

		GC	GC/MS	HPLC
_	ALDICARB			
_	ALDICARB SULFOXIDE			
_	ALDICARB SULFONE			
_	CARBARYL			
_	3-HYDROXYCARBOFURAN			
_	METHOMYL			

2. HERBICIDES

_	ALDRIN			
_	BUTACHLOR			
_	DICAMBA			
_	DIELDRIN			
_	METOLACHLOR			
_	METRIBUZIN			
_	PROPACHLOR			

GROUP II UNREGULATED CONTAMINANTS

		GC	GC/MS
_	BROMOBENZENE		
X	BROMODICHLOROMETHANE	502.2	
X	BROMOFORM	502.2	
_	BROMOMETHANE		
_	CHLOROETHANE		
_	CHLOROFORM		
_	CHLOROMETHANE		
X	DIBROMOCHLOROMETHANE	502.2	
_	DICHLORODIFLUOROMETHANE		
_	p-CHLOROTOLUENE		
_	DIBROMOMETHANE		
_	1,1-DICHLOROETHANE		
_	1,3-DICHLOROPROPENE		
_	1,3-DICHLOROPROPANE		
_	2,2-DICHLOROPROPANE		
_	TRICHLOROFLUOROMETHANE		
_	1,2,3-TRICHLOROPROPANE		
_	m-DICHLOROBENZENE		
_	1,1,1,2-TETRACHLOROETHANE		
_	1,1,2,2-TETRACHLOROETHANE		
_	METHYL tert-BUTYL ETHER		
_	1,1-DICHLOROPROPENE		
_	o-CHLOROTOLUENE		

GROUP III UNREGULATED CONTAMINANTS

1. BASE/NEUTRAL EXTRACTABLES

_	BUTYL BENZYL PHTHALATE		
_	DI-n-BUTYL PHTHALATE		
_	DIETHYL PHTHALATE		
_	DIMETHYL PHTHALATE		
_	2,4-DINITROTOLUENE		
_	DI-n-OCTYL PHTHALATE		
_	ISOPHORONE		

2. ACID EXTRACTABLES

_	2-CHLOROPHENOL		
_	2-METHYL-4,6-DINITROPHENOL		
_	PHENOL		
_	2,4,6-TRICHLOROPHENOL		

P.O. BOX 210 • JACKSONVILLE, FLORIDA 32231

LAWTON CHILES, GOVERNOR

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

LABORATORY: ENVIROMETRICS CERTIFICATION NUMBER: 83214 EPA: FL00205
DATE: JULY 21, 1998
SUPERSEDES PREVIOUS ANALYTE SHEET DATED: JUNE 9, 1995

MICROBIOLOGY METHODS

X	Membrane Filter	SM9222B
_	Multiple Tube Fermentation	
X	Fecal/E. coli	SM9221E, (1a); MUG
X	MMO-MUG	SM9223
_	P/A	

PRIMARY INORGANIC

	1. METALS	AA(FUR)	ICP	ICP/MS	OTHER
X	ANTIMONY	SM3113B			
X	ARSENIC	SM3113B			
X	BARIUM	SM3113B			SM3111D
_	BERYLLIUM				
X	CADMIUM	SM3113B			
X	CHROMIUM	SM3113B			
X	LEAD	SM3113B			
X	MERCURY				245.1
X	NICKEL	SM3113B			SM3111B
X	SELENIUM	SM3113B			
X	SODIUM				SM3111B
X	THALLIUM	200.9			

	2. LEAD AND COPPER				
X	LEAD	SM3113B			
X	COPPER	SM3113B			SM3111B

	3. CYANIDE	IC	ISE	UV-VIS	OTHER
X	CYANIDE			SM4500CN E	

	4. NITRATE AND NITRITE				
X	NITRATE			353.2	
X	NITRITE			353.2, 354.1	
X	TOTAL NO2-NO3			353.2	

	5. FLUORIDE				
X	FLUORIDE		SM4500F C		

	6. ASBESTOS				
_	ASBESTOS				

SECONDARY INORGANIC

		AA(FUR)	ICP	UV-VIS	OTHER
X	ALUMINUM	SM3113B			SM3111D
X	CHLORIDE				SM4500CI- B
X	COLOR			SM2120B	
X	COPPER	SM3113B			SM3111B
X	FLUORIDE				SM4500F C
X	FOAMING AGENTS			SM5540C	
X	IRON	SM3113B			SM3111B
X	MANGANESE	SM3113B			
X	ODOR				SM2150B
X	pH				150.1
X	SILVER	SM3113B			SM3111B
X	SULFATE				375.4
X	TDS				SM2540C
X	ZINC				SM3111B

	PESTICIDES AND PCB'S	GC	GC/MS	HPLC
	1. INSECTICIDES			
_	ALACHLOR			
_	ATRAZINE			
_	CHLORDANE			
_	ENDRIN			
_	HEPTACHLOR			
_	HEPTACHLOR EPOXIDE			
_	LINDANE			
_	METHOXYCHLOR			
_	TOXAPHENE			
_	HEXACHLOROBENZENE			
_	HEXACHLOROCYCLOPENTADIENE			
_	SIMAZINE			
	2. HERBICIDES			
_	2,4-D			
_	PENTACHLOROPHENOL			
_	2,4,5-TP (SILVEX)			
_	DALAPON			
_	DINOSEB			
_	PICLORAM			
	3. CARBAMATES			
_	CARBOFURAN			
_	OXAMYL (VYDATE)			
	4. DISINFECTANT BY-PRODUCTS/VOC'S			
_	1,2-DIBROMO-3-CHLOROPROPANE			
_	ETHYLENE DIBROMIDE			
	5. MISCELLANEOUS SOC'S			
_	DIQUAT			
_	ENDOTHALL			
_	GLYPHOSATE			
	6. PCB'S			
_	AROCHLORS			
_	DECACHLOROBIPHENYL			
	7. ADIPATES AND PHTHALATES			
_	DI(2-ETHYLHEXYL) ADIPATE			
_	DI(2-ETHYLHEXYL) PHTHALATE			
	8. PAH			
_	BENZO(a)PYRENE			
	DIOXIN			
_	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN			

P.O. BOX 210 • JACKSONVILLE, FLORIDA 32231

LAWTON CHILES, GOVERNOR

PUBLIC DRINKING WATER ANALYSIS REPORTING FORMAT

PUBLIC WATER SYSTEM INFORMATION (to be completed by system or lab)

System Name: Ft. Pierce Utilities I.D. #: 456 0490

Address: 206 South 6th St. Phone #: (407)466-1600

Type (check one): ( ) Community ( ) Nontransient Noncommunity ( ) Noncommunity

SAMPLE INFORMATION (to be completed by sampler)

Sample Date (MMDDYY): 10/1995 Sample Time: 1300

Sample Location (be specific): Well FB-4

Sampler Name and Phone: Jim Dalberg (407) 562-1968

Sampler's Signature: Title: Field Supervisor

Check Type(s): ( ) Distribution ( ) Recheck of MCL ( ) Resample of Lab Invalidated Sample
( ) Clearance ( ) Thm Max Res Time ( ) Plant Tap
( ) Distrib entry pt (X) New ( ) Composite of Multiple Sites--Attach a format for each site

LABORATORY CERTIFICATION INFORMATION (to be completed by lab) – ATTACH HRS ANALYTE SHEET

Lab Name: ENVIROMETRICS HRS #: 83214 Expiration Date: 6-30-96

Address: 683. SW 27TH AVE, VERO BEACH, FL Phone #: (407) 562-1968

Subcontracted Lab Name & HRS #: KNL/84252 Southern 84216 – ATTACH HRS ANALYTE SHEET FOR SUBCONTRACTED LAB –

ANALYSIS INFORMATION (to be completed by lab) – SAMPLE NUMBER: 9511273 Envirometrics KNL/85985

Date Sample(s) Received: 10/19/95 Group(s) Analyzed & Results attached for compliance with 62-550, F.A.C.: Southern/9510110-1

( ) Nitrate Only	( ) Nitrite Only	( ) Asbestos Only	( ) Trihalomethanes
Inorganics-- ( ) All 17 (X) Partial	Volatile Organics-- ( ) All 21 ( ) Partial	Secondaries-- (X) All 14 ( ) Partial	Pesticide/PCBs-- ( ) All 30 ( ) Partial
Group I Unregulated-- ( ) All 13 ( ) Partial	Group II Unregulated-- ( ) All 23 ( ) Partial	Group III Unregulated-- ( ) All 11 ( ) Partial	Radiochemicals-- (X) Single Sample ( ) Qtrly Composite*

*Provide radiochemical sample dates & locations for each quarter

I, GRACE TREADWAY, do HEREBY CERTIFY that all attached analytical data are correct.

Signature

Title CHEMIST Date 11/17/95

COMPLIANCE INFORMATION (to be completed by State)

Sample Collection Satisfactory: _____ Sample Analysis Satisfactory: _____

Resample Requested for: _____ Reason: _____

Person notified to resample: _____ Date Notified: _____

DEP/HRS Reviewing Official: _____

Effective September 1994

Turbidity Analysis
62-550.310(3)
(PWS026)

Ft. Pierce Utilities
Well FB4

Parameter ID	Name	Sample #	Result mg/l	Analytical Method	Det.Lt. Used	Analysis Date
0100	Turbidity	9511273	0.27	180.1	0.1	10/19

Inorganic Analysis
17-550.310(1)
(PWS030)

Parameter ID	Name	MCL mg/l	Sample #	Anal. Result mg/l	Method	MDL	Date
1005	Arsenic	.05	9511273	0.009	SM3113B	.001	10/25
1010	Barium	2	9511273	0.015	SM3111B	.002	10/26
1015	Cadmium	.005	9511273	< 0.0002	SM3113B	.0002	11/03
1020	Chromium	0.1	9511273	< 0.001	SM3113B	.001	10/25
1024	Cyanide	0.2	9511273	< 0.020	SN4500CNE	.02	10/23
1025	Fluoride	4	9511273	1.19	SM4500FC	0.1	10/26
1030	Lead	0.015	9511273	< 0.001	SM3113B	.001	10/24
1035	Mercury	0.002	9511273	< 0.0002	245.1	.0002	11/03
1036	Nickel	0.1	9511273	< 0.001	SM3113B	.001	10/26
1040	Nitrate,N	10	9511273	0.06	353.2	0.05	10/25
1041	Nitrite,N	1	9511273	< 0.05	354.1	0.05	10/20
1045	Selenium	0.05	9511273	< 0.002	SM3113B	.002	10/25
1052	Sodium	160	9511273	209	SM3111B	1.0	10/23
1074	Antimony	0.006	9511273	< 0.002	SM3113B	.002	10/31
1075	Beryllium (per HRS 84269)	0.004	9511273	< 0.002	210.2	.002	10/27
1085	Thallium	0.002	9511273	< 0.0007	SM3113B	.0007	10/31
1094	Asbestos	7 MFL	----	-----		---	

D-10

Secondary Chemical Analysis
62-550.320
(PWS031)

Ft. Pierce Utilities
Well FB4

Parameter ID	Name	MCL mg/l	Sample #	Anal. Result mg/l	Method	MDL	Date
1002	Aluminum	0.2	9511273	0.178	SM3113B	0.001	10/26
1017	Chloride	250	9511273	261	SM4500CLB	1.0	10/23
1022	Copper	1	9511273	< 0.001	SM3113B	0.001	10/24
1025	Fluoride	2.0	9511273	1.19	SM4500FC	0.1	10/26
1028	Iron		9511273	0.01	SM3111B	0.001	10/24
1032	Manganese	0.05	9511273	< 0.001	SM3113B	0.001	10/26
1050	Silver	0.1	9511273	< 0.0002	SM3113B	.0002	11/02
1055	Sulfate	250	9511273	200	375.4	1.0	10/30
1095	Zinc	5	9511273	< 0.001	SM3111B	0.001	10/26
1905	Color, PCU Color Units	15	9511273	0	SM2121B	0	10/19
1920	Odor,(total odor #)	3	9511273	100	SM2150	1.0	10/19
1925	pH, Lab (6.5-8.5)		9511273	7.84	150.1	0.01	10/19
1930	Total Dissolved Solids	500	9511273	866	2540C	0.1	10/24
2905	Foaming agents	0.5	9511273	0.16	SM5540C	0.05	10/20
	Hydrogen Sulfide		9511273	4.66	376.1	0.02	10/20

Envirometrics

KNL LABORATORY SERVICES
P.O. Box 1833
Tampa, Florida 33601
(813) 229-2879
Fax (813) 229-0002

PUBLIC DRINKING WATER ANALYSIS REPORT

PUBLIC WATER SYSTEM INFORMATION (to be completed by system or sampler)

System Name: FT. PIERCE UTILITIES I.D. #: 4560490

Address: Ps. Bx. 3171 Phone #: 407 466 1600

Type (check one): (✓)Community ( )Noncommunity ( )Nontransient Noncommunity

SAMPLE INFORMATION (to be completed by sampler)

Sample Date (MMDDYY) 10/19/95 Sample Time: 1300

Sample Location (be specific): WELL FB-4

Sampler Name and Phone: JAMES DALBERG 407 562 1768

Sampler's Signature: James T. D Title: FIELD SUPERV

Check Type(s):
( ) Distribution ( ) Recheck of MCL (✓) Raw
( ) Resample ( ) Clearance ( ) Thm Max Res Time
( ) Plant Tap ( ) Distrib entry pt
( ) Composite of Multiple Sites--Attach a format for each site

LABORATORY CERTIFICATION INFORMATION(to be completed by lab) -- Attach Analyte Sheet

Lab Name: KNL Laboratory Services HRS#: 84252 Expiration Date: June Renewal
Address: PO Box 1833, Tampa, FL 33601 Phone #: 813-229-2879

Subcontracted Lab HRS #:_____ Groups Analyzed:_____

Subcontracted Lab HRS #:_____ Groups Analyzed:_____

ANALYSIS INFORMATION(to be completed by lab) -- KNL Sample No. 85985

Date Sample(s) Received:_____ Group(s) Analyzed:

( ) Nitrate/Nitrite Only ( ) Asbestos Only ( ) Trihalomethanes [field Cl, _____]

Inorganics--
( ) All 17
( ) All except asbestos
( ) Partial

Volatile Organics--
( ) All 21
( ) Partial

Secondaries--
( ) All 14
( ) Partial [field pH _____]

Pesticides & PCB's--
( ) All 30
( ) All except dioxin
( ) Partial

Group I Unregulateds--
( ) All 13
( ) Partial

Group II Unregulateds--
( ) All 23
( ) Partial

Group III Unregulateds--
( ) All 11
( ) Partial

Radiochemicals--
(✓) Single Sample
( ) Qtrly Composite*

*Provide radiochemical sample dates & locations for each quarter

I, Garrett McGibbon, do HEREBY CERTIFY that all attached analytical data are correct.

Signature Garrett McGibbon Title: Laboratory Mgr. Date: NOV -2 1995

COMPLIANCE INFORMATION(to be completed by State)
Sample Collection Satisfactory_____ Sample Analysis Satisfactory_____
Resample Requested for_____ Reason:_____
Person notified to resample:_____ Date Notified_____
DEP/HRS Reviewing Official_____

Effective 9/94

RADIOCHEMICAL ANALYSIS

62-550.310(4)

(PWS033)

Parameter ID	Name	Sample Number	Analysis Result (pCi/l)	Analytical Method	Analysis Error	Analysis Date
4000	Gross Alpha	85985	4.5	EPA 900.0	± 1.7	10-31-95
4100	Gross Beta	85985	15.5	EPA 900.0	± 1.8	10-31-95

Alpha Standard: Th-230
Beta Standard: Cs-137

KARR Environmental Inc.

1495 South Volusia Ave. Suite 101
Orange City, Florida 32763
904-775-0144 Fax 904-775-4470

LAB FORMAT FOR REPORTING DRINKING WATER ANALYSES
PUBLIC WATER SYSTEM INFORMATION (to be completed by system or lab)

System Name: H. Pierce Utl. I.D. #: 4560490

Address: _____ Phone #: _____

Type (check one): ( ) Community ( ) Nontransient Noncommunity ( ) Noncommunity

SAMPLE INFORMATION (to be completed by sampler)

Sample Date (MMDDYY) 10 19 95 Sample Time: 1300

Sample Location (be specific): Well FB 4

Sampler Name and Phone: Jim Dalbery

Sampler's Signature: _____ Title: Field Supervisor

Check Type(s): ( ) Distribution ( ) Recheck of MCL ( ) Resample of Lab Invalidated Sample
( ) Clearance ( ) Thm Max Res Time ( ) Plant Tap
( ) Distrib entry pt ( ) Raw ( ) Composite of Multiple Sites--Attach a format for each site

LABORATORY CERTIFICATION INFORMATION (to be completed by lab) -- ATTACH HRS ANALYTE SHEET*

Lab Name: KARR Environmental , Inc. HRS #: 82472 Expiration Date: June 31, 1996

Address: 1495 S. Volusia Ave., Orange City Phone #: 904-775-0144

Subcontracted Lab HRS #: 84269 -ATTACH HRS ANALYTE SHEET FOR SUBCONTRACTED LAB, TOO *

ANALYSIS INFORMATION (to be completed by lab) -- SAMPLE NUMBER: 9510110_1
Date Sample (s) Received: 10_23_95 Group (s) Analyzed & Results attached for compliance with 62-550,F.A.C.:

( ) Nitrate Only ( ) Nitrite Only ( ) Asbestos Only ( ) Trihalomethanes

Inorganics--
( ) All 17 ( ) Partial

Volatile Organics--
( ) All 21 ( ) Partial

Secondaries--
( ) All 14 ( ) Partial

Pesticide/PCBs--
( ) All 30 ( )Partial

Group I Unregulateds--
( ) All 13 ( ) Partial

Group II Unregulateds--
( ) All 23 ( ) Partial

Group III Unregulateds--
( ) All 11 ( ) Partial

Radiochemicals--
( ) Single Sample
( ) Qtrly Composite**

** Provide radiochemical sample dates & location for each quarter

I, Robert L. Sullivan do HEREBY CERTIFY that all attached analytical data are correct.

Signature Robert L. Sullivan

Title Laboratory Manager Date 11_14_95

COMPLIANCE INFORMATION (to be completed by State)

Sample Collection Satisfactory: _____ Sample Analysis Satisfactory: _____

Resample Requested for: _____ Reason: _____

Person notified to resample: _____ Date Notified: _____

DEP/HRS Reviewing Official: _____

* All HRS Lab #'s and their HRS Analyte Sheet for labs performing the attached water analyses must be provided. Failure to do so will result in rejection of the analyses and possible enforcement against the public water system for failure to sample.

Effective January 1995

ENVIRONMENTAL CERTIFICATION E83323 QA PLAN 910047 G DRINKING WATER CERTIFICATION

CONTINUE FROM PREVIOUS PAGE 001

X Multiple Tube Fermentation	SM9DDA
X MMO MUG	MMO-MUG
P/A	____
X Fecal/E.Coli	SM908C

PRIMARY INORGANIC	AA(FL)	AA(FUR)	ICP	OTHER
1. METALS				
X ANTIMONY	____	204.2	____	____
X ARSENIC	____	206.2	____	____
X BARIUM	208.1	____	200.7	____
X BERYLLIUM	____	210.2	200.7	____
X CADMIUM	____	213.2	200.7	____
X CHROMIUM	____	218.2	200.7	____
X LEAD	____	239.2	____	____
X MERCURY	____	____	____	245.1
X NICKEL	249.1	____	200.7	____
X SELENIUM	____	270.2	____	____
X SODIUM	273.1	____	200.7	____
X THALLIUM	____	279.2	____	____
2. LEAD AND COPPER				
X LEAD	____	239.2	____	____
X COPPER	220.1	____	200.7	____
3. NITRATE AND NITRITE				
X NITRATE	____	____	____	353.2
X NITRITE	____	____	____	353.2/354.1
X TOTAL NO2-NO3	____	____	____	353.2
4. CYANIDE				
X CYANIDE	____	____	____	335.2
5. FLUORIDE				
X FLUORIDE	____	____	____	340.2
6. ASBESTOS				
ASBESTOS	____	____	____	____

SECONDARY INORGANIC	AA(FL)	AA(FUR)	ICP	OTHER
X ALUMINUM	202.1	202.2	200.7	____
X CHLORIDE	____	____	____	325.2
X COLOR	____	____	____	SM204A
X COPPER	220.1	____	200.7	____
X FLUORIDE	____	____	____	340.2
X FOAMING AGENTS	____	____	____	SM512B
X IRON	236.1	____	200.7	____
X MANGANESE	243.1	____	200.7	____
X ODOR	____	____	____	SM207
X pH	____	____	____	150.1
X SILVER	272.1	272.2	200.7	____
X SULFATE	____	____	____	375.4
X TDS	____	____	____	160.1
X ZINC	289.1	____	200.7	____

PESTICIDES AND PCB'S	GC	GC/MS	HPLC
1. INSECTICIDES			
X ALACHLOR	507	____	____
X ATRAZINE	507	____	____
X CHLORDANE	508	____	____
X ENDRIN	508	____	____
X HEPTACHLOR	508	____	____
X HEPTACHLOR EPOXIDE	508	____	____
X LINDANE	508	____	____
X METHOXYCHLOR	508	____	____
X TOXAPHENE	508	____	____
X HEXACHLOROBENZENE	508	____	____
X HEXACHLOROCYCLOPENTADIENE	505	____	____
X SIMAZINE	507	____	____
2. HERBICIDES			
X 2,4-D	515.1	____	____
X PENTACHLOROPHENOL	515.1	____	____
X 2,4,5-TP (SILVEX)	515.1	____	____
X DALAPON	515.1	____	____
X DINOSEB	515.1	____	____
X PICLORAM	515.1	____	____
3. CARBAMATES			
X CARBOFURAN	____	____	531.1
X OXAMYL (VYDATE)	____	____	531.1
4. DISINFECTANT BY-PRODUCTS/VOC'S			
X 1,2-DIBROMO-3-CHLOROPROPANE	504		
X ETHYLENE DIBROMIDE	504		
5. MISCELLANEOUS SOC'S			
X DIQUAT	____	____	549
X ENDOTHALL	548	____	____
X GLYPHOSATE	____	____	547
6. PCB'S			
X DECACHLOROBIPHENYL	508	____	____
7. ADIPATES AND PHTHALATES			
X DI(2-ETHYLHEXYL) ADIPATE	506	____	____
X DI(2-ETHYLHEXYL) PHTHALATE	506	____	____
8. PAH			
X BENZO(a)PYRENE	____	____	550/.1

SAFE DRINKING WATER ANALYTE SHEET

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

LABORATORY: ENVIROMETRICS — CERTIFICATION NUMBER: 83214 EPA: FL80206
DATE: JULY 21, 1998
SUPERSEDES PREVIOUS ANALYTE SHEET DATED: JUNE 9, 1998

MICROBIOLOGY	METHODS
X Membrane Filter	SM9222B
_ Multiple Tube Fermentation	
X Fecal/E. coli	SM9221E, (1a); MUG
X MMO-MUG	SM9223
_ P/A	

PRIMARY INORGANIC

1. METALS

	AA(FUR)	ICP	ICP/MS	OTHER
X ANTIMONY	SM3113B			
X ARSENIC	SM3113B			
X BARIUM	SM3113B			SM3111D
_ BERYLLIUM				
X CADMIUM	SM3113B			
X CHROMIUM	SM3113B			
X LEAD	SM3113B			
X MERCURY				245.1
X NICKEL	SM3113B			SM3111B
X SELENIUM	SM3113B			
X SODIUM				SM3111B
X THALLIUM	200.9			

2. LEAD AND COPPER

X LEAD	SM3113B			
X COPPER	SM3113B			SM3111B

3. CYANIDE

	IC	ISE	UV-VIS	OTHER
X CYANIDE			SM4500CN E	

4. NITRATE AND NITRITE

X NITRATE			353.2	
X NITRITE			353.2, 354.1	
X TOTAL NO2-NO3			353.2	

5. FLUORIDE

X FLUORIDE		SM4500F C		

6. ASBESTOS

_ ASBESTOS				

SECONDARY INORGANIC

	AA(FUR)	ICP	UV-VIS	OTHER
X ALUMINUM	SM3113B			SM3111D
X CHLORIDE				SM4500CL- B
X COLOR			SM2120B	
X COPPER	SM3113B			SM3111B
X FLUORIDE				SM4500F C
X FOAMING AGENTS			SM5540C	
X IRON	SM3113B			SM3111B
X MANGANESE	SM3113B			
X ODOR				SM2150B
X pH				150.1
X SILVER	SM3113B			SM3111B
X SULFATE				375.4
X TDS				SM2540C
X ZINC				SM3111B

PESTICIDES AND PCB'S	GC	GC/MS	HPLC
1. INSECTICIDES			
_ ALACHLOR			
_ ATRAZINE			
_ CHLORDANE			
_ ENDRIN			
_ HEPTACHLOR			
_ HEPTACHLOR EPOXIDE			
_ LINDANE			
_ METHOXYCHLOR			
_ TOXAPHENE			
_ HEXACHLOROBENZENE			
_ HEXACHLOROCYCLOPENTADIENE			
_ SIMAZINE			
2. HERBICIDES			
_ 2,4-D			
_ PENTACHLOROPHENOL			
_ 2,4,5-TP (SILVEX)			
_ DALAPON			
_ DINOSEB			
_ PICLORAM			
3. CARBAMATES			
_ CARBOFURAN			
_ OXAMYL (VYDATE)			
4. DISINFECTANT BY-PRODUCTS/VOC'S			
_ 1,2-DIBROMO-3-CHLOROPROPANE			
_ ETHYLENE DIBROMIDE			
5. MISCELLANEOUS SOC'S			
_ DIQUAT			
_ ENDOTHALL			
_ GLYPHOSATE			
6. PCB'S			
_ AROCHLORS			
_ DECACHLOROBIPHENYL			
7. ADIPATES AND PHTHALATES			
_ DI(2-ETHYLHEXYL) ADIPATE			
_ DI(2-ETHYLHEXYL) PHTHALATE			
8. PAH			
_ BENZO(a)PYRENE			
DIOXIN			
_ 2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN			

P.O. BOX 210 • JACKSONVILLE, FLORIDA 32231