APPLICATION FOR MODIFICATION OF WATER USE PERMIT # 50-00365-W

APRIL 15, 1988

SEACOAST UTILITIES
4200 HOOD ROAD
PALM BEACH GARDENS, FLORIDA 33410

TABLE A

DESCRIPTION OF WELLS

NORTH PALM BEACH WELLFIELD

WELL NO.	RR 1	RR 2	RR 3	RR 4
Map Designation	1	2	3	4
Existing/Proposed	E	E	E	E
Diameter (Inches)	10"	10"	10"	12"
Total Depth	147	140	145	161
Cased Depth	85'	?	103'	131'
Screened Interval	?	?	?	30'
Pumped or Flowing	P	P	P	P
Working Valve If Artesian (Yes/No)	NA	NA	NA	NA
Pump Manufacturer and Model No.	Deming 6"	Deming 6"	Deming 6"	Layne 8"
Pump (Centrifugal, Type Jet, Deep Jet, Turbine, etc.) VT = Vertical Turbine	VT	VT	VT	VT
Intake Depth (NGVD)	NA	NA	NA	NA
Pump Capacity (GPM at__FT of head at__PSI)	500 100'	350 100'	400 100'	600 100'
Active (Yes/No)	Y	Y	Y	Y
Year Drilled	1966	1956	1966	1985
Type of Meter	None	None	None	None
Florida Plane Coordinates	See Location Map			

TABLE A

DESCRIPTION OF WELLS

NORTH PALM BEACH WELLFIELD

WELL NO.	RR 5	RR 6	RR 7	RR 8
Map Designation	5	6	7	8
Existing/Proposed	E	E	E	E
Diameter (Inches)	12"	12"	12"	12"
Total Depth	180'	80'	180'	180'
Cased Depth	130'	?	130'	135'
Screened Interval	30'	?	30'	30'
Pumped or Flowing	P	P	P	P
Working Valve If Artesian (Yes/No)	NA	NA	NA	NA
Pump Manufacturer and Model No.	Layne 8"	Deming 6"	Layne 8"	Layne 8"
Pump (Centrifugal, Type Jet, Deep Jet, Turbine, etc.) VT = Vertical Turbine	VT	VT	VT	VT
Intake Depth (NGVD)	NA	NA	NA	NA
Pump Capacity (GPM at FT of head at PSI)	600 100'	350 100'	600 100'	600 100'
Active (Yes/No)	Y	Y	Y	Y
Year Drilled	1987	1956	1987	1987
Type of Meter RP=Rockwell Propeller	RP	None	RP	RP
Florida Plane Coordinates	See Location Map			

TABLE A

DESCRIPTION OF WELLS

OLD DIXIE WELLFIELD

WELL NO.	RR 9*	RR 10	RR 11	RR 12
Map Designation	9	10	11	12
Existing/Proposed	E	E	E	E
Diameter (Inches)	10"	10"	10"	10"
Total Depth	90'	80'	78'	100'
Cased Depth	50'	50'	50'	?
Screened Interval	?	?	?	?
Pumped or Flowing	P	P	P	P
Working Valve If Artesian (Yes/No)	NA	NA	NA	NA
Pump Manufacturer and Model No.	No Pump	No Pump	U.S. 6"	No Pump
Pump (Centrifugal, Type Jet, Deep Jet, Turbine, etc.) VT= Vertical Turbine	NA	NA	VT	NA
Intake Depth (NGVD)	NA	NA	NA	NA
Pump Capacity (GPM at___FT of head at___PSI)	NA	NA	500 100'	NA
Active (Yes/No)	N	N	Standby	N
Year Drilled	1962	1962	1962	1969
Type of Meter	None	None	None	None
Florida Plane Coordinates	SEE	LOCATION	MAP	

*NOTE: Well #9 site sold to Bev Smith Ford in 1988

TABLE A

DESCRIPTION OF WELLS

OLD DIXIE WELLFIELD

WELL NO.	RR 13	RR 14	RR 15	RR 16	RR 17
Map Designation	13	14	15	16	17
Existing/Proposed	E	E	E	E	E
Diameter (Inches)	10"	16"	16"	16"	16"
Total Depth	125'	100'	112'	102'	104'
Cased Depth	85'	60'	70'	62'	63'
Screened Interval	40'	40'	30'	40'	40'
Pumped or Flowing	P	P	P	P	P
Working Valve If Artesian (Yes/No)	NA	NA	NA	NA	NA
Pump Manufacturer and Model No.	Johnson 6"	Johnson 8"	Johnson 8"	Johnson 8"	Johnson 8"
Pump (Centrifugal, Type Jet, Deep Jet, Turbine, etc.) VT= Vertical Turbine	VT	VT	VT	VT	VT
Intake Depth (NGVD)	NA	NA	NA	NA	NA
Pump Capacity (GPM at FT of head at PSI)	500 150'	500 150'	750 150'	500 150'	750 150'
Active (Yes/No)	Standby	Y	Y	Y	Y
Year Drilled	1970	1971	1971	1971	1973
Type of Meter	None	None	None	None	None
Florida Plane Coordinates	See Location Map				

TABLE A

DESCRIPTION OF WELLS

BURMA ROAD - PROPOSED

WELL NO.	RR 21	RR 22	RR 23	RR 24	RR 25
Map Designation	21	22	23	24	25
Existing/Proposed	P	P	P	P	P
Diameter (Inches)	12"	12"	12"	12"	12"
Total Depth EST	180'	180'	180'	180'	180'
Cased Depth EST	150'	150'	150'	150'	150'
Screened Interval EST	30'	30'	30'	30'	30'
Pumped or Flowing	P	P	P	P	P
Working Valve If Artesian (Yes/No)	NA	NA	NA	NA	NA
Pump Manufacturer and Model No.	NOT KNOWN AT THIS TIME				
Pump (Centrifugal, Type Jet, Deep Jet, Turbine, etc.)	NOT KNOWN AT THIS TIME				
Intake Depth (NGVD)	NA	NA	NA	NA	NA
Pump Capacity (GPM at FT of head at PSI)	600 150'	600 150'	600 150'	600 150'	600 150'
Active (Yes/No)	PROPOSED WELLS				
Year Drilled	1988	1988	1988	1988	1991
Type of Meter RP= Rockwell Propeller	RP	RP	RP	RP	RP
Florida Plane Coordinates	See Location Map				

TCE ug/l

All Analyses by : Everglades Laboratories, Inc.
Unless Otherwise Noted

SAMPLE COLLECTION DATE

Sample Point	9/12/80	9/25/80	10/17/80	4/21/81	7/13/81	8/24/81	2/4/82	4/21/82	7/20/82	7/27/82	10/19/82	11/12/82	12/7/82
RR 9	28.0	5.0	35.0	34.0	83.0	Removed from Service	-	-	-	-	-	-	-
RR 10	-	-	<0.3	-	-	-	-	-	-	-	-	-	-
RR 11	-	-	40.0	65.0	39.6	Placed on Standby Service	(3.0)	15.7	26.1	[58.0]	134	288.5	112
RR 12	-	-	5.7	Removed from Service	-	-	-	-	-	-	-	-	-
RR 13	-	-	<0.3	-	0.2	-	(<0.1)	-	<0.1	[<0.2]	-	-	-
RR 14	-	-	<0.3	-	0.1	-	(<0.1)	-	-	-	-	-	-
RR 15	-	-	<0.3	-	0.3	-	(<0.1)	-	<0.1	[<0.2]	-	-	-
RR 16	-	-	<0.3	-	0.2	-	(<0.1)	-	<0.1	[<0.2]	-	-	-
RR 17	-	-	<0.3	-	0.2	-	(0.5)	0.6	2.4	[3.8]	0.27	-	-
Plant Tap	-	-	<0.3	0.4	0.2	[<0.2]	(<0.1)	0.4	0.29	[2.2]	0.28	-	-

- = no sample taken
[] = EPA Laboratory
() = ESE Laboratory

EXHIBIT II

TCE ug/l
All Analyses by Montgomery Laboratories
Unless Otherwise Noted

SAMPLE COLLECTION DATE

Sample Point	Everglades Laboratories, INC. 1/18/83	4/12/83	5/11/83	7/5/83	10/5/83	McGinnes 1/17/84	Geotec 2/21/84	Geotec 4/23/84	Montgomery 6/12/84	Montgomery 8/28/84	Montgomery 10/30/84	Montgomery 1/28/85	Montgomery 2/18/85
RR 9	-	-	-	-	-	-	-	-	-	-	-	-	180
RR 10	-	-	10.7	21.0	(7)	2.0	44	<1	18	-	37	50	-
RR 11	114	12.7	9.5	97.2	(89)	Removed from Service	-	-	-	-	-	-	24
RR 12	-	-	-	-	-	-	-	-	-	-	-	-	270
RR 13	<1	-	-	1.3	-	<1.0	-	-	5.9	7.5	10	12	-
RR 14	<1	-	-	<1.0	-	<1.0	-	-	0.1	-	-	<0.5	-
RR 15	<1	-	-	<1.0	-	<1.0	-	-	<0.1	-	-	<0.5	-
RR 16	<1	-	-	<1.0	-	<1.0	-	-	<0.1	-	-	<0.5	-
RR 17	3.7	7.6	-	12.1	(3)	=0.5	<1	<1	Sample Lost	1.9	1.7	2.2	-
Plant Tap	1.4	0.31	-	<1.0	(5)	<1.0	-	<1	0.2	-	0.5	<0.5	-

- = no sample taken
[] = EPA Laboratory
() = ESE Laboratory

TCE ug/l
All Analyses by Montgomery Laboratories
Unless Otherwise Noted

SAMPLE COLLECTION DATE

Sample Point	4/16/85	7/25/85	10/8/85	1/28/86	McGinnes 7/21/86	McGinnes 10/14/86	McGinnes 1/22/87	McGinnes 4/13/87	Enviropact 7/14/87	Enviropact 10/19/87	Enviropact 1/14/88		
RR 9	-	-	-	-	-	-	-	-	-	-	-		
RR 10	28	19	22 u	Removed from Service	-	-	-	-	-	-	-		
RR 11	13	29	58	40	12	9.4	6.1	5.5	< 1	20.2	30.0		
RR 12	-	-	-	-	-	-	-	-	-	-	-		
RR 13	20	29	35	36	9.4	7.3	5.0	5.0	20.3	< 1	35.9		
RR 14	-	-	-	< 0.5	0.8	1.8	< 0.5	0.56	< 1	< 1	<1		
RR 15	-	< 0.5	-	< 0.5	-	< 0.5	< 0.5	< 0.5	-	-	<1		
RR 16	-	< 0.5	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	<1		
RR 17	1.0	0.7	0.5	0.5	0.7	0.5	< 0.5	0.63	< 1	-	<1		
Plant Tap	0.7	0.6	0.5	0.5	0.5	0.5	< 0.5	0.46	< 1	< 1	<1		

- = no sample taken
[] = EPA Laboratory
() = ESE Laboratory

GERAGHTY & MILLER, INC.

DRILLING AND TESTING OF TEST WELLS AT BURMA ROAD AND LAKE CATHERINE PALM BEACH COUNTY, FLORIDA

March 1988

Prepared for:
Seacoast Utilities, Inc.
4200 Hood Road
Palm Beach Gardens, Florida 33410

Prepared by:
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EXHIBIT III

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TABLE 2: Aquifer Coefficients Interpreted From Testing of Burma Road Test Well

APPENDICES

APPENDIX A: Geologic Logs

APPENDIX B: Geophysical Logs

DRILLING AND TESTING OF TEST WELLS AT BURMA ROAD AND LAKE CATHERINE PALM BEACH COUNTY, FLORIDA

INTRODUCTION

In October 1987, Seacoast Utilities, Inc., contracted Geraghty & Miller, Inc., to assist in the design, construction, and testing of test wells and monitor wells (shallow and deep) at a proposed well field. Two sites were tested--one west of Lake Catherine in Palm Beach Gardens and one on the east side of the Burma Road parcel owned by Foundation Land Company. The site locations are shown on Figure 1. The test wells and monitor wells were installed by Drilling Services, Inc., of Fort Pierce, Florida, to define the geologic and hydrologic conditions of the shallow aquifer, the production horizons, and the quantity and quality of the water available for withdrawal, and to provide hydrogeological information to support water-use applications to the South Florida Water Management District (SFWMD). The test wells were designed so that the testing could be performed and were not intended as future production wells.

This report contains information relevant to the drilling and testing inspected by Geraghty & Miller in the Burma Road area in 1987 and 1988. A brief description of the geologic and hydrologic conditions in the vicinity is provided, along with an analysis of the data from the pumping tests and a discussion of the impacts of future withdrawals. Well-construction details, geologic logs, and geophysical logs also are included. The findings of the testing program are presented, and recommendations regarding well capacity, pumping levels, and well spacing are discussed.

FINDINGS

1. The shallow aquifer in the area consists of a water-table zone of shelly sand to about 45 feet deep; a less permeable sequence of clay, shell, and fine sand between about 45 and 130 feet deep; and a more permeable production zone of shell, limestone, and sandstone below 130 feet deep. The full depth of the aquifer was not explored, but it is estimated to extend to below 300 feet deep.

2. A suitable production zone exists beneath the west side of Lake Catherine and beneath the Burma Road parcel to justify the construction of public water-supply wells. Individual wells may be expected to yield 400 to 800 gpm (gallons per minute) with pumping levels near 50 feet below land surface.

3. During a 24-hour, constant-rate test of a well at the Burma Road site, pumping from the production zone caused measurable declines in the water table. The data also were influenced by the effect of evapotranspiration, the presence of the nearby C-17 Canal, and an unknown regional influence (probably an irrigation well).

4. Overall aquifer coefficients appear to be:

   Transmissivity: 75,000 gpd/ft.
   Storage coefficient: 0.00003
   Leakance: 0.3 gpd/cu.ft.

   Specific yield was not determined, but is estimated to range between 0.1 and 0.2.

5. Five production wells located immediately west of the C-17 Canal on and north of the Burma Road parcel can yield 600 gpm each (a total of 4.32 million gallons per day). Water levels beneath the Burma Road parcel could decline 10 feet below pre-pumping conditions and water levels between the Florida East Coast Railway and the Earman River could decline by one foot.

6. No significant impacts are expected as a consequence of planned withdrawals. Storm-water ponds and borrow pits may be affected but no known lakes exist that could be affected.

WELL CONSTRUCTION

Test Wells

Two test wells were installed--one west of Lake Catherine and one on the Burma Road property. During construction of the wells, formation samples were collected at five-foot intervals and at each formation change and described by a Geraghty & Miller hydrogeologist, who was on site during drilling, construction, and testing phases of the project. The construction dimensions of the test wells and monitor wells are presented in Table 1.

The test well on the Burma Road parcel was constructed by first drilling a 4-inch-diameter pilot hole to a depth of 215 feet to collect formation samples and conduct geophysical logging. Spontaneous potential, single-point resistance, gamma ray, and caliper surveys were run in the hole. The geologic and geophysical logs are included in Appendices A and B, respectively. These data were examined and an apparently permeable production zone was selected. After logging, the drilling contractor set and cemented 12-inch-diameter surface casing to a depth of 40 feet. A

nominal 12-inch-diameter hole then was drilled to a depth of approximately 162 feet and a 6-inch-diameter, wire-wound, 0.040-inch-slot, low carbon steel well screen attached to 6-inch-diameter, PVC casing was installed. The annulus outside the well screen was gravel packed from the bottom to a point extending approximately 17 feet above the top of the screen. From this point to the land surface, the annulus was filled with cement. At this point, the well was developed to a sand-free condition and a 24-hour constant-rate pumping test was conducted.

The test well at Lake Catherine was constructed by drilling a 6-inch-diameter hole and installing a 2-inch-diameter PVC well screen and casing. The well screen was gravel packed and cement was installed around the 2-inch-diameter casing from the top of the gravel to the land surface. After construction, the well was developed to sand-free condition and a one-half-hour pumping test was conducted.

Monitor Wells

Shallow and deep monitor-well pairs installed adjacent to the Burma Road test well were constructed by drilling a 6-inch-diameter hole and installing 2-inch-diameter, gravel-packed, 0.020-inch-slot, PVC well screen and 2-inch-diameter PVC casing. Cement was emplaced from the top of the well screen to land surface. The wells were developed to a sand-free condition.

HYDROGEOLOGIC CONDITIONS

The Burma Road parcel is located in the coastal ridge physiographic subdivision to the east of the sandy flatlands. According to Land, Rodis, and Schneider (1973), south Florida is underlain by metamorphic and igneous basement rocks covered by approximately 15,000 feet of marine sediments. Interest in this report is focused on the upper several hundred feet of permeable sediments that yield fresh water. These sediments generally are described as the "shallow aquifer." The shallow aquifer in the Burma Road area is composed of (in ascending order) Tertiary age sediments of the Tamiami Formation, the Caloosahatchee marl, the Anastasia Formation, and the Pamlico sand. Geological cross-sections completed by Miller (1987) indicate that the base of the shallow aquifer in the Burma Road area is in excess of 300 feet deep. Below the base of the shallow aquifer are less permeable sediments (Tamiami and Hawthorn Formations) that separate the shallow aquifer from the deeper, Floridan aquifer.

The sediments penetrated in the shallow aquifer during the drilling of both test wells were very similar and can be divided into an upper and a lower unit. The upper unit is principally composed of unconsolidated fine- to medium-grained shelly sand with a clayey zone and a zone

composed of very fine- to fine-grained phosphatic sand. The clayey zone occurs in the depth interval between 45 and 50 feet and the fine-grained sand zone occurs just above the production horizon in the depth interval between 100 and 128 feet. Beneath the Lake Catherine and Burma Road sites, the lower unit is composed of unconsolidated fine- to medium-grained shelly sand to depths of approximately 141 feet and 150 feet, respectively. From these depths to the total depth of the wells, the sediments are composed of predominantly fine- to medium-grained shelly limestone at the Lake Catherine well and of a combination of fine- to medium-grained shelly sandstone and limestone at the Burma Road test well.

AQUIFER TESTING

Lake Catherine

On December 31, 1987, a pumping test was conducted on the test well located west of Lake Catherine. No other wells were available for monitoring water levels, so the test was conducted by pumping at a constant rate of 60 gpm (gallons per minute) for 30 minutes using a 2-inch contractor's pump. The rate and vacuum pressure were monitored during pumping.

At the end of pumping, the hose and fittings were disconnected quickly from the well head so that recovering water levels could be measured. Recovery data were collected for 20 minutes. These were graphed on semi-logarithmic paper, and apparent transmissivity of the aquifer in the screen zone was calculated by the "Straight-line Residual Drawdown Method" (Johnson Division-UOP, Ground Water and Wells, 1972, p. 140). The apparent transmissivity was 51,100 gpd/ft (gallons per day per foot). No effort was made to determine other aquifer coefficients for this well because no observation-well data were available. Based on the test data, individual production wells completed between 140 and 170 feet deep at Lake Catherine could yield 400 to 800 gpm with pumping water levels at 50 feet deep. Multiple wells in this area could increase pumping levels to greater depths.

Burma Road

A pumping test was begun at 11:00 a.m. on February 3, 1988, on the Burma Road test well. In addition to the monitor-well pairs located nearby, a temporary well point (Well 1S) was installed 13 feet away from the test well to determine the effect of pumping at the water table. Monitor-well pairs 2S and 2D and 3S and 3D were located, respectively, 200 and 500 feet south of the test well in a line paralleling the C-17 Canal. Well-pair 4S and 4D was located perpendicular to this line and across the C-17 Canal opposite the test well, about 250 feet away.

The test was conducted for 24 hours at a constant rate of 213 gpm. Water levels in the pumped well declined rapidly at first and continued to decline slowly after the first 10 minutes of the test. At the end of the test, the water level in the pumped well had declined 20 feet. Monitor wells screened in the production zone (2D,3D,4D) declined steadily and similarly during the first hour, rose slightly during the next 12 hours, declined rapidly in the next 3 hours, and then rose slowly until the end of the test. A similar pattern was observed in the water-level responses of the shallow wells (1S, 2S, 3S, 4S) except that the rapid response in the first 10 minutes of pumping was not apparent. The water-level response to pumping will be discussed subsequently.

Because water levels in the shallow wells (1S, 2S, 3S and 4S) responded to pumping in the same manner as the deeper wells (2D, 3D, 4D), it may be concluded that a significant hydraulic connection exists between the production zone and the water table. After about 30 minutes of pumping, when water levels had stabilized, the water levels appeared to be influenced primarily by evaporation and transpiration. At around midnight, however, water levels declined sharply over a two-hour period. The magnitude of this decline was about the same in all wells, indicating that some regional influence had occurred. The cause of the decline is unknown. Perhaps wells were turned on at Seacoast's North Palm Beach or Old Dixie well fields. More likely, a local irrigation well within the City of Palm Beach Gardens or at a nearby nursery caused the change. Water levels rose slowly in the early morning, perhaps partially in response to a brief light rain.

The test data were interpreted as if the test well tapped a leaky confined aquifer. Although it is apparent from the data that declines of the water table do result from pumping, the change in this test was relatively small. Based on the known geologic conditions and the test data, it may be assumed that the water at the water table moved both laterally toward the test well and vertically downward into the production zone through the less permeable layers described above. With this performance, interpretation of the aquifer's response as a leaky confined one remains valid.

The drawdown and recovery data collected from the monitoring wells screened in the production zone were interpreted by the "Hantush I Method" (Kruseman and DeRidder, Analysis and Evaluation of Pumping Test Data, 1970). Verification of the drawdown data were made independently by the "Walton Method" (Kruseman and DeRidder, 1970). Recovery data from the test well were interpreted by "Jacob's Method" (Kruseman and DeRidder, 1970). A distance-drawdown method, the "Hantush-Jacob Method" (Kruseman and DeRidder, 1970), was applied to data from the wells after water levels had stabilized.

As can be seen from Table 2, the interpreted aquifer coefficients varied from well to well. The apparent transmissivity of the test well is assumed to be conservatively low for the aquifer, since the well screen only extends over 30 feet of the aquifer, which is believed to extend to a depth of about 300 feet.

For Well 2D, the interpreted aquifer coefficients are consistent over a narrow range. For Well 3D, the coefficients are consistent but very high. The data from this well appear to have been affected by recharge from the canal. The effect may be greater at this well because of its distance from the pumped well. For Well 4D, the leakance values were much higher than for other wells. Recharge from the canal, which is between the pumped well and Well 4D, is assumed to have influenced leakage.

In an effort to minimize the influence of the C-17 Canal, the Hantush-Jacob Method was applied to steady-state water levels in Wells 2D and 3D. If the canal serves as a boundary or significant recharge source, this method, using data from wells that parallel the canal, should yield reliable aquifer coefficients.

Based on the interpretations made, the interpretation of data from Well 2D and the distance-drawdown analysis of Wells 2D and 3D appear to yield the best results. The aquifer coefficients appear to be transmissivity, 75000 gpd/ft. (gallons per day per foot); storage coefficient, 0.00003; and leakance, 0.3 gpd/cu.ft. (gallons per day per cubic foot). Specific yield of the water table could not be obtained but is assumed to be in the range of 0.1 to 0.2, based on regional knowledge. The specific capacity (yield per foot of drawdown) of the test well was 10.65 gpm/ft. for the 24-hour test.

The performance of the test well indicated that the expected production of individual wells could range between 400 and 800 gpm with pumping levels near 50 feet below land surface. In a multi-well field, interference effects could increase the pumping levels somewhat.

IMPACT ASSESSMENT

In order to determine the impacts of proposed future withdrawals, the "Coupled Aquifer Model" (Motz, Steady-State Drawdowns in Coupled Aquifers, ASCE Hydraulics Division, 1978) was applied. This model simulates withdrawals from a confined aquifer overlain by a leaky confining bed which receives recharge from the water table. The model represents steady-state conditions because the leakage lost from the water table is offset by salvaged evapotranspiration.

The Coupled Aquifer Model also can be applied to a stratified water-table aquifer in which a deep production zone is replenished primarily by

vertical movement of water from an overlying water table. Thus, this model is appropriate for the Burma Road site.

Five production wells are planned--four along the eastern boundary of the site, and one north of the property and immediately south of Northlake Boulevard. The wells will be spaced 600 feet apart. All 5 wells will be close to the C-17 Canal right-of way to take advantage of recharge from the canal. The aquifer at the Burma Road site may be assumed to be 300 feet thick. To represent the full aquifer thickness, the aquifer can be considered to be separated into a water-table zone (transmissivity, 20000 gpd/ft.) and an artesian zone (transmissivity, 55000 gpd/ft.). Leakance of the confining bed (vertical permeability of confining sediments above the production zone divided by thickness of the confining sediments) is taken as 0.25 gpd/cu.ft. (more conservative than 0.3 gpd/cu.ft. derived from test analysis).

The Coupled Aquifer Model requires information about the annual evapotranspiration rate. Evapotranspiration for the area is estimated to be 50 inches per year and is assumed to decrease with water-table depth below ground surface at a rate of 0.13 inches per foot.

Withdrawals of 600 gpm from each of 5 wells (total of 4.32 million gallons per day) were simulated by the Coupled Aquifer Model. Drawdowns in the production zone are shown on Figure 2. Drawdowns in the production zone beneath the Burma Road site may reach 10 feet below pre-pumping conditions and may reach one foot below pre-pumping conditions as far east as between the Florida East Coast Railway (east side of coastal ridge) and the Earman River and as far west as just beyond Interstate 95. Drawdowns in the water table (not shown) are slightly less, indicating that the hydraulic connection or "leakiness" between the water table and production zone is quite high. Water-table declines may cause seasonal declines in the levels of some storm-water ponds and borrow pits. However, no lakes exist in the area that may be affected. Existing known lakes are connected to the C-17 Canal and supported by its levels.

The coupled-aquifer method of analysis of withdrawals is believed to overestimate the impacts of withdrawals in this case for the following reasons:

A. The well field is assumed to operate at design capacity for an indefinite period; in reality, the well field may be expected to operate at levels between 50% and 100% of design capacity.

B. The model considers no recharge from the C-17 Canal or interconnected lakes; in reality, the canal is expected to provide a considerable amount of continuous recharge.

C. no rainfall recharge is anticipated; although this condition may exist during seasonal droughts, rainfall recharge will occur on a long-term basis.

Thus, the predicted impacts are the maximums that can be expected under this proposed well field scenario.

ACKNOWLEDGEMENTS

We appreciate the assistance of Seacoast Utilities, Inc., in conducting this study. Also, the cooperation of Drilling Services in completing the work and of the South Florida Water Management District in expediting well-construction permits is appreciated.

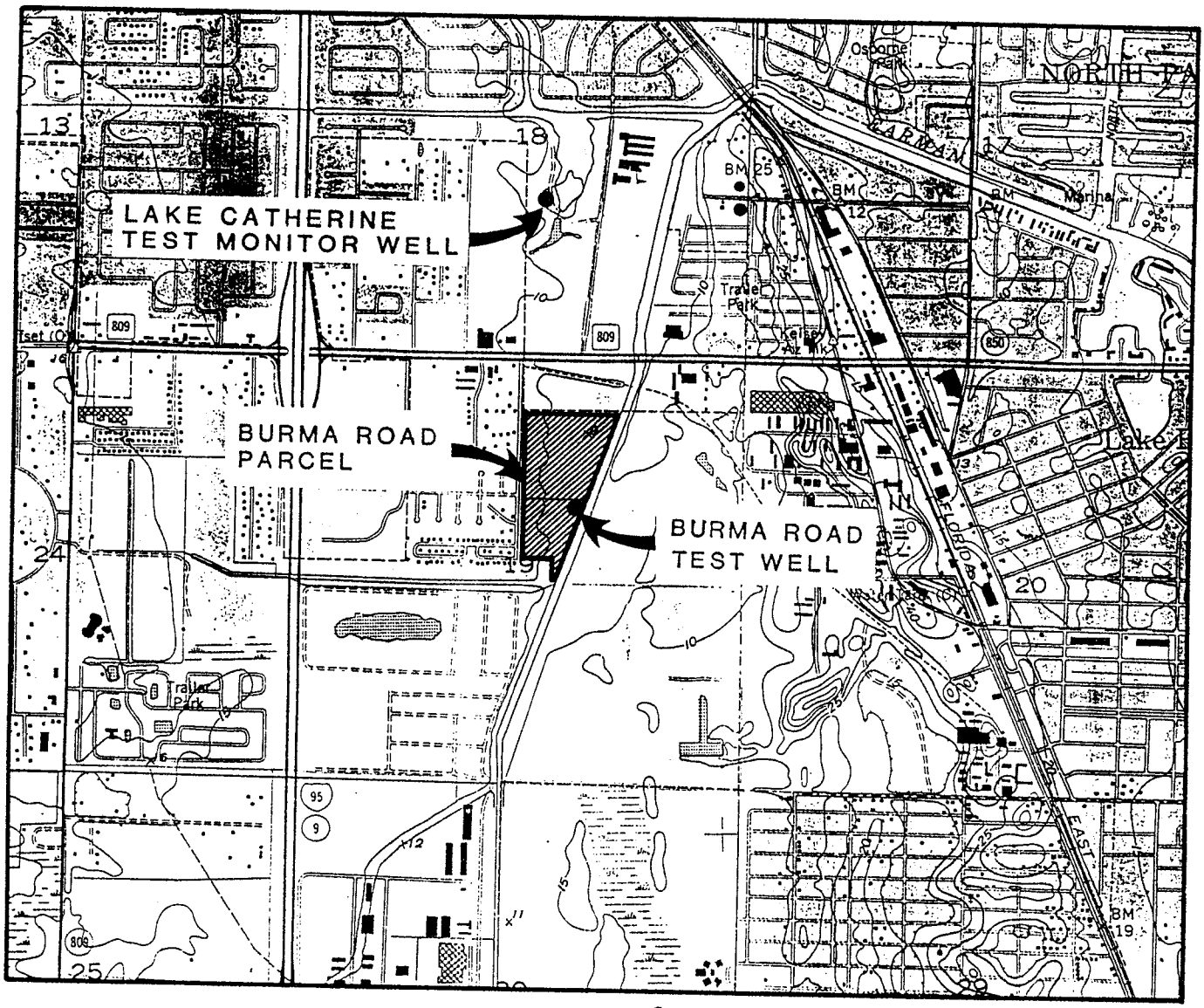
Respectfully submitted.
GERAGHTY & MILLER, INC.

William Rice
Staff Hydrogeologist

Thomas L. Tessier
Vice President

TLT/lt

FIGURES



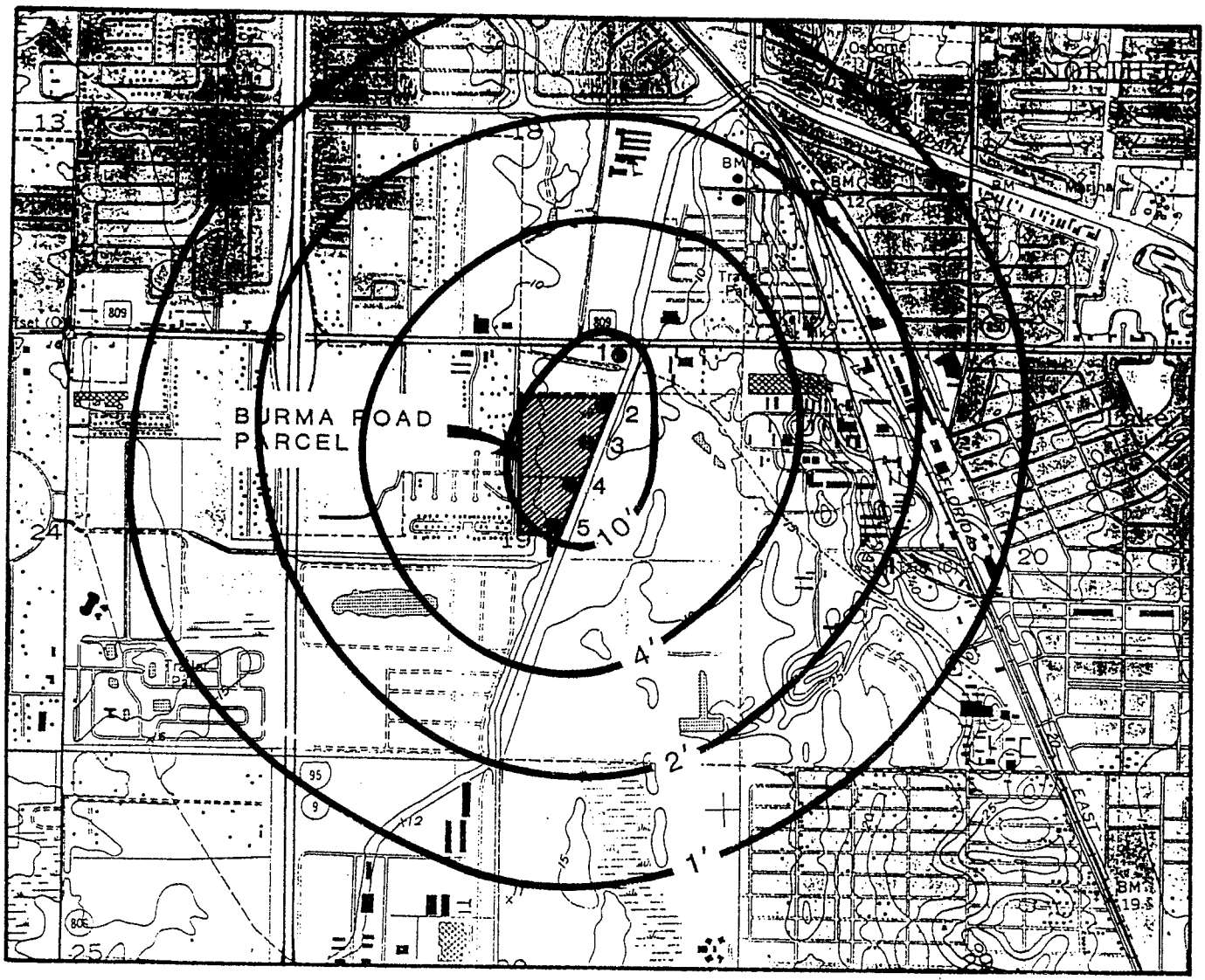
PREPARED FOR

SEACOAST UTILITIES, INC.

TITLE

SITE LOCATION MAP

COMPILED BY W. RICE	Geraghty & Miller, Inc.	DATE MARCH 88
DRAWN BY B. OLIVA	Palm Beach Gardens, Florida	REVISED
CHECKED BY T. TESSIER	SCALE AS SHOWN	FIGURE 1



NOTE: DRAWDOWN BASED ON WELLS 1,2,3,4 AND 5 AT A RATE OF 600 GPM EACH

LEGEND

● PROPOSED PRODUCTION WELLS

PREPARED FOR
SEACOAST UTILITIES, INC.

TITLE
DRAWDOWN CONTOUR MAP

COMPILED BY W. RICE	Geraghty & Miller, Inc.	DATE MARCH 88
DRAWN BY B. OLIVA	Palm Beach Gardens, Florida	REVISED
CHECKED BY T. TESSIER	SCALE AS SHOWN	FIGURE 2

TABLES

TABLE 1

WELL CONSTRUCTION DIMENSIONS OF
TEST WELLS AND MONITOR-WELL PAIRS

Well No.	Drilled Depth (feet)	Total Well Depth (feet)	Casing Diameter (inches)	Screen Interval (feet)
		Burma Road		
Test Well	215	162	6.0	132.0 - 162.0
1S	5	5	1.25	4.5 - 5.0
2S	10	10	2.0	2.0 - 12.0
2D	162	162	2.0	132.0 - 162.0
3S	10	10	2.0	2.0 - 12.0
3D	162	162	2.0	132.0 - 162.0
4S	10	10	2.0	2.0 - 12.0
4D	162	162	2.0	132.0 - 162.0
		Lake Catherine Site		
Test Well	215	215	2.0	142.0 - 172.0

Note: All depths are in "feet below land surface."

TABLE 2

AQUIFER COEFFICIENTS INTERPRETED
FROM TESTING OF BURMA ROAD TEST WELL

Wells	Data Used	Method	Transmissivity (gpd/ft.)	Storage Coefficient	Leakance (gpd/ct.ft.)
Test Well	Recovery	Jacob	48100	N/A	N/A
2D	Drawdown	Hantush I	69600	0.00025	0.36
	Drawdown	Walton	64200	0.00030	0.40
	Recovery	Hantush I	74900	0.00023	0.31
3D	Drawdown	Hantush I	262500	0.00096	0.46
	Drawdown	Walton	290600	0.00106	0.41
	Recovery	Hantush I	269200	0.0007	0.44
4D	Drawdown	Hantush I	44300	0.00054	1.23
	Drawdown	Walton	106100	0.001	0.82
	Recovery	Hantush I	47400	0.00065	1.12
2D,3D	Drawdown	Hantush-Jacob	87000	N/A	0.29

Notes: "gpd/ft" means gallons per day per foot.

"gpd/cu.ft." means gallons per day per cubic foot.

APPENDIX A

Geologic Logs

GEOLOGIC LOG
OF
TEST WELL
LAKE CATHERINE
PALM BEACH GARDENS, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 10	10	SILTY SAND - Sand, 95%, colorless, fine- to medium-grained, poorly sorted, sub-rounded; Silt, 5%, pale yellowish brown.
10 - 35	25	SAND - Sand, 100%, colorless, very fine- to medium-grained, sub-rounded to well rounded, poorly sorted.
35 - 40	5	SHELLY SAND - Sand, 95%, colorless, very fine- to medium-grained, sub-rounded to well rounded, poorly sorted; Shell, 5%, pale yellowish brown, small fragments.
40 - 45	5	SHELLY SAND - Sand, 90%, colorless, very fine- to medium-grained, sub-rounded to well rounded, poorly sorted; Shell, 10%, pale yellowish brown, small fragments.
45 - 50	5	SHELLY SAND AND CLAY - Sand, 70%, colorless, very fine- to medium-grained, sub-rounded to well rounded, poorly sorted; Clay, 20%, medium light gray, moderate plasticity; Shell, 10%, pale yellowish brown, small fragments.
50 - 55	5	SAND - Sand, 100%, colorless, fine- to medium-grained, moderately well sorted, sub-rounded to rounded.
55 - 65	10	SAND - Sand, 100%, colorless and black, fine- to medium-grained, quartz and phosphate, moderately well sorted, sub-rounded to rounded.

Depth Interval (feet)	Thickness (feet)	Sample Description
65 - 75	10	SAND AND SHELL - Sand, 60%, colorless, fine- to medium-grained, sub-angular to sub-rounded, poorly sorted; Shell, 40%, pale yellowish orange to yellowish gray, fine to coarse sand-sized fragments.
75 - 80	5	SHELL AND SAND - Shell, 75%, very pale orange and yellowish gray to light gray, fine to very coarse sand-sized fragments; Sand, 25%, colorless, fine to coarse, sub-angular to sub-rounded, poorly sorted.
80 - 100	20	SAND WITH SHELL - Sand, 60%, colorless, quartz, fine- to medium-grained, poorly sorted, sub-rounded to sub-angular; Sand, 25%, black, fine- to medium-grained, phosphatic, poorly sorted, sub-rounded; Shell, 15%, pale yellowish brown, fine to coarse sand-sized fragments.
100 - 105	5	SAND WITH SHELL - Sand, 60%, colorless, quartz, fine-grained, moderately well sorted, rounded; Sand, 25%, black, fine-grained, phosphatic, rounded; Shell, 15%, very pale orange, fine to medium sand-sized fragments.
105 - 110	5	SAND - Sand, 65%, colorless, quartz, fine-grained, moderately well sorted, rounded; Sand, 30%, black, fine-grained, phosphatic, moderately well sorted, rounded; Shell, 5%, very pale orange, fine to coarse sand-sized fragments.
110 - 120	10	SAND - Sand, 80%, colorless, quartz, very fine- to fine-grained, sub-rounded to rounded; Sand, 20%, black, very fine- to fine-grained, phosphatic, sub-rounded to rounded.

Depth Interval (feet)	Thickness (feet)	Sample Description
120 - 125	5	SHELLY SAND - Sand, 85%, colorless, quartz, very fine- to fine-grained, sub-rounded to rounded, poorly sorted; Sand, 10%, black, very fine- to fine-grained, phosphate, sub-rounded to rounded, poorly sorted; Shell, 5%, pale yellowish brown, fine to coarse sand-sized fragments.
125 - 130	5	SAND AND SHELL - Sand, 70%, colorless, quartz, very fine- to medium-grained, sub-rounded to sub-angular, poorly sorted; Sand, 5%, black, very fine- to fine-grained, phosphate, sub-rounded; Shell, 25%, very pale orange, very fine to coarse sand-sized fragments.
130 - 135	5	SAND AND SHELL - Sand, 50%, colorless, quartz, very fine- to medium-grained, sub-angular to sub-rounded, poorly sorted; Sand, 5%, black, very fine- to fine-grained, phosphate, sub-rounded, poorly sorted; Shell, 45%, very pale orange, fine to coarse sand-sized fragments.
135 - 141	6	SHELL AND SAND - Shell, 55%, very pale orange, fine to coarse sand-sized fragments; Sand, 40%, colorless, quartz, very fine- to medium-grained, sub-angular to sub-rounded, poorly sorted; Sand, 5%, black, very fine- to fine-grained, phosphate, poorly sorted, sub-rounded.
141 - 150	9	LIMESTONE AND SHELL - Limestone, 50%, medium light gray and very pale orange, very fine- to medium-grained, sandy, quartz and shell, moderately well cemented, micrite and biomicrite; Shell, 50%, pale yellowish brown and very pale orange, very coarse sand-sized fragments.

Depth Interval (feet)	Thickness (feet)	Sample Description
150 - 195	45	LIMESTONE - Limestone, 90%, very pale orange and yellowish gray to medium light gray, sandy, quartz and shell, fine- to medium-grained, moderately well cemented, micrite and biomicrite; Shell, 5%, pale yellowish brown and very pale orange, very coarse sand-sized fragments; Sand, 5%, colorless, quartz, fine-grained, rounded, moderately well sorted.
195 - 215	20	SHELLY LIMESTONE - Limestone, 90%, medium gray to grayish olive, very fine- to medium-grained, sandy, quartz and shell, moderately well cemented, micrite and biomicrite; Shell, 10%, very pale orange, very coarse sand-sized fragments.

TOTAL DEPTH: 215

GEOLOGIC LOG
OF
TEST WELL
BURMA ROAD
LAKE PARK, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 5	5	SAND - Sand, 98%, clear to frosted, quartz, fine- to medium-grained; Silt, 2%, brown.
5 - 10	5	SAND - Sand, 95%, clear to frosted, quartz, fine- to medium-grained; Silt, 5%, brown.
10 - 15	5	SAND - Sand, 98%, clear to frosted, quartz, medium-grained; Silt, 2%, brown.
15 - 25	10	SAND - Sand, 100%, clear to frosted, quartz, medium-grained, phosphatic.
25 - 30	5	SAND AND SHELL - Sand, 70%, clear, quartz, medium- to coarse-grained, rounded; Shell, 30%, very coarse-sized fragments, white.
30 - 35	5	SAND WITH SHELL - Sand, 85%, clear, quartz, medium-grained; Shell, 15%, very coarse fragments, white to brown.
35 - 45	10	SAND - Sand, 100%, clear, quartz, medium-grained, shell fragments, very coarse, white to gray, phosphatic.
45 - 50	5	SAND - Sand, 100%, clear to frosted, quartz, medium-grained; Sand, trace, phosphatic; Shell, trace; Clay, trace.

Depth Interval (feet)	Thickness (feet)	Sample Description
50 - 60	10	SAND - Sand, 95%, clear to frosted, quartz, medium-grained; Sand, 5%, phosphatic, black.
60 - 65	5	SAND WITH SHELL - Sand, 80%, clear, quartz, fine- to medium-grained; Shell, 20%, medium-sized fragments, tan.
65 - 75	10	SAND AND SHELL - Sand, 70%, clear, quartz, medium-grained; Shell, 30%, medium- to coarse-sized fragments, white to brown.
75 - 80	5	SHELLY SAND - Sand, 70%, clear to frosted, quartz, medium-grained; Shell, 25%, medium-sized fragments; Sand, 5%, phosphatic, black.
80 - 90	10	SAND - Sand, 70%, clear, quartz, medium-grained; Sand, 25%, phosphatic, black; Shell, 5%, medium- to coarse-sized fragments, white to brown.
90 - 95	5	SHELLY SAND - Sand, 75%, clear, quartz, fine- to medium-grained; Shell, 20%, medium- to very coarse-sized fragments, white to tan; Sand, 5%, phosphatic, black.
95 - 100	5	SHELLY SAND - Sand, 80%, clear to frosted, quartz, medium-grained; Shell, 15%, clear, very coarse-sized fragments, tan; Sand, 5%, phosphatic.
100 - 128	28	SAND - Sand, 100%, clear to frosted, quartz, fine-grained, phosphatic, hard drilling.

Depth Interval (feet)	Thickness (feet)	Sample Description
128 - 140	12	SAND AND SHELL - Sand, 50%, colorless and black, quartz and phosphate, fine- to medium-grained, poorly sorted, sub-angular to sub-rounded; Shell, 50%, light to dark gray and yellowish gray, fine to coarse sand-sized fragments.
140 - 145	5	SAND AND SHELL WITH SANDSTONE - Sand, 45%, colorless and black, quartz and phosphate, fine- to medium-grained, poorly sorted, sub-rounded; Shell, 45%, light to dark gray, fine to coarse sand-sized fragments; Sandstone, 10%, medium gray, poorly to moderately well cemented, shell and quartz, calcareous cement.
145 - 150	5	SILTY SHELLY SAND WITH SANDSTONE- Sand, 70%, very pale orange, quartz, very fine- to medium-grained, calcareous, poorly sorted, sub-rounded to rounded; Shell, 10%, light gray and yellowish gray, fine to coarse sand-sized fragments; Sandstone, 10%, medium gray, poorly to moderately well cemented, calcareous cement, shell and quartz; Silt, 10%, yellowish gray to very pale orange.
150 - 155	5	SANDY LIMESTONE - Limestone, 90%, very pale orange, very fine- to medium-grained, moderately well cemented, micrite; Sand, 5%, colorless, very fine- to medium-grained, poorly sorted, sub-rounded; Shell, 5%, light to dark gray, small fragments.

Depth Interval (feet)	Thickness (feet)	Sample Description
155 - 160	5	SHELLY SAND AND SANDY LIMESTONE- Sand, 60%, colorless and very pale orange, quartz, fine-to coarse-grained, calcareous, poorly sorted; Shell, 15%, very pale orange and light gray, small fragments; Limestone, 25%, very pale orange, very fine- to medium-grained, quartz and shell, moderately well cemented.
160 - 170	10	SANDY LIMESTONE AND SILTY CLAY (interbedded) - Limestone, 60%, very pale orange, very fine- to fine-grained, poorly to moderately well cemented; Clay, 40%, white, silty, mud color change.
170 - 177	7	SANDY LIMESTONE WITH SILT AND SHELL- Limestone, 80%, very pale orange, very fine- to medium-grained, quartz and shell, moderately well cemented; Shell, 10%, very pale orange and light gray, small fragments; Silt, 10%, very pale orange.
177 - 190	13	SANDSTONE - Sandstone, 95%, grayish olive, very fine- to fine-grained, moderately well cemented, calcareous cement; Shell, 5%, very pale orange, small fragments.
190 - 200	10	SANDSTONE WITH SHELL - Sandstone, 80%, grayish olive to medium gray, very fine- to fine-grained, moderately well cemented, calcareous cement; Shell, 20%, very pale orange, small fragments.
200 - 215	15	SANDSTONE WITH SHELL - Sandstone, 90%, grayish olive to medium gray, very fine- to fine-grained, moderately well cemented, calcareous cement, quartz and shell; Shell, 10%, very pale orange, small fragments.

TOTAL DEPTH: 215

ENVIROPACT

4116
SEACOAST UTILITIES
4200 HOOD ROAD
P.B. GARDEN, FL 33410

March 10, 1988
Report 24444
LAB I.D. 86119

ATT : MAC POWELL
Sample Collected: 2/04/88
Sample Received: 2/05/88 Collected By: YOUR REP.
Sample Description: TEST WELL BURMA ROAD: EPA METHOD 625, EPA METHOD 502.2, EPA METHOD 603 LAB ID 86119 AND 82223.

REPORT OF ANALYSIS : RR- WTP		UNITS	DATE
3,3 DICHLOROBENZIDINE	< 10	µg/l	2/18/88
ACROLEIN	< 25	µg/l	2/18/88
ACRYLONITRILE	< 25	µg/l	2/18/88
BENZIDINE	< 10	µg/l	2/18/88
N-NITROSODIMETHYLAMINE	< 10	µg/l	2/18/88
PARATHION	< 10	µg/l	2/18/88
PHENOL	< 5	µg/l	2/18/88
TOLUENE	< 1	µg/l	2/18/88
TOXAPHENE	< 40	µg/l	2/18/88
CHLOROMETHANE	< 1	µg/l	2/18/88
BROMOMETHANE	< 1	µg/l	2/18/88
DICHLORODIFLUOROMETHANE	< 1	µg/l	2/18/88
VINYL CHLORIDE	< 1	µg/l	2/18/88
CHLOROETHANE	< 1	µg/l	2/18/88
METHYLENE CHLORIDE	< 1	µg/l	2/18/88
TRICHLOROFLUOROMETHANE	< 1	µg/l	2/18/88
1,1-DICHLOROETHENE	< 1	µg/l	2/18/88
1,1-DICHLOROETHANE	< 1	µg/l	2/18/88
TRANS-1,2-DICHLOROETHENE	< 1	µg/l	2/18/88
CHLOROFORM	< 1	µg/l	2/18/88
1,2-DICHLOROETHANE	< 1	µg/l	2/18/88
1,1,1-TRICHLOROETHANE	< 1	µg/l	2/18/88
CARBON TETRACHLORIDE	< 1	µg/l	2/18/88
BROMODICHLOROMETHANE	< 1	µg/l	2/18/88

EXHIBIT IX

ENVIROPACT SERVICES, INC
MIAMI DIVISION
4790 N W 157th STREET
MIAMI, FL 33014-6421
305-620-1700

SEACOAST UTILITIES
4200 HOOD ROAD
P.B. GARDEN, FL 33410

March 10, 1988
Report 24444
LAB ID. 86119

ATT : MAC POWELL
Sample Collected: 2/04/88
Sample Received: 2/05/88 Collected By: YOUR REP.
Sample Description: TEST WELL BURMA ROAD: EPA METHOD 625, EPA METHOD 502.2, EPA METHOD 603 LAB ID 86119 AND 82223.

REPORT OF ANALYSIS : RR- WTP		UNITS	DATE
1,2-DICHLOROPROPANE	< 1	µg/l	2/18/88
TRICHLOROETHENE	< 1	µg/l	2/18/88
DIBROMOCHLOROMETHANE	< 1	µg/l	2/18/88
1,1,2-TRICHLOROETHANE	< 1	µg/l	2/18/88
BROMOFORM	< 1	µg/l	2/18/88
TETRACHLOROETHENE	< 1	µg/l	2/18/88
CHLOROBENZENE	< 1	µg/l	2/18/88
,3-DICHLOROBENZENE	< 1	µg/l	2/18/88
,2-DICHLOROBENZENE	< 1	µg/l	2/18/88
1,4-DICHLOROBENZENE	< 1	µg/l	2/18/88
BENZENE	< 1	µg/l	2/18/88
ETHYL BENZENE	< 1	µg/l	2/18/88
2,4 - DIMETHYL PHENOL	< 5	µg/l	2/18/88
2,4 - DICHLOROPHENOL	< 5	µg/l	2/18/88
2,4,6 - TRICHLOROPHENOL	< 5	µg/l	2/18/88
4 - CHLORO - 3 METHYLPHENOL	< 15	µg/l	2/18/88
2,4, - DINITROPHENOL	< 10	µg/l	2/18/88
PENTACHLOROPHENOL	< 10	µg/l	2/18/88
NAPHTHALENE	< 10	µg/l	2/18/88
ETHYLENE DIBROMIDE	< 0.02	µg/l	2/18/88
GUTHION	< 10	µg/l	2/18/88
ALDRIN	< 5	µg/l	2/18/88
DIELDRIN	< 10	µg/l	2/18/88
ENDRIN ALDEHYDE	< 5	µg/l	2/18/88
HEPTACHLOR	< 5	µg/l	2/18/88

4116
SEACOAST UTILITIES
4200 HOOD ROAD
P.B. GARDEN, FL 33410

March 10, 1988
Report 24444
LAB ID. 86119

ATT : MAC POWELL
Sample Collected: 2/04/88
Sample Received: 2/05/88 Collected By: YOUR REP.
Sample Description: TEST WELL BURMA ROAD: EPA METHOD 625, EPA METHOD 502.2, EPA METHOD 603 LAB ID 86119 AND 82223.

REPORT OF ANALYSIS : RR- WTP		UNITS	DATE
HEPTACHLOR-EPOXIDE	< 5	µg/l	2/18/88
ALPHA BHC	< 5	µg/l	2/18/88
BETA BHC	< 5	µg/l	2/18/88
GAMMA BHC	< 5	µg/l	2/18/88
DELTA BHC	< 5	µg/l	2/18/88
ENDOSULFAN SULFATE	< 5	µg/l	2/18/88
CHLORDANE	< 40	µg/l	2/18/88
MALATHION	< 10	µg/l	2/18/88
1,2-DIBROMOETHANE (EDB)	< 0.02	µg/l	2/18/88
1,2-DIBROMO-3-CHLOROPROPANE	< 0.02	µg/l	2/18/88
STYRENE	< 1	µg/l	2/18/88
ACENAPHTHENE	< 10	µg/l	2/18/88
ACENAPHTHYLENE	< 10	µg/l	2/18/88
ANTHRACENE	< 10	µg/l	2/18/88
BENZO (A) ANTHRACENE	< 10	µg/l	2/18/88
BENZO (B) FLUORANTHENE	< 10	µg/l	2/18/88
BENZO (K) FLUORANTHENE	< 10	µg/l	2/18/88
BENZO (A) PYRENE	< 10	µg/l	2/18/88
BENZO (G,H,I) PERYLENE	< 25	µg/l	2/18/88
BIS (2-CHLOROETHYL) ETHER	< 10	µg/l	2/18/88
BIS (2-CHLOROETHOXY) METHANE	< 10	µg/l	2/18/88
BIS (2-ETHYLHEXYL) PHTHALATE	< 10	µg/l	2/18/88
BIS (2-CHLOROISOPROPYL) ETHER	< 10	µg/l	2/18/88
4-BROMOPHENYL PHENYL ETHER	< 10	µg/l	2/18/88
BUTYL BENZYL PHTHALATE	< 10	µg/l	2/18/88

4116
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4200 HOOD ROAD
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March 10, 1988
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Sample Description: TEST WELL BURMA ROAD: EPA METHOD 625, EPA METHOD 502.2, EPA METHOD 603 LAB ID 86119 AND 82223.

REPORT OF ANALYSIS : RR- WTP		UNITS	DATE
2-CHLORONAPHTHALENE	< 10	µg/l	2/18/88
4-CHLOROPHENYL PHENYL ETHER	< 10	µg/l	2/18/88
CHRYSENE	< 10	µg/l	2/18/88
DIBENZO (A,H) ANTHRACENE	< 25	µg/l	2/18/88
DI-N-BUTYL PHTHALATE	< 10	µg/l	2/18/88
DIETHYL PHTHALATE	< 10	µg/l	2/18/88
DIMETHYL PHTHALATE	< 10	µg/l	2/18/88
2,4-DINITROTOLUENE	< 10	µg/l	2/18/88
,6-DINITROTOLUENE	< 10	µg/l	2/18/88
DI-N-OCTYL PHTHALATE	< 10	µg/l	2/18/88
1,2-DIPHENYL HYDRAZINE	< 10	µg/l	2/18/88
FLUORANTHENE	< 10	µg/l	2/18/88
FLUORENE	< 10	µg/l	2/18/88
HEXACHLOROBENZENE	< 10	µg/l	2/18/88
HEXACHLOROBUTADIENE	< 10	µg/l	2/18/88
HEXACHLOROETHANE	< 10	µg/l	2/18/88
HEXACHLOROCYCLOPENTADIENE	< 10	µg/l	2/18/88
INDENO-(1,2,3-CD) PYRENE	< 25	µg/l	2/18/88
ISOPHORONE	< 10	µg/l	2/18/88
NITROBENZENE	< 10	µg/l	2/18/88
N-NITROSODI-N-PROPYLAMINE	< 10	µg/l	2/18/88
N-NITROSODIPHENYLAMINE	< 10	µg/l	2/18/88
PHENANTHRENE	< 10	µg/l	2/18/88
PYRENE	< 10	µg/l	2/18/88
1,2,4-TRICHLOROBENZENE	< 10	µg/l	2/18/88

4116
SEACOAST UTILITIES
4200 HOOD ROAD
P.B. GARDEN, FL 33410

March 10, 1988
Report 24444
LAB ID. 86119

ATT : MAC POWELL
Sample Collected: 2/04/88
Sample Received: 2/05/88 Collected By: YOUR REP.
Sample Description: TEST WELL BURMA ROAD: EPA METHOD 625, EPA METHOD 502.2, EPA METHOD 603 LAB ID 86119 AND 82223.

REPORT OF ANALYSIS : RR- WTP		UNITS	DATE
BROMOBENZENE	< 1	µg/l	2/18/88
SEC-BUTYLBENZENE	< 1	µg/l	2/18/88
TERT-BUTYLBENZENE	< 1	µg/l	2/18/88
2-CHLOROTOLUENE	< 1	µg/l	2/18/88
4-CHLOROTOLUENE	< 1	µg/l	2/18/88
DIBROMOMETHANE	< 1	µg/l	2/18/88
CIS-1,2-DICHLOROETHENE	< 1	µg/l	2/18/88
1,3-DICHLOROPROPANE	< 1	µg/l	2/18/88
?,2-DICHLOROPROPANE	< 1	µg/l	2/18/88
O-XYLENE	< 1	µg/l	2/18/88
1,1-DICHLOROPROPENE	< 1	µg/l	2/18/88
ISOPROPYLBENZENE	< 1	µg/l	2/18/88
P-ISOPROPYLTOLUENE	< 1	µg/l	2/18/88
1,1,1,2-TETRACHLOROETHANE	< 1	µg/l	2/18/88
1,1,2,2-TETRACHLOROETHANE	< 1	µg/l	2/18/88
1,2,3-TRICHLOROBENZENE	< 1	µg/l	2/18/88
1,2,3-TRICHLOROPROPANE	< 1	µg/l	2/18/88
1,2,4-TRIMETHYLBENZENE	< 1	µg/l	2/18/88
1,3,5-TRIMETHYLBENZENE	< 1	µg/l	2/18/88
M-XYLENE	< 1	µg/l	2/18/88
P-XYLENE	< 1	µg/l	2/18/88
1,3 DICHLOROPROPENE	< 1	µg/l	2/18/88

Analyses performed in accordance with E.P.A., A.S.T.M., Standard Methods or other approved methods.

Respectfully Submitted,

Michael Rentoumis

Michael Rentoumis
Laboratory Supervisor
Enviropact Services, Inc.

PAUL R. McGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE · WEST PALM BEACH, FLORIDA 33407 · (305) 842-2849

Client: Seacoast Utilities, Inc.
4200 Hood Road
Palm Beach Gardens, Florida 33410

March 4, 1988

Sample: RR Test Well received in lab 2-4-88 Job No. 88-2-4-SC-40
Collected by client in laboratory supplied containers.

Location: RR Well

Analysis:

FAC 17-22 PRIMARY INORGANICS & TURBIDITY

Surface Water - Annual / Groundwater - every 3 years

Parameter	MCL	RR Test Well	Analysis Date/Tech
Arsenic, mg/L As	0.05	<0.005	2-17 HW
Barium, mg/L Ba	1.0	<0.05	2-5 HW
Cadmium, mg/L Cd	0.010	<0.002	2-5 HW
Chromium, mg/L Cr	0.05	<0.01	2-5 HW
Lead, mg/L Pb	0.05	<0.05	2-5 HW
Mercury, mg/L Hg	0.002	<0.001	2-16 BK
Selenium, mg/L Se	0.01	<0.005	2-17 HW
Silver, mg/L Ag	0.05	<0.01	2-5 HW
Sodium, mg/L Na	160	112.0	2-10 HW
Nitrate, mg/L N	10.0	<0.1	2-4 CF
Fluoride, mg/L F	1.4	0.21	2-10 BK
Turbidity, N.T.U.	1	0.19	2-4 BK

FAC 17-22 PRIMARY ORGANICS

Parameter	MCL	RR Test Well	Analysis Date/Tech
Endrin, mg/L	0.0002	<0.00005	2-23 HW
Lindane, mg/L	0.004	<0.000002	2-23 HW
Methoxychlor, mg/L	0.1	<0.001	2-23 HW
Toxaphene, mg/L	0.005	<0.0005	2-23 HW
2,4-D, mg/L	0.1	<0.0001	2-23 HW
2,4,5-TP Silvex, mg/L	0.01	<0.0001	2-23 HW

Methods: See attached Methods Sheet.

Technician

Supervisor - McGinnes Laboratories
DHRS Laboratory I.D. No. 86140/E86070

PAUL R. McGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE · WEST PALM BEACH, FLORIDA 33407 · (305) 842-2849

Client: Seacoast Utilities, Inc.
4200 Hood Road
Palm Beach Gardens, FLorida 33410

March 4, 1988

Sample: Raw water collected 2-4-88. Job No. 88-2-4-SC-40
Collected by client in laboratory supplied containers.

Location: RR Test Well

Analysis:

FAC 17-22 SECONDARY INORGANICS

Surface Water - every 3 years / Groundwater - every 3 years

Parameter	MCL	RR Test Well	Analysis Date/Tech
Collection Time	---	0840	SU
Temperature, °C	---	24.0	SU
Alkalinity, Total, mg/L as $CaCO_3$	---	347	2-4 BK
Calcium, mg/L Ca	200	149	2-10 HW
Chloride, mg/L Cl^-	250	180	2-8 BK
Color, APHA units	15	27	2-4 HW
Copper, mg/L Cu	1.0	<0.01	2-5 HW
Corrosivity, L.I.	±0.2	0.32	Calc.RG
Foaming Agents, mg/L MBAS	0.5	*	--
Iron, mg/L Fe	0.3	0.08	2-5 HW
Manganese, mg/L Mn	0.05	0.011	2-5 HW
Odor, threshold	3	48 **	2-4 HW
pH, units	≥ 6.5	7.05	SU
pHs, units	---	6.73	Calc.RG
Sulfate, mg/L SO_4	250	17	2-5 BK
Solids, Total Dissolved, mg/L	500	790	2-4/8 YA
Zinc, mg/L Zn	5	0.007	2-5 HW

* This will be tested at a later date.

Methods: All analyses per Standard Methods.
See attached Methods Sheet.

**Sulfur odor. Sulfides to be tested at a later date.

Barbara J Kneant
Technician

Supervisor - McGinnes Laboratories
DHRS Laboratory I.D. No.86140/ E86070

PAUL R. MCGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE · WEST PALM BEACH, FLORIDA 33407 · (305) 842-2849

Client: Seacoast Utilities, Inc.
4200 Hood Road
Palm Beach Gardens, FLorida 33410

March 4, 1988

Sample: Raw water collected 2-4-88. Job No. 88-2-4-SC-40
Collected by client in laboratory supplied containers.

Location: RR Test Well

Analysis:

FAC 17-22 SECONDARY INORGANICS

Surface Water - every 3 years / Groundwater - every 3 years

Parameter	MCL	RR Test Well	Analysis Date/Tech
Collection Time	---	0840	SU
Temperature, °C	---	24.0	SU
Alkalinity, Total, mg/L as $CaCO_3$	---	347	2-4 BK
Calcium, mg/L Ca	200	149	2-10 HW
Chloride, mg/L Cl^-	250	180	2-8 BK
Color, APHA units	15	27	2-4 HW
Copper, mg/L Cu	1.0	<0.01	2-5 HW
Corrosivity, L.I.	±0.2	0.32	Calc.RG
Foaming Agents, mg/L MBAS	0.5	*	--
Iron, mg/L Fe	0.3	0.08	2-5 HW
Manganese, mg/L Mn	0.05	0.011	2-5 HW
Odor, threshold	3	48 **	2-4 HW
pH, units	≥ 6.5	7.05	SU
pHs, units	---	6.73	Calc.RG
Sulfate, mg/L SO_4	250	17	2-5 BK
Solids, Total Dissolved, mg/L	500	790	2-4/8 YA
Zinc, mg/L Zn	5	0.007	2-5 HW

* This will be tested at a later date.

Methods: All analyses per Standard Methods.
See attached Methods Sheet.

**Sulfur odor. Sulfides to be tested at a later date.

Barbara J Kreeht
Technician

Supervisor - McGinnes Laboratories
DHRS Laboratory I.D. No.86140/ E86070

PAUL R. McGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE · WEST PALM BEACH, FLORIDA 33407 · (305) 842-2849

Client: Seacoast Utilities, Inc.
4200 Hood Road
Palm Beach Gardens, Florida 33410

March 4, 1988

Sample: RR Test Well received in lab 2-4-88
Collected by client in laboratory supplied containers.

Job No. 88-2-4-SC-40

Location: RR Well

Analysis:

FAC 17-22 PRIMARY INORGANICS & TURBIDITY

Surface Water - Annual / Groundwater - every 3 years

Parameter	MCL	RR Test Well	Analysis Date/Tech
Arsenic, mg/L As	0.05	<0.005	2-17 HW
Barium, mg/L Ba	1.0	<0.05	2-5 HW
Cadmium, mg/L Cd	0.010	<0.002	2-5 HW
Chromium, mg/L Cr	0.05	<0.01	2-5 HW
Lead, mg/L Pb	0.05	<0.05	2-5 HW
Mercury, mg/L Hg	0.002	<0.001	2-16 BK
Selenium, mg/L Se	0.01	<0.005	2-17 HW
Silver, mg/L Ag	0.05	<0.01	2-5 HW
Sodium, mg/L Na	160	112.0	2-10 HW
Nitrate, mg/L N	10.0	<0.1	2-4 CF
Fluoride, mg/L F	1.4	0.21	2-10 BK
Turbidity, N.T.U.	1	0.19	2-4 BK

FAC 17-22 PRIMARY ORGANICS

Parameter	MCL	RR Test Well	Analysis Date/Tech
Endrin, mg/L	0.0002	<0.00005	2-23 HW
Lindane, mg/L	0.004	<0.000002	2-23 HW
Methoxychlor, mg/L	0.1	<0.001	2-23 HW
Toxaphene, mg/L	0.005	<0.0005	2-23 HW
2,4-D, mg/L	0.1	<0.0001	2-23 HW
2,4,5-TP Silvex, mg/L	0.01	<0.0001	2-23 HW

Methods: See attached Methods Sheet.

Technician

Supervisor - McGinnes Laboratories
DHRS Laboratory I.D. No. 86140/E86070

PAUL R. MCGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE - WEST PALM BEACH, FLORIDA 33407 - (305) 842-2849

Client: Seacoast Utilities
Atten: Mac Powell
4200 Hood Road
West Palm Beach, FL 33410

October 20, 1987

Sample: Raw water collected 9/22/87 by SU Personnel in laboratory supplied containers.

Job No. 87-9-22-SU-165

Location: Richard Road Well #1, #2, #8

Analysis:

ECR II (Palm Beach Co. only)
SEMI-ANNUAL RAW WATER ANALYSIS

Surface Water and Groundwater - semi-annual*

Parameter	RR #1	RR #2	RR #8	Analysis Date/Tech
Collection Time	1140	1135	1130	9/22 SU
Temperature, °C (field)	---	---	---	---
Calcium, mg/L Ca	105	73	82	10/15 HW
Chloride, mg/L Cl^-	95	33	40	9/29 BK
Color, APHA units	63	86	45	9/22 HW
Hardness, Total, mg/L as $CaCO_3$	320	212	262	9/29 BK
Iron, mg/L Fe	0.44	0.55	0.18	10/14 HW
Magnesium, mg/L Mg	5.7	2.2	4.7	10/15 HW
Nitrate, mg/L N	0.2	0.1	0.1	9/23 LJ
pH, units	7.3	7.5	7.5	9/22 SU
Solids, Total Dissolved, mg/L	527	297	348	9/29, 10/1 YA

* Wet Season - June to October / Dry Season - November to May

Methods: See attached sheet.

DHRS Laboratory I.D. Nos. 86140; 86070

PAUL R. MCGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE · WEST PALM BEACH, FLORIDA 33407 · (305) 842-2849

Client: Seacoast Utilities
Atten: Mac Powell
4200 Hood Road
West Palm Beach, FL 33410

October 20, 1987

Sample: Raw water collected 9/21/87 by SU Personnel in laboratory supplied containers..

Job No. 87-9-21-SU-153

Location: Richard Road Wells #4, #5, #16, #17

Analysis:

ECR II (Palm Beach Co. only)
SEMI-ANNUAL RAW WATER ANALYSIS

Surface Water and Groundwater - semi-annual*

Parameter	RR #4	RR #5	RR #16	RR #17	Analysis Date/Tech
Collection Time	1124	1127	1140	1145	9/21 SU
Temperature, °C (field)	---	---	---	---	---
Calcium, mg/L Ca	85	87	84	79	10/15 HW
Chloride, mg/L Cl^-	37	42	60	20	9/28 BK
Color, APHA units	61	42	45	39	9/21 HW
Hardness, Total, mg/L as $CaCO_3$	242	253	258	233	9/28 BK
Iron, mg/L Fe	0.35	0.28	0.51	0.56	10/8 RG
Magnesium, mg/L Mg	3.2	4.3	3.7	2.9	10/15 HW
Nitrate, mg/L N	0.1	0.4	0.4	<0.1	9/22 LJ
pH, units	7.5	7.4	7.4	7.5	9/21 SU
Solids, Total Dissolved, mg/L	321	357	399	310	9/28, 9/30 BK

* Wet Season - June to October / Dry Season - November to May

Methods: See attached sheet.

DHRS Laboratory I.D. Nos. 86140; T86070

PAUL R. McGINNES AND ASSOCIATES
CONSULTING LABORATORIES, INC.

4168 WESTROADS DRIVE · WEST PALM BEACH, FLORIDA 33407 · (305) 842-2849

Client: Seacoast Utilities Inc
Atten: Mac Powell
4200 Hood Road
West Palm Beach, FL 33410

October 20, 1987

Sample: Raw water collected 9/23/87 by SU Personnel in laboratory supplied containers.

Job No. 87-9-23-SU-177

Location: Richard Road Wells #3, #6, #7, #13, #14

Analysis:

ECR II (Palm Beach Co. only)
SEMI-ANNUAL RAW WATER ANALYSIS

Surface Water and Groundwater - semi-annual*

Parameter	RR #3	RR #6	RR #7	RR #13	RR #14	Analysis Date/Tech
Collection Time	1035	1045	1100	1136	1147	9/23 SU
Temperature, °C (field)	---	---	---	---	---	---
Calcium, mg/L Ca	82	73	92	74	82	10/15 HW
Chloride, mg/L Cl^-	47	46	47	30	29	9/29 BK
Color, APHA units	35	65	37	45	120	9/23 HW
Hardness, Total, mg/L as $CaCO_3$	249	226	274	200	231	9/29 BK
Iron, mg/L Fe	0.20	0.30	0.29	0.41	1.89	10/14 HW
Magnesium, mg/L Mg	4.4	3.8	5.9	1.8	2.0	10/15 HW
Nitrate, mg/L N	0.1	0.5	0.1	0.2	0.4	9/24 CF
pH, units	7.3	7.4	7.3	7.6	7.4	9/23 SU
Solids, Total Dissolved, mg/L	371	323	424	286	324	9/30, 10/1 YA

* Wet Season - June to October / Dry Season - November to May

Methods: See attached sheet.

DHRS Laboratory I.D. Nos. 86140; T86070

Paul R. McGinnes and Associates
Consulting Laboratories, Inc.

Laboratory I.D. No. 86140

Analysis	Collection/Storage	Analysis Method	ECR II/FAC 17- mg/l allowed Drinking Wate
PRIMARY INORGANICS:			
Arsenic; Selenium.....	0.5%HNO_3/<6 mos.	Hydride generation into hydrogen argon flame	0.05;0.01
Mercury	0.5%HNO_3/<14 days	Cold vapor atomic absorption	0.002
Chromium; Lead	0.5%HNO_3/<6 mos.	Atomic Absorption	0.05;0.05
Barium; Cadmium; Silver	0.5%HNO_3/<6 mos.	Atomic Absorption	1.0;0.010;0.0
Nitrate	Refrigerate/<24hrs	Brucine sulfate colorimetric	10.0
Fluoride	Refrigerate/<7 days	Specific ion probe	1.4
PRIMARY ORGANICS:			
Endrin; Lindane	Extract <7 days	Gas chromatography	0.0002;0.004
Methoxychlor; Toxaphene	Extract <7 days	Gas chromatography	0.1;0.005
2,4-D; 2,4,5-TP Silvex	Extract <7 days	Gas chromatography	0.1;0.01;0.10
Trihalomethanes	<7 days	Solvent extraction GC	0.10
SECONDARY INORGANICS:			
tal Dissolved Solids	Refrigerate/<7 days	Gravimetric difference	500
pH	On site	Corning 610A meter	6.5 min.
Magnesium; Iron; Copper	0.5%HNO_3/<6 mos.	Atomic absorption	--;0.3;1.0
Zinc; Manganese ; Calcium ...	0.5%HNO_3/<6 mos.	Atomic absorption	5;0.05; 200
Sulfate	Refrigerate/<7 days	Turbidimetric	250
Sulfide	ZnAc pres./<24hrs	$Na_2S_2O_3$ titrimetric	--
Hydrogen Sulfide	ZnAc pres./<24hrs	Calc. from sulfide	0.05
Chloride	<7 days	$Hg(NO_3)_2$ titrimetric	250
Sodium	0.5%HNO_3/<6 mos.	Atomic emission	160
Detergents(MBAS)	Refrigerate/<24hrs	Chloroform extraction/ colorimetric	0.5
Hardness	Refrigerate	EDTA titrimetric	--
Color	Refrigerate/<24hrs	Colorimetric	15
Odor	Immediate	Panel evaluation	3.0
Turbidity	Refrigerate/<24hrs	Hach 2100A turbidimeter	1.0
Alkalinity	Immediate	H_2SO_4 titrimetric	--
D.O/Conductivity	Immediate	YSI SCT meters	--
Corrosivity	--	Calculation	-0.2 to +0.2
pHs	--	Calculation	--
Carbon Dioxide	--	Nomograph	--

Note: Detection limits for each analysis vary with nature and condition of sample analyzed.

Rev.2-85/10-86