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GROUND-WATER RESOURCES AT PORT LABELLE

GLADES AND HENDRY COUNTIES, FLORIDA

PREPARED FOR:

Villages of Port LaBelle

General Development Corporation

NOVEMBER 30, 1983

PREPARED BY:

Geraghty & Miller, Inc.
Ground-Water Consultants
West Palm Beach, Florida

GROUND-WATER RESOURCES
AT PORT LABELLE
GLADES AND HENDRY COUNTIES, FLORIDA

November 1983

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INTRODUCTION

By issuance of Addendum 23 of Contract 816, General Development Corporation (GDC) authorized Geraghty & Miller, Inc., to proceed with an investigation of the availability of ground-water resources at and in the vicinity of GDC holdings near LaBelle, Florida. GDC has been developing the community of Port LaBelle for the past fifteen years; as the planned land use has been defined, it has been the desire of the developer to determine how much water is available to support the community.

Geraghty & Miller, Inc., has been involved with developing ground-water resources at LaBelle since 1971. Between 1971 and 1982, exploratory holes, test wells, and production wells were constructed and tested. In the current program, additional exploratory holes have been installed; new monitor wells have been constructed, sampled, and tested; and borehole geophysical surveys and surface resistivity surveys have been performed. These data and those collected during previous studies have been evaluated in the program. In this report, Geraghty & Miller, Inc., summarizes previously collected data, describes the hydrogeologic conditions existing in the area, and predicts the impacts of proposed future withdrawals for the community. Much of the previous work related to this area is cited by reference. However, geophysical logs, surface resistivity profiles, lithologic logs, and pumping test and water-quality data generated during this program are found in the Appendices.

FINDINGS

1. Three aquifers exist beneath Port LaBelle and are available for use. The shallow aquifer, consisting of sand, shell, limestone, and sandstone, reaches depths as great as 100 feet and is extensive beneath Port LaBelle. The intermediate aquifer consists primarily of sand and shell; it occurs as a northwest-to-southeast trending band beneath Port LaBelle at depths between 90 and 360 feet. The Floridan aquifer consists mostly of limestone at depths below 580 feet.

2. The shallow aquifer exists under water-table conditions. The aquifer presently is used for irrigation but could be used for public supply where it is 40 feet thick or more. Yields as high as 400 gpm (gallons per minute) can be expected.

3. The shallow aquifer serves as a storage reservoir of water for future use and as a source of recharge to the intermediate aquifer. Available ground-water recharge to the shallow aquifer is estimated as 6 to 14 inches per year.

4. The water quality of the shallow aquifer is generally suitable for all uses including public supply, after treatment.

5. The parameters of the shallow aquifer determined in this study are transmissivity as great as 43,000 gpd/ft (gallons per day per foot) and specific yield of about 0.2.

6. The water table is found at or slightly below land surface during most of the year. Flow in the water table is toward the north and northwest toward the Caloosahatchee River.

7. The intermediate aquifer is artesian (or confined) as it is overlain by clays that are 10 to 250 feet thick and underlain by clays that are 220 feet thick or more.

8. Although restricted in extent, the high productivity of the intermediate aquifer and the good water quality makes it valuable for public supply. Because of its depth, its use for small irrigation systems is limited due to the cost of well drilling. Production wells can produce as much as 2100 gpm of water that is suitable for public supply after treatment.

9. The intermediate aquifer receives recharge via downward vertical leakage through the confining bed. Aquifer coefficients are transmissivity to 250,000 gpd/ft; storage coefficient ranging from 0.00006 to 0.0005; and leakance of 0.0005 gpd/cu. ft. to 0.005 gpd/cu. ft. Under natural conditions, water levels in the intermediate aquifer are slightly above to slightly below land surface.

10. The artesian Floridan aquifer is overlain by confining clay that is 220 feet thick and more. Wells flow naturally; depending upon well depth, the water quality may be marginally suitable for irrigation.

11. The water levels in the Floridan aquifer are above land surface. The aquifer receives no recharge locally. Flowing wells produce less than 100 gpm.

12. Aquifer coefficients of the Floridan aquifer determined from this study are estimated as transmissivity of less than 10,000 gpd/ft; storage coefficient near 0.001; and leakance of 0.0005 gpd/cu. ft. or less.

13. Eleven wells screened in the intermediate aquifer can produce 28 mgd (million gallons per day) to meet maximum-day demand at Port LaBelle. Based on the data from these investigations, the aquifer is capable of sustaining LaBelle's planned withdrawals for an average day of 14 million gallons and a maximum day of 28 million gallons.

14. The impacts of withdrawals will not be excessive. Based on the pumping scenarios evaluated in this study, the most significant off-site impact will be beneath an area east of the water plant. There, the water level in the shallow aquifer may decline 3 feet (5 percent of the aquifer thickness) and the water level in the intermediate aquifer may decline 31 feet (21 percent of available drawdown) after two years of continuous pumpage at 14 mgd. Northwest of Port LaBelle across the Caloosahatchee River, the water level in the intermediate aquifer may decline 13 feet. Elsewhere, impacts outside of Port LaBelle will be insignificant. Under alternative well field development scenarios, impacts could be reduced further.

15. Upconing of saline water from the Floridan aquifer is unlikely to occur. It will take about 400 years of pumping a well at 3 mgd before the first drop of saline water will reach the production well.

16. Stresses on the shallow and intermediate aquifers could be reduced further by spreading out the wells or by installing a greater number of wells over a larger area.

17. In addition to public supply use of the intermediate aquifer, the shallow aquifer remains available for irrigation use. Because the aquifer is thin near the river, domestic users may have to have systems with pneumatic pressure storage tanks and zone irrigation to produce adequate volumes of water in that area. Near public supply wells, some irrigation wells may incur a decline in yield during droughts. These domestic users should construct deeper wells and install jet pumps to assure themselves of a reliable system.

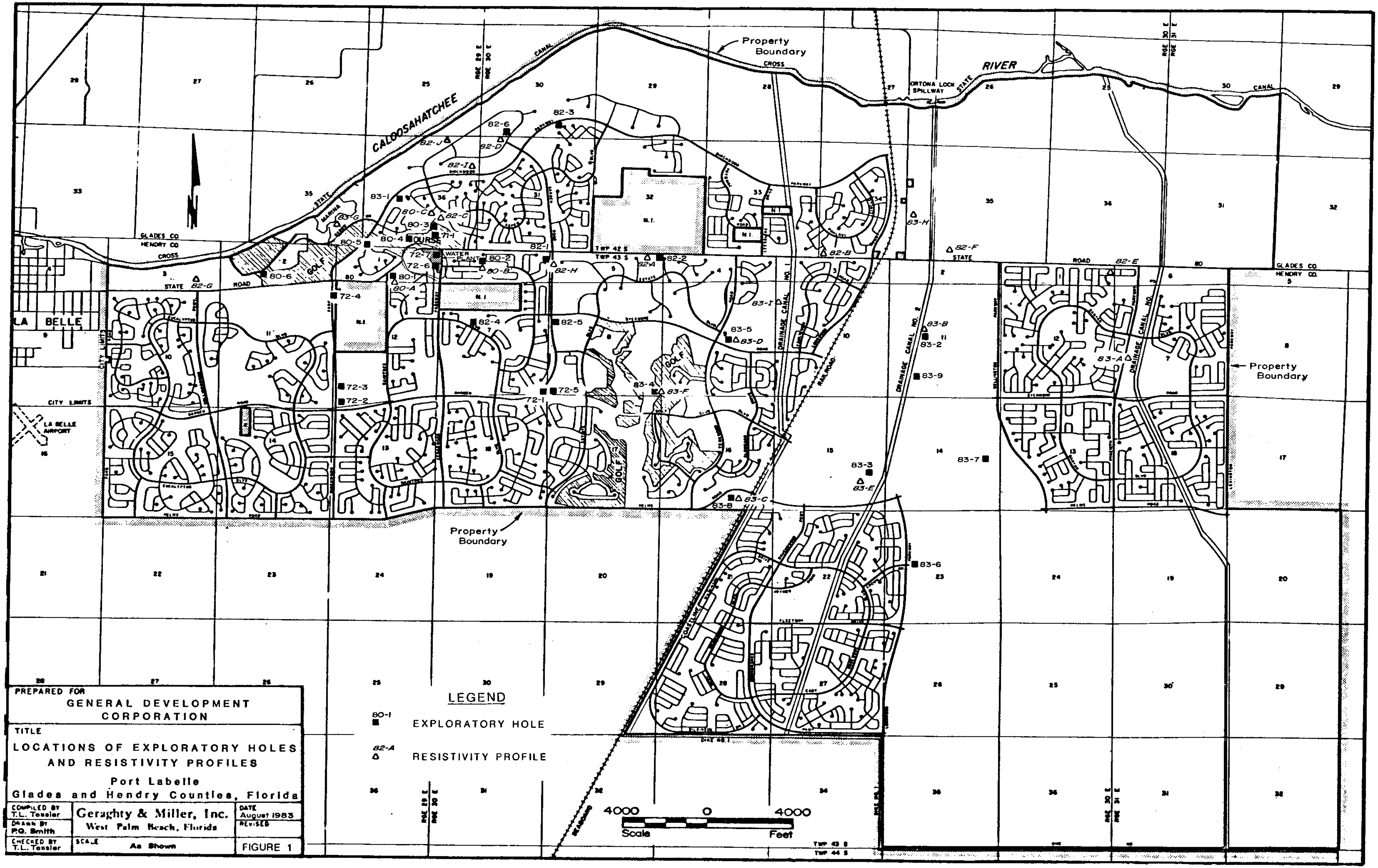
18. The Floridan aquifer has not been used for irrigation or as a public supply because of its apparent low yield and poor quality. However, the potential for blending and/or desalination should not be overlooked.

ACKNOWLEDGEMENTS

We appreciate the cooperation of many persons in helping us obtain data and complete this study. The staff of General Development Corporation, especially Lee Stepanchak and Carol Fox, guided the program toward completion. Patricia Lodge of General Development Utilities, Inc., (GDUI-Miami), directed the work and served well as program coordinator by gaining corporate assistance and providing data. Ralph Goodwin of GDUI-LaBelle located many of the existing irrigation wells, helped provide access to many areas, and handled water-quality analyses of selected wells. Henry LaRose of the U. S. Geological Survey provided unpublished water-level data and John Fish exchanged his thoughts on the regional hydrogeology, also. Billy D. Green Well Drilling of Plant City, and Marvin E. Miller & Son Well Drilling of Fort Myers worked quickly and efficiently in completing exploratory holes and wells.

HISTORY OF GROUND-WATER EXPLORATION AT PORT LABELLE

GDC began to explore the ground-water resources at Port LaBelle in 1971. The locations of referenced borings and wells are shown on Figure 1. A test well (71-1) was installed near the present golf-course maintenance area. Potentially productive geologic material was encountered in two intervals; the first, from 54 to 62 feet below land surface, produced 60 gpm (gallons per minute) with 24.7 feet of drawdown in a one-hour test. The second interval began at about 100 feet below land surface and continued to the total drilled depth of 142 feet. A 10-foot-long well screen was installed from a depth of 127 to 137 feet. The well produced 236 gpm with 5.03 feet of drawdown in a one-hour test. Water quality was tested at GDUI's laboratory in Port Charlotte for constituents that affect treatability. Total dissolved solids concentration in the shallower interval was reported as 375 ppm (parts per million) in the shallow zone and 350 ppm in the deeper zone. Chloride concentration was 30 ppm in both zones. The well screen was left in place in the deeper zone; water levels in this 8-inch-diameter well (known as the Jimmie


CALOOSAHATCHEE
CANAL
CROSS
STATE RIVER
CANAL
ORTONA LOCK SPILLWAY
Property Boundary
Property Boundary
Property Boundary
LA BELLE
LA BELLE AIRPORT
CITY LIMITS
GLADES CO.
HENDRY CO.
STATE ROAD 80
TWP 42 S
TWP 43 S
TWP 44 S
RGE 29 E
RGE 30 E
RGE 31 E
DRAINAGE CANAL NO. 1
DRAINAGE CANAL NO. 2
DRAINAGE CANAL NO. 3
RAILROAD
SEABOARD
GOLF
GOLF COURSE
WATER PLANT
N.I.
MARINA
DIKE
LEGEND
80-1
EXPLORATORY HOLE
82-A
RESISTIVITY PROFILE
4000 0 4000
Scale Feet
72-1
72-2
72-3
72-4
72-5
72-6
72-7
80-1
80-2
80-3
80-4
80-5
80-6
80-A
80-B
80-C
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83-4
83-5
83-6
83-7
83-8
83-9
83-A
83-B
83-C
83-D
83-E
83-F
83-G
83-H
83-I
PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
LOCATIONS OF EXPLORATORY HOLES AND RESISTIVITY PROFILES
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY P.G. Smith
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
DATE August 1983
REVISED
SCALE As Shown
FIGURE 1

Miller Well) have been monitored by the U. S. Geological Survey since February, 1977 (designated HE517 or GL517).

In 1972 and 1973, seven exploratory borings were installed at widespread locations in western Port LaBelle. They were installed to depths of 200 to 300 feet below land surface. In Borings 72-1 through 72-4, productive material was encountered only in the upper 50 to 90 feet, which appeared to be about as productive as the shallow interval in Well 71-1. These four borings were abandoned by backfilling with drilled cuttings and bentonite clay. A thin layer of potentially productive material with a high clay content was found from 200 to 260 feet below land surface in Boring 72-5. A well was completed by installing 4-inch-diameter steel casing to 240 feet and a 10-foot-long well screen in the interval of 240 to 250 feet. After development, a water sample was obtained by pumping 10 gpm for 5-3/4 hours. GDUI reported total dissolved solids concentration at 500 ppm and chloride concentration at 45 ppm. This well remains as a monitor well (Well 72-5).

Boring 72-6 was installed in January 1973. Potentially productive material was encountered at shallow depth and between 200 and 300 feet below land surface. A temporary screen was installed from 273 to 276 feet below grade; a water sample obtained after pumping 10 gpm for two hours contained a total dissolved solids concentration of 680 ppm and a chloride concentration of 125 ppm. Because this site appeared to be most productive of those tested in 1972 and 1973, an 8-inch-diameter test well was installed at the location; 40 feet of 0.030-inch-slot well screen was set between 250 and 290 feet below land surface. Approximately 300 feet to the north, Well 72-7 was installed to serve as an observation well in a test of the new well; Well 72-7 was cased with 2-inch-diameter steel pipe to 263 feet and screened from 263 feet to 276 feet below land surface using 10 feet of torch-slotted casing and a 3-foot-long well point. The test well produced 500 gpm during a 48-hour test at constant rate. The test well was converted to Production Well 1 (PW1) which had been the only public supply well for Port LaBelle until 1982. Well 72-7 has remained as a monitor well on the present water plant site.

In 1980, additional exploratory drilling was undertaken at Port LaBelle to define the trend of the productive materials encountered between 100 and 142 feet below grade in Well 71-1 and between 200 and 300 feet below grade in Wells 72-6 and 72-7 (Geraghty & Miller, Inc., 1980). At the same time, surface resistivity profiles were performed to determine if this geophysical method would be effective in locating productive material. Six borings were installed. Borings 80-1, 80-2, and 80-3 were located respectively approximately 2000 feet west, east, and north of the water plant and were drilled to depths of 300 to 313 feet. Borings 80-4, 80-5, and 80-6 were located progressively west of Boring 80-3 north of State Road 80. Although all the borings encountered some productive material at depths shallower than 100 feet, only Borings 80-2 and 80-3 penetrated potentially productive material below 100 feet deep. Wells 80-2 and 80-3 were completed at these sites using 1-1/2-inch-diameter PVC casing and gravel packed, 0.040-inch saw-cut slotted PVC screen. The screen section consisted of two 20-foot sections of casing spaced between two 20-foot sections and one 10-foot section of screen in the interval between 110 and 200 feet below grade. The other borings were backfilled with drilled cuttings and bentonite.

Because of the very dry nature of the soil in LaBelle when the resistivity surveys were performed in 1980, it was difficult to assess the effectiveness of electrical resistivity profiling as an exploration method (Geraghty & Miller, Inc., 1980). It did appear that resistivity could be useful in distinguishing high resistivity formations that might produce water (such as sand, limestone, and sandstone) from lower resistivity formations that are less water-productive (such as silt and clay).

In 1981 and 1982, a second production well (PW2) was installed at Port LaBelle. This well was needed to supply back-up capacity at the plant. Although PW1 was only 8 inches in diameter and equipped with a 350-gpm pump, it was anticipated that the LaBelle system soon would be expanded beyond a 0.5-mgd (million gallons per day) capacity and would require more and larger production wells; PW2 was designed for a much greater capacity. Located close to Well 72-7 on the water plant site, the well was constructed of 14-inch-diameter steel casing to 220 feet below grade and 60 feet of 12-inch-diameter wire-wound, stainless steel screen (0.035-inch slots) exposed from 220 to 278 feet below grade. The well can produce 3 mgd alone. A pumping test of PW2 has provided much of the information about areal hydrogeologic conditions (Geraghty & Miller, Inc., 1982).

THE CURRENT PROGRAM

The work recently performed at LaBelle consisted initially of surface resistivity surveys and exploratory drilling to further define hydrogeologic conditions and to locate productive material below 100 feet deep that was similar to that in the area near the water plant. In 1982, resistivity surveys and exploratory drilling were performed adjacent to State Road 80 east and west of the water plant, and north of the golf course north of the water plant. An inventory of irrigation wells on the property was also conducted. This work showed that the material penetrated by Wells 71-1, 80-2, 80-3, PW1, and PW2 was limited in lateral extent. Therefore, in 1983, the area of investigation was extended further southeast of the water plant in a previously unexplored area. The total exploration program in 1982 and 1983 (19 resistivity surveys, 15 exploratory borings of which 13 were converted to wells, and geophysical logging and testing of new wells and old irrigation wells) allows for a detailed hydrogeologic description of LaBelle. Figure 1 shows the locations of exploratory holes and resistivity profiles completed at LaBelle over the past 12 years. Appendix A presents data and findings from the resistivity profiles.

THE GROUND-WATER SYSTEM

The geologic and hydrologic conditions beneath Port LaBelle are described below. A summary of the geologic and hydrologic units are shown in Table 1.

TABLE 1

SUMMARY OF GEOLOGIC AND HYDROLOGIC UNITS
IN PORT LABELLE

GEOLOGIC		HYDROLOGIC
Sand, shell, sandstone, limestone, minor clay, 20-100 ft. thick extensive	SHALLOW AQUIFER	Water-table conditions, locally leaky artesian; transmissivity to more than 40,000 gpd/ft specific yield 0.2
Sandy to shelly clay, clayey sand, limestone and sand stringers, 0 ->200 ft. thick	CONFINING BED	Average vertical permeability 0.1 gpd/sq. ft. leakance 0.0005 to 0.005 gpd/cu. ft.
Sand, often with shell <20 - 175 ft. thick	INTERMEDIATE AQUIFER	Leaky artesian conditions transmissivity 20,000 gpd/ft. to 250,000 gpd/ft. storage coefficient 0.00006 to 0.0005
Clay and sandy clay >200 ft. thick	CONFINING BED	Estimated vertical permeability 0.0075 gpd/sq. ft. estimated leakance 0.00003 gpd/cu. ft.
Limestone, marl estimated >1000 ft.	FLORIDAN AQUIFER	Estimated transmissivity less than 10,000 gpd/ft.

Geologic Conditions

Geologic or driller's logs of all exploratory holes drilled in Port LaBelle under Geraghty & Miller's, direction are found in previous reports or in Appendix B of this report. The general geologic section will be described here. Formation names and ages are compared to those presented by Klein and others (1964), although it is recognized that detailed work in Lee County recently has changed the stratigraphic section. Little effort has been devoted to classifying the Glades and Hendry Counties stratigraphic section in greater detail.

Beginning at land surface, exploratory holes have encountered a surficial layer of sand, often with shell and organics, to a depth of 5 to 10 feet below land surface. This material probably represents the Pamlico terrace sands of Pleistocene age that mantle much of the area below the +25 feet msl elevation. Near the bottom of the sand, shell beds are sometimes found, but more often the sand grades downward into a limestone, sandstone, and dolomite sequence suggestive of the Pleistocene Fort Thompson and Anastasia Formations. A very hard limestone or dolomite layer, about 2 to 3 feet thick, occurring in the one-half-square-mile area north and east of the water plant is suggestive of the Bee Branch Member of the Caloosahatchee Marl that has been found along the Caloosahatchee River nearby.

Beginning at a depth of 15 to 25 feet, a sequence of shell, sand, limestone, and sandstone extends to depths of 40 to 100 feet below land surface. Gray- to olive-colored clay layers, as much as 12 feet thick, and clay-sand-shell-limestone sequences as much as 30 feet thick occur in some areas. This section appears to be representative of the upper Miocene(?) Tamiami Formation which has been described as reworked Hawthorn deltaic deposits.

Most of the exploratory holes in Port LaBelle encountered green to blue to gray clay starting at depths of 50 to 80 feet. Although this clay is absent at one location, elsewhere it varied from 10 to more than 250 feet thick. The clay was often sandy or shelly and occasionally contained thin lenses of sand or limestone stringers.

In a northwest-to-southeast-trending band in LaBelle, the clay sequence is interrupted by clastics—sand and shell. The sand is dominant; it is often medium- to coarse-grained. The shell occasionally comprises 60 to 70 percent of a sample, but that is rare. The shell is composed of small to large fragments and some small, whole shells. Although calcareous sandstone is found sometimes, limestone is distinctly absent.

The clastic sequence has been encountered at depths as shallow as 90 feet and extends to depths as great as 360 feet (deepest hole drilled under Geraghty & Miller direction). The thickness may be greater than 180 feet in some areas. The top and bottom of this clastic band is deepest on the south side where it also is thickest.

The deepest exploratory hole (Hole 83-7) in Port LaBelle continued to 360 feet within the clastics. At other locations, once the clastics were penetrated completely, they were not encountered again. The blue to green to gray clay was re-entered and continued to total depth. The clastics and enveloping clay appear to be characteristic of the middle(?) Miocene upper Hawthorn Formation.

Although formations deeper than the upper Hawthorn Formation have not been penetrated by exploratory holes at Port LaBelle, they have been described regionally. In addition, two existing flowing wells on the property have been geophysically logged to provide additional data. As will be discussed in Appendix C, it appears from these data that the clay sequence continues downward to a depth of about 580 feet, where limestone occurs. This limestone probably represents the lower Hawthorn Formation and grades downward into limestone of the Lower Miocene Tampa Formation. One or both of the flowing wells may even penetrate deeper, older limestone formations (Suwannee and/or Ocala).

Hydrologic Conditions

Shallow Aquifer: The shallow aquifer beneath Port LaBelle extends from the depth of first occurrence of the water table (at or slightly below land surface) to a depth as great as about 100 feet below land surface. This section corresponds with the sand-shell-limestone-sandstone sequence identified earlier as Pamlico, Fort Thompson, Anastasia, Caloosahatchee, and upper Tamiami Formations. Except in a one-square-mile area (Section 9, T43S, R30E) where underlying clay is thin to absent, the shallow aquifer is underlain by extensive clay and marl that is 20 to several hundred feet thick and separates it from underlying aquifers.

The shallow aquifer beneath Port LaBelle serves several hydrologic purposes. First, the aquifer can provide a source of water to irrigation, domestic, and public supply wells. Agricultural interests, especially in the Increment III area south of State Road 80 and east of the Seaboard Railroad, have installed small-diameter (2-inch to 6-inch) shallow wells (20 feet to 70 feet deep) in this aquifer. The wells have been used primarily to fill canals for flood irrigation. Some wells have been equipped with windmill pumps and provide continuous water for cattle or to recharge canals. Because the aquifer is extensive beneath the community, because individual wells reduce the use of treated water from the public supply, and because domestic irrigation results in the return of excess water directly to the aquifer from which it is withdrawn, individual wells for lawn irrigation are encouraged by General Development Corporation as a water-conservation measure. Public supply wells have not yet been installed in the shallow aquifer beneath Port LaBelle. To be cost-effective, public supply wells must be larger (4 inches in diameter or greater), deeper (40 feet is a practical regulatory minimum in Florida and is often needed to provide a sufficient saturated thickness), and more productive (50 gallons per minute is nearly minimal in Florida) than irrigation or domestic wells.

The shallow aquifer has value as a storage reservoir. Rainfall in the LaBelle area varies seasonally. MacVicar (1983) showed an annual average rainfall of about 49 inches at LaBelle, somewhat less than the 51.81 inches reported by Klein and others (1964) based on 22 years of record. For the May-to-October wet season of 1968, MacVicar (1983) indicated that nearly 46 inches of rain was recorded at LaBelle. Conversely, in the November-to-April dry season of 1970-1971, less than 3 inches of rain was recorded. Although these are seasonal extremes, the shallow aquifer has value in storing excess water in the wet season for use in the dry season. The usage may be by wells, by plants with root networks that reach the water table, or by drainage into streams and canals to support base flow. By providing storage, the shallow aquifer can also provide flood protection as it can rapidly absorb water from heavy rainfalls before the water can run off rapidly into lakes and streams, and release that water later after the effects of heavy rainfall subside.

Only a portion of the rainfall that reaches the land surface will arrive at the water table. Another portion will run off and some will evaporate. Of the portion that infiltrates through the land surface, some is taken up by plants (transpiration) and some will be evaporated directly from the soil. The remainder recharges the ground-water system.

Precise estimates of the amount of rainfall that recharges the water table are difficult to obtain. Part of the difficulty is that the uptake by plants and the evaporation will vary according to season, depth to water, and soil moisture content. Recent technical studies in Boca Raton and Fort Lauderdale have reported recharge values of 30 to 34 inches per year in years of near normal precipitation. This recharge seems inordinately high for the Port LaBelle area where the surficial sands are not as permeable as they are on the east coast. Annual recharge of 20 to 25 inches per year would seem to be more reasonable for the study area.

Even when precipitation reaches the water table, it may not remain there. Ground water is subject to evaporation and transpiration by plants (collectively called evapotranspiration) too. Actual evapotranspiration varies from a maximum when the water table is at land surface to zero when the water table exceeds some depth below land surface. The maximum value is called potential evapotranspiration and has been reported by R. E. Dohrenwend (1977) as about 51 inches per year by using a life-zone bioclassification system. This is a maximum evapotranspiration rate. Actual evapotranspiration is generally much lower. Dohrenwend estimated actual evapotranspiration as 39 inches per year at LaBelle.

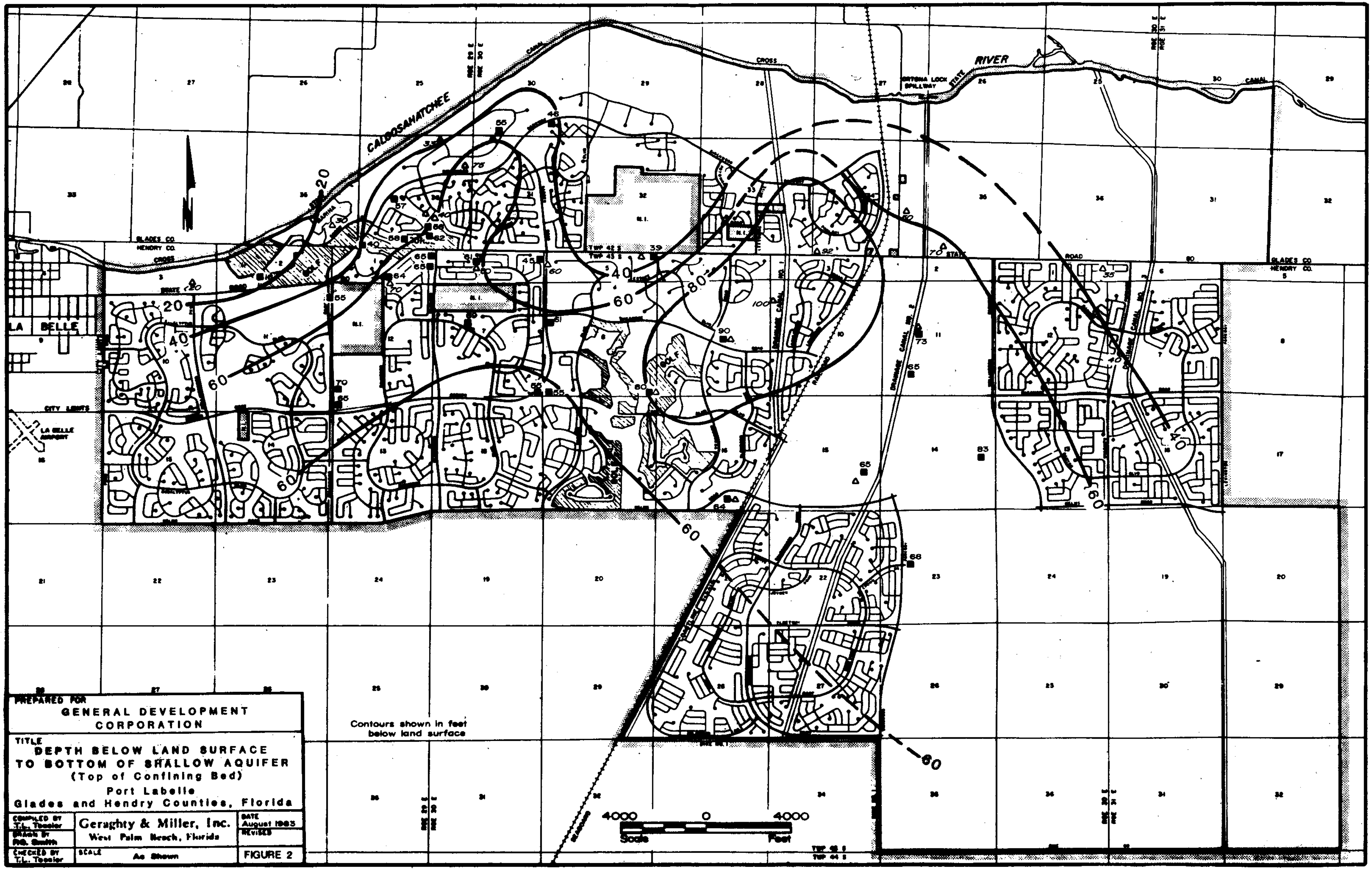
Available ground-water recharge has been estimated in several studies. Kreitman (1975) has mapped potential average annual ground-water recharge for the study area as less than 6 inches per year. Dohrenwend has estimated water surplus for the area (basically the same as potential annual ground-water recharge) as 12 to 14 inches per year. The difference between these numbers may rest in the fact that the aquifer at LaBelle is brim full during much of the year, resulting in rejection of excess water as runoff and evaporation. Effective recharge of 10 inches per year is assumed to be a reasonable estimate under normal conditions.

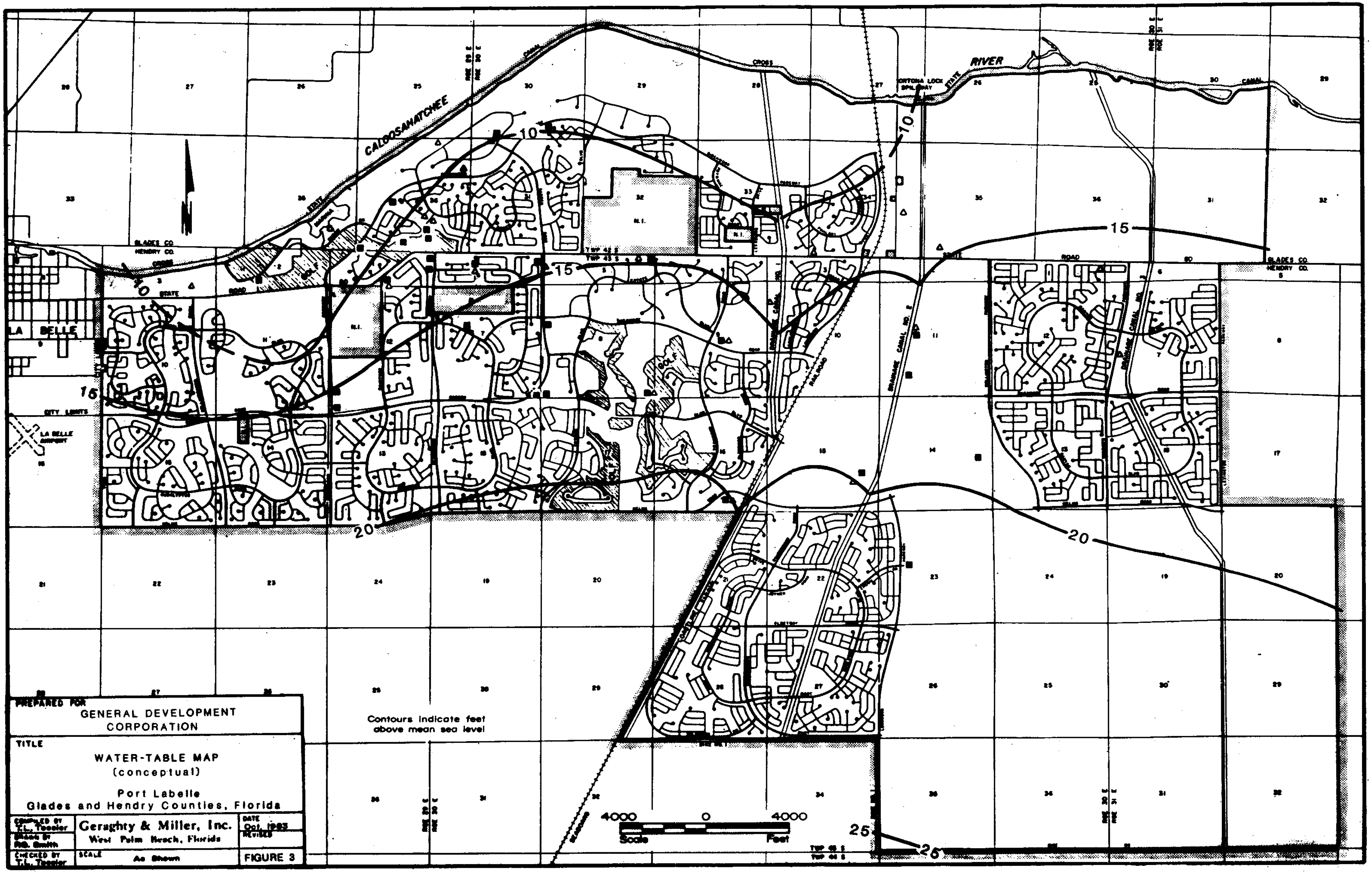
Estimates of potential ground-water recharge are based on existing natural conditions, but systems that increase ground-water recharge can occur. The drainage of land through the use of canals can increase ground-water recharge by lowering the water table areally which decreases evapotranspiration. Lowering of the water table by pumping can accomplish the same thing. Additional sources of recharge may exist also. A surface-water management system, like that designed for Port LaBelle, encourages on-site retention of rainfall for recharge and discourages rapid runoff of water during smaller rainfall events. Artesian wells tapping the Floridan aquifer may flow or leak water to the shallow ground-water system. Septic systems discharge water to the ground; some of this water recharges the ground-water system. Regional drainage canal systems may allow the importation of additional water into an area to supplement natural recharge. All of these sources of recharge currently exist in the study area and increase the volume of ground water available for use.

The shallow aquifer is valuable as a source of recharge to deeper aquifers. Where the water level in the shallow aquifer is higher than the water level in underlying aquifers, a potential for downward movement of water exists. At Port LaBelle, this may occur where the intermediate aquifer underlies the shallow aquifer; the recharge mechanism will be discussed in more detail when the intermediate aquifer is considered later in this report.

To characterize the shallow aquifer hydrologically, one must understand its three-dimensional extent and its parameters. Figure 2 shows the depth below land surface to the bottom of the shallow aquifer beneath Port LaBelle as determined from the geologic logs of all the exploratory holes and from the surface resistivity surveys. Because Figure 2 shows the bottom of the aquifer, it does not illustrate the thickness of the aquifer. The thickness is known approximately, but varies seasonally with the amount of water in storage in the aquifer. The water table (top of the shallow aquifer) occurs at land surface or only a few feet below beneath most of Port LaBelle. Therefore, the topographic surface, which rises from an elevation of less than 10 feet near the Caloosahatchee River northwest of Port LaBelle to 26 feet above sea level south and east of LaBelle, approximates the shape and elevation of the water table. The land surface is wet much of the time in this area, so the water may be assumed to be at land surface south and east of Port LaBelle and to coincide with the river level downstream of the Ortona Lock northwest of the community. Figure 3 is a conceptual water-table map of Port LaBelle, based on pre-development topography, and assuming that water levels are within about two feet of land surface.

Aquifer coefficients (transmissivity, storativity, leakance) usually are determined by detailed testing of wells. Because the shallow aquifer has not been considered as a major source for public supply at Port LaBelle, detailed testing has not been performed. However, two exploratory wells installed under Geraghty & Miller's direction, Wells 71-1 and 83-9, were tested informally during construction and provided adequate data for present purposes. Well 71-1 was completed with a


CALOOSAHATCHEE
RIVER
CANAL
ORTONA LOCK SPILLWAY
LA BELLE
LA BELLE AIRPORT
CITY LIMITS
GLADES CO
HENDRY CO
Contours shown in feet below land surface
4000 0 4000
Scale Feet
PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
DEPTH BELOW LAND SURFACE TO BOTTOM OF SHALLOW AQUIFER
(Top of Confining Bed)
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY P.G. Smith
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
DATE August 1983
REVISED
SCALE As Shown
FIGURE 2


CALOOSAHATCHEE
RIVER
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ORTONA LOCK SPILLWAY
LA BELLE
CITY LIMITS
LA BELLE AIRPORT
GLADES CO
HENDRY CO.
STATE
ROAD
GOLF
N.I.
10
15
20
25
Contours indicate feet above mean sea level
4000 0 4000
Scale Feet
PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
WATER-TABLE MAP
(conceptual)
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY P.G. Smith
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
SCALE As Shown
DATE Oct. 1983
REVISED
FIGURE 3

screen from 127 to 137 feet below land surface. However, during the drilling a temporary screen was installed from 54 to 62 feet deep in a permeable section of the shallow aquifer extending from 37 to 62 feet below land surface. This well was developed and pumped in a one-hour test. The well produced 60 gpm with 24.7 feet of drawdown after one hour.

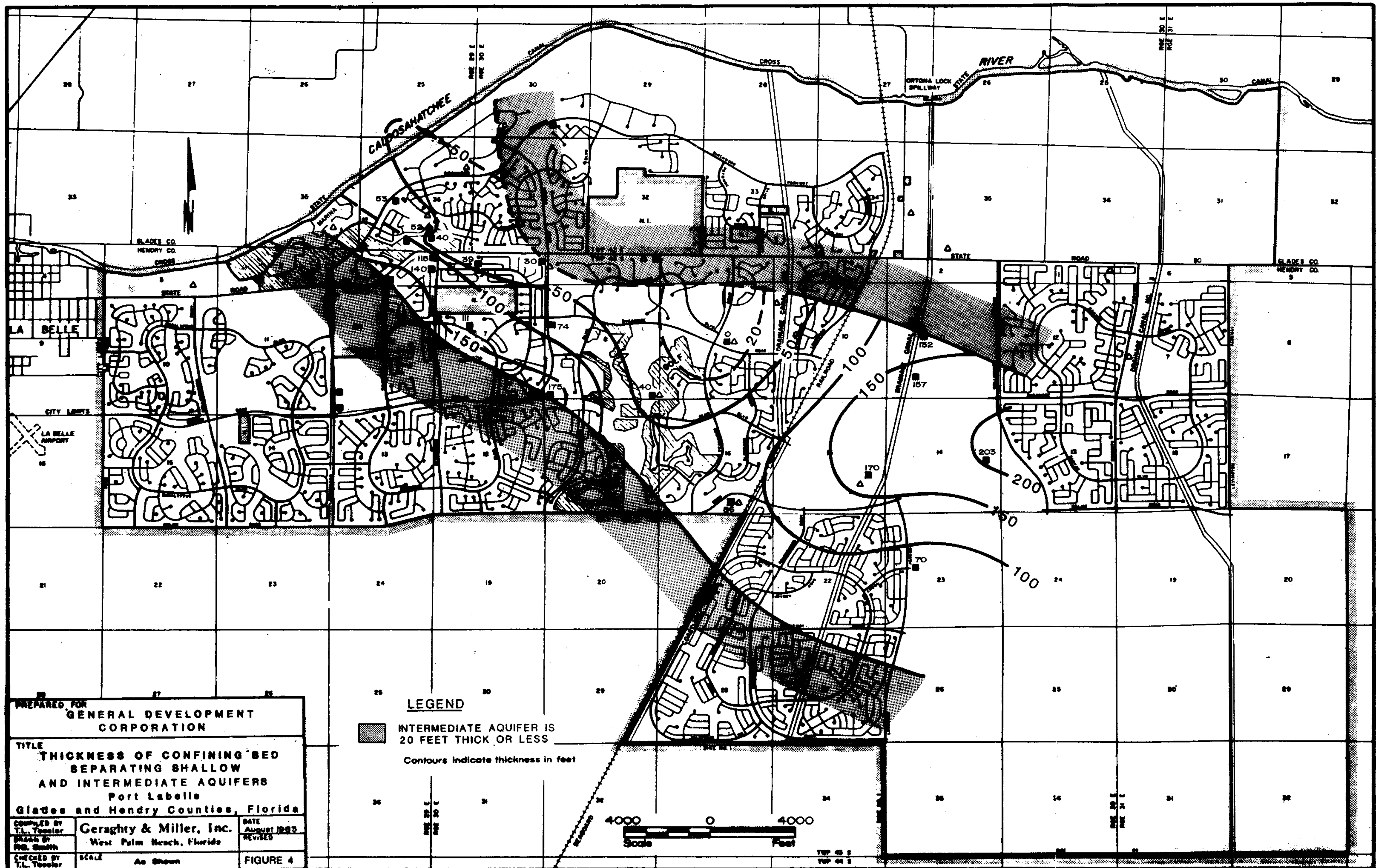
Well 83-9 was screened from 30 to 60 feet below land surface. This 2-inch-diameter well penetrated permeable material from land surface to 65 feet below. This well was developed, and pumped one-half hour at a rate of 33 gpm to obtain a water sample. Recovering water levels were measured after pumping was completed. These data were interpreted using Jacob's modification of the Theis Equation (UOP, Inc., Johnson Divison, 1972, p. 136) and a transmissivity of 43,300 gpd/ft was estimated. This suggests that public supply wells 40 feet deep in the shallow aquifer or more could yield as much as 400 gpm.

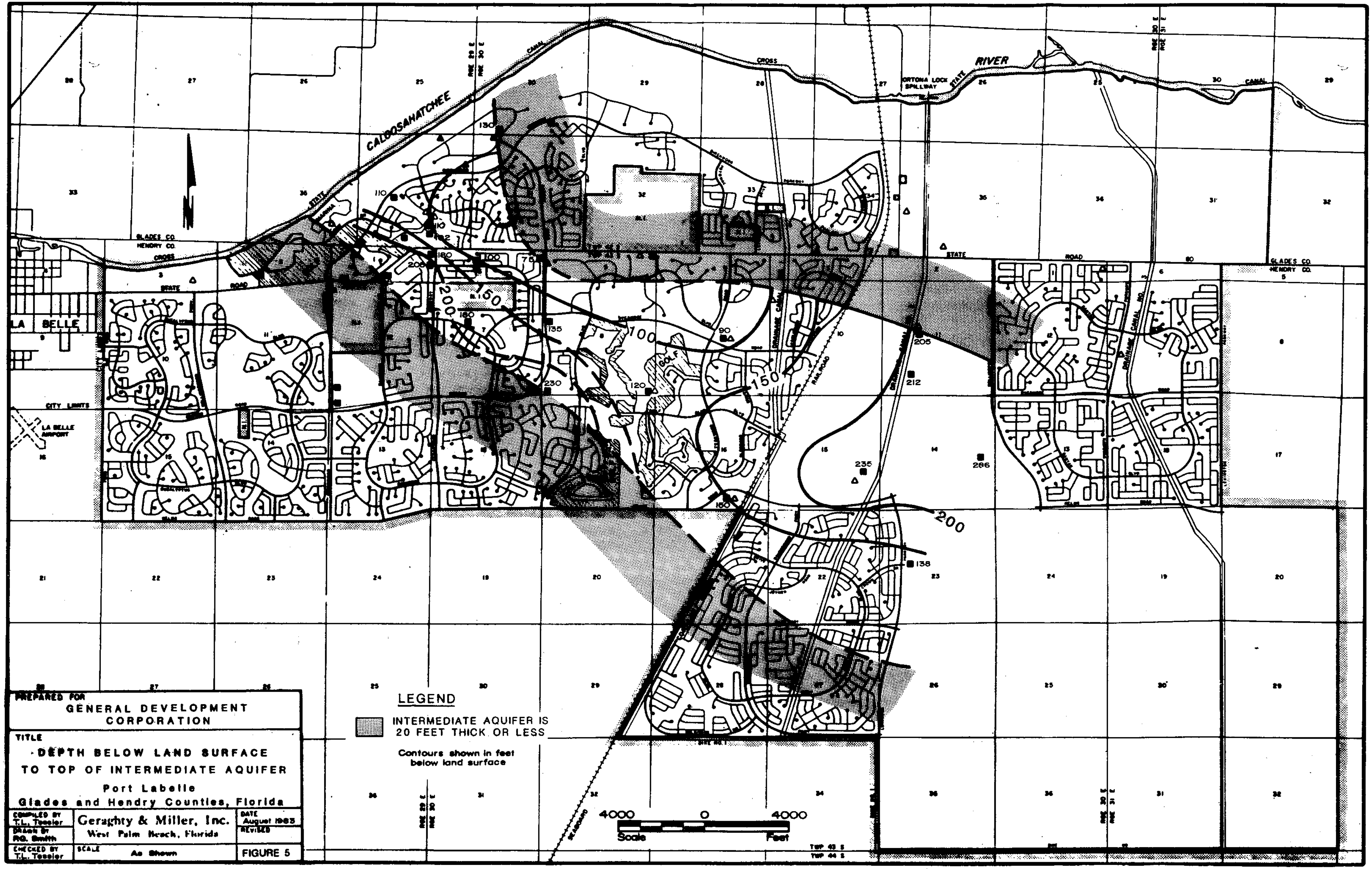
Another aquifer parameter is storativity. Actually there are two values of storativity. The first is called storage coefficient which can be crudely defined as the fractional volume of water that can be derived from an aquifer per unit drawdown primarily as a result of aquifer compressibility and water expansion. Generally, this number is small. Of greater interest is the specific yield, which is the fractional volume of water that can be drained from sediments at the water table as a result of unit head decline. Pumping tests to determine specific yield are rarely performed because they are complex, long, and tedious. However, specific yield has been determined in other areas with similar lithologic conditions (Fetter, 1980, p. 68). For the fine- to medium-grained sand typically encountered at the water table and a few feet below in Port LaBelle, specific yield averaged 0.21 to 0.26. A graph (U. S. Department of the Interior, Bureau of Reclamation, "Drainage Manual," 1978, p. 25) presents specific yields that may be expected for various hydraulic conductivities. In other areas of Florida, the Soil Conservation Service has conducted tests to determine the hydraulic conductivity of near-surface soils similar to those at Port LaBelle. Generally, the hydraulic conductivity falls in the range of 90 to 300 gpd/sq. ft. Graphically, these correspond to specific yields of 0.20 to 0.25. The South Florida Water Management District uses 0.20 as an approximate specific yield for the water table in the absence of site-specific data.

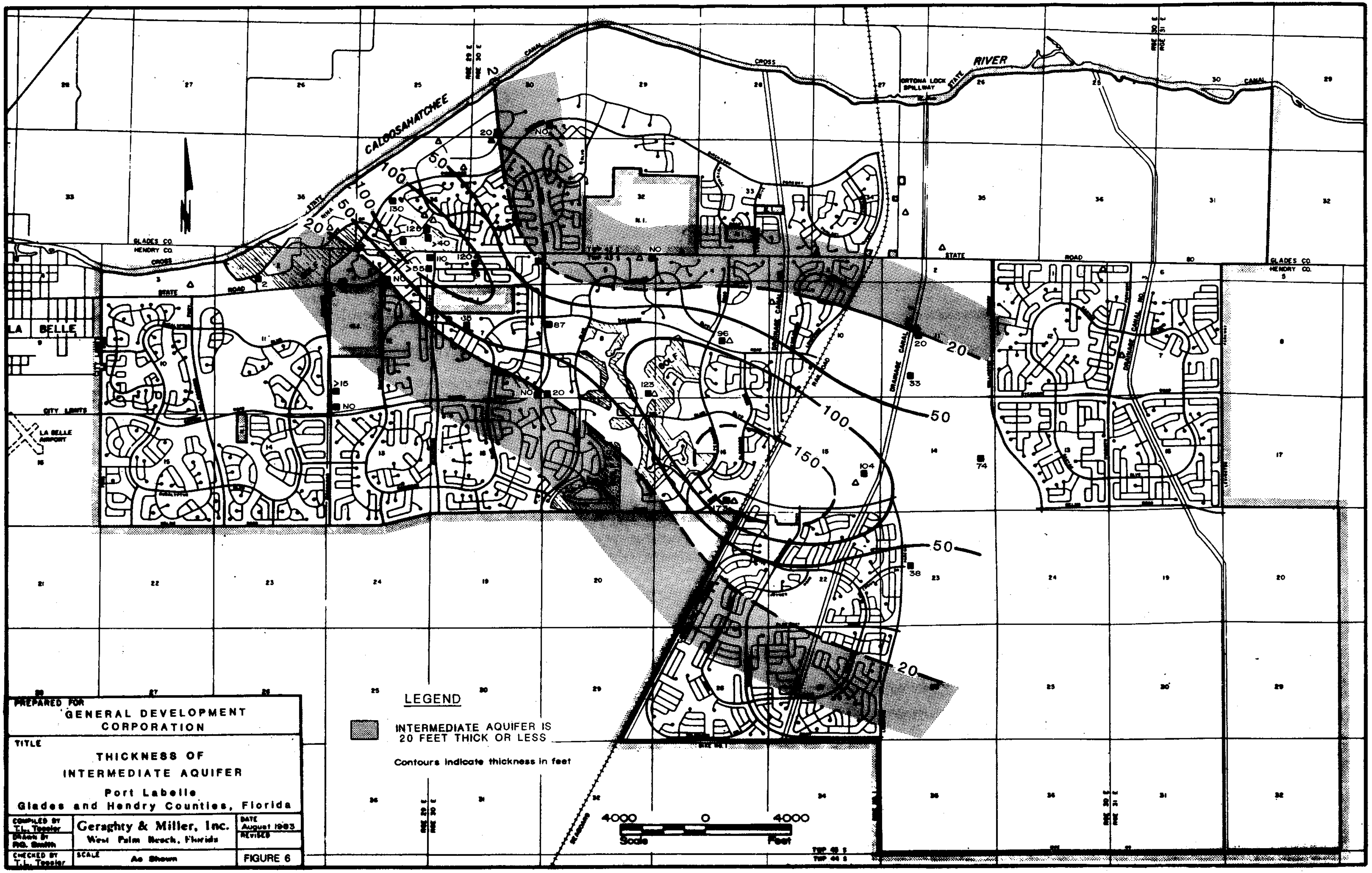
Leakance is not an important parameter in a discussion of the shallow aquifer at LaBelle. Although the clay within the shallow aquifer will tend to retard the downward movement of water and may cause wells completed in the deeper portion of the aquifer to respond to pumpage as if leaky artesian conditions prevail in the area, under long-term pumping conditions in the absence of significant recharge, water-table levels will decline and water-table conditions will dominate.

<u>Intermediate Aquifer</u> : The intermediate aquifer at Port LaBelle extends from the depth of the occurrence of coarse- to medium-grained sand. This sand occurs in a northwest-to-southeast-trending band across Port LaBelle below vari-colored clay that is from 10 to 250 feet thick which serves as a confining bed to separate the shallow and intermediate aquifers. However, in one area (Section 9, T43S, R30E), the clay is absent and the shallow and intermediate aquifers exist as a single unit. Figure 4 shows the thickness and extent of the confining bed where it overlies the intermediate aquifer. Figures 5 and 6 show respectively the depth below land surface to the top of the intermediate aquifer and the thickness of the intermediate aquifer. The medium- to coarse-grained sand is characteristic of the intermediate aquifer. However, in its lower section especially, greater percentages of shell may be found.

The value of the intermediate aquifer is its use as a public water supply. General Development Utilities, Inc., taps this aquifer at the present water plant from two wells. This aquifer generally is not used for agricultural irrigation or domestic supply. An inventory of the area showed that only one old irrigation well penetrated to a depth sufficient to reach the intermediate aquifer. Because wells drilled to the shallow aquifer produce an adequate quantity and are less expensive


PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
THICKNESS OF CONFINING BED SEPARATING SHALLOW AND INTERMEDIATE AQUIFERS
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
DATE August 1983
REVISED
SCALE As Shown
FIGURE 4
LEGEND
INTERMEDIATE AQUIFER IS 20 FEET THICK OR LESS
Contours indicate thickness in feet
4000 0 4000
Scale Feet
CALOOSAHATCHEE
CROSS STATE RIVER CANAL
ORTONA LOCK SPILLWAY
LA BELLE
LA BELLE AIRPORT
CITY LIMITS
GLADES CO.
HENRY CO.
STATE ROAD 80
MARINA
RAILROAD
50
100
150
200
20
175
203
170
157
152
74
140
118
70
66
52
53
40
39
30


CALOOSAHATCHEE
CANAL
RIVER
STATE
ORTONA LOCK
SPILLWAY
STATE ROAD 80
GLADES CO.
HENDRY CO.
LA BELLE
CITY LIMITS
LA BELLE AIRPORT
GOLF
RAILROAD
DRAINAGE CANAL
SEABOARD
RGE 29 E
RGE 30 E
RGE 31 E
TWP 43 S
TWP 44 S
130
110
180
100
75
200
150
160
135
100
90
205
212
150
230
120
235
286
150
138
200
LEGEND
INTERMEDIATE AQUIFER IS 20 FEET THICK OR LESS
Contours shown in feet below land surface
4000 0 4000
Scale Feet
PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
DEPTH BELOW LAND SURFACE TO TOP OF INTERMEDIATE AQUIFER
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY P.G. Smith
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
DATE August 1983
REVISED
SCALE As Shown
FIGURE 5



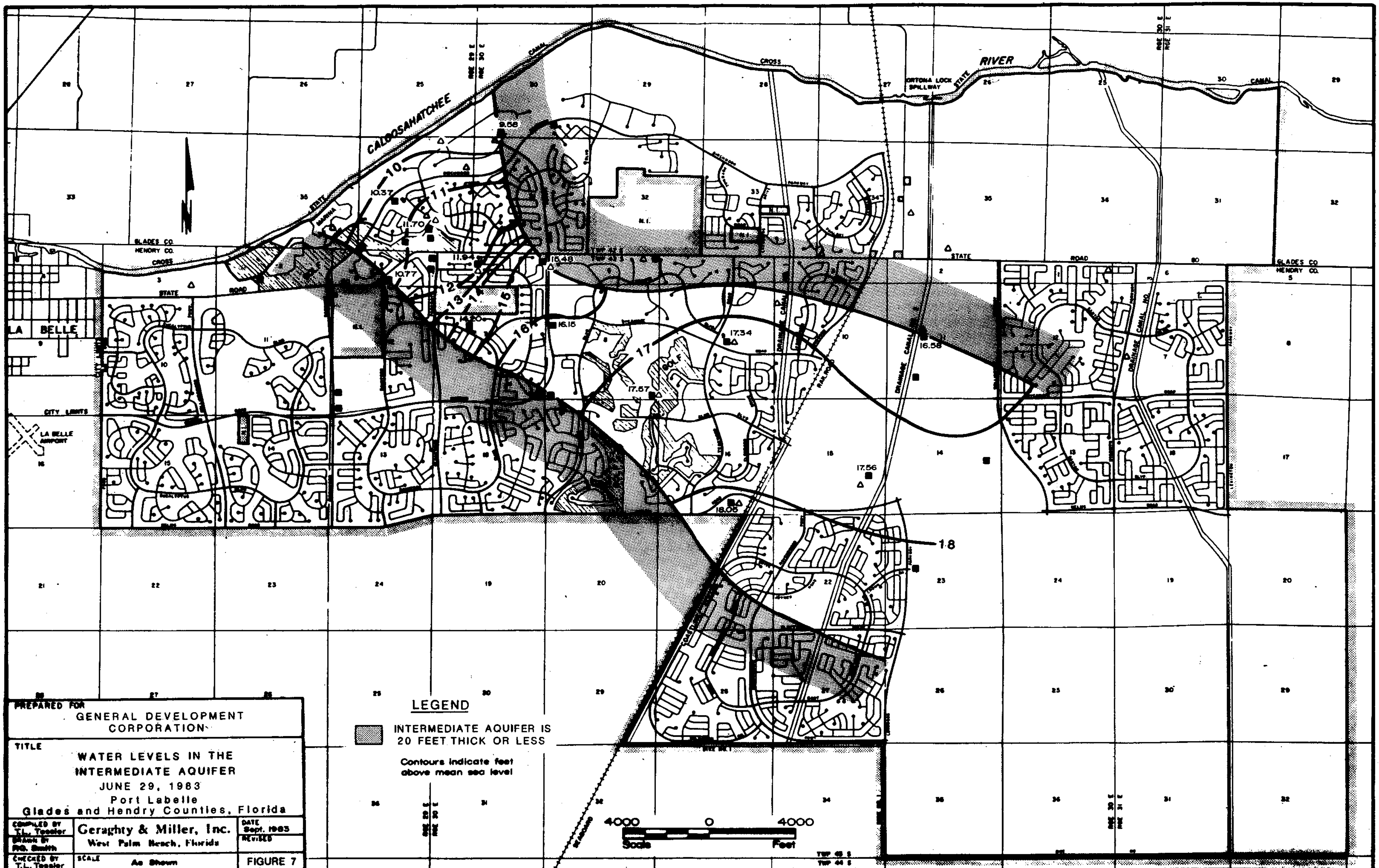
PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
THICKNESS OF INTERMEDIATE AQUIFER
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Teesler
DRAWN BY P.O. Smith
CHECKED BY T.L. Teesler
Geraghty & Miller, Inc.
West Palm Beach, Florida
DATE August 1983
REVISED
SCALE As Shown
FIGURE 6
LEGEND
INTERMEDIATE AQUIFER IS 20 FEET THICK OR LESS
Contours indicate thickness in feet
4000 0 4000
Scale Feet
CALOOSAHATCHEE
CROSS STATE RIVER CANAL
ORTONA LOCK SPILLWAY
LA BELLE
LA BELLE AIRPORT
CITY LIMITS
GLADES CO
HENDRY CO.
STATE ROAD 80
DRAINAGE CANAL
GOLF
TWP 43 S
TWP 44 S

to construct, most of the irrigation and domestic wells tap the shallow aquifer only.

Although the intermediate aquifer is confined by the overlying clay and is therefore artesian, wells tapping that aquifer do not flow. Figure 7 is a water-level map of the intermediate aquifer in June 1983. Depending on the season and location, it is likely that the water levels in the intermediate aquifer are slightly lower than those of the shallow aquifer beneath most of Port LaBelle under natural conditions. In June 1983, however, the water level in Well 83-9 (shallow aquifer) located slightly east of Drainage Canal No. 2 was about 0.7 feet lower than the level in Well 83-2 (intermediate aquifer) one-half mile away.

The aquifer coefficients (transmissivity, storativity, leakance) of the intermediate aquifer have been determined by detailed testing of Production Well 2, informal testing of small-diameter wells, and by evaluation of the geologic conditions. The test of Production Well 2 established the aquifer as a highly transmissive zone with boundaries to the southwest and northeast. Because the small-diameter test wells only partially penetrate the intermediate aquifer which varies greatly in thickness, transmissivity can be estimated by applying the formula generated by the multiple linear regression analysis of tests on small-diameter wells (Appendix D) to the map of aquifer thickness (Figure 6). When this is done, transmissivity ranges from less than 20,000 gpd/ft to 250,000 gpd/ft.

Storativity (or storage coefficient for an artesian aquifer) has been established from the test of Production Well 2 (Geraghty & Miller, Inc., 1982). It ranged between 0.00030 and 0.00043 for that test. Storage coefficient is closely related to aquifer thickness (Lohman, 1972), however, so to approximate storage coefficient elsewhere at Port LaBelle, one may relate the aquifer thickness near Production Well 2 (110 feet) to the established storage coefficient. One may say that the storage coefficient is 0.000003 (0.00033/110) per foot of aquifer thickness. For the intermediate aquifer as a whole, the storage coefficient may range from 0.00006 to 0.0005.


PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
WATER LEVELS IN THE INTERMEDIATE AQUIFER
JUNE 29, 1983
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY P.G. Smith
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
DATE Sept. 1983
REVISED
SCALE As Shown
FIGURE 7
LEGEND
INTERMEDIATE AQUIFER IS 20 FEET THICK OR LESS
Contours indicate feet above mean sea level
4000 0 4000
Scale Feet
CALOOSAHATCHEE
CROSS STATE RIVER CANAL
ORTONA LOCK SPILLWAY
LA BELLE
LA BELLE AIRPORT
CITY LIMITS
GLADES CO.
HENDRY CO.
STATE ROAD 80
DRAINAGE CANAL
RAILROAD
GOLF
RGE 29 E
RGE 30 E
RGE 31 E
TWP 43 S
TWP 44 S
10
11
12
13
14
15
16
17
18
9.56
10.37
11.70
10.77
11.94
14.20
15.48
16.15
17.34
17.57
16.56
17.56
18.05

A most important coefficient for the intermediate aquifer at Port LaBelle is leakance. Because the aquifer is separated from the shallow and Floridan aquifers by confining beds, leakage is the only way the aquifer can receive significant recharge. As discussed in Appendix E, leakance is a function of vertical permeability of the confining bed and thickness of the confining bed. From test data, it appears that an average vertical permeability for the confining bed separating the shallow and intermediate aquifers near Production Well 2 is 0.1 gpd/sq. ft. Assuming this value holds elsewhere, one can use the confining bed thickness (Figure 4) to determine leakance. This shows leakance ranges from 0.0005 gpd/cu. ft. to 0.005 gpd/cu. ft. in the confining bed above the intermediate aquifer. Of course, where the confining bed is absent (Section 9), leakance is even higher.

Floridan Aquifer : Beneath the intermediate aquifer where it occurs or beneath the shallow aquifer elsewhere, the vari-colored clay probably extends to 580 feet and confines the Floridan aquifer. Wells penetrating the Floridan aquifer beneath LaBelle flow naturally, with a shut-in head of about 44 feet above sea level in June 1983.

Only two wells penetrating the Floridan aquifer were known to exist at Port LaBelle. One 5-1/2-inch-diameter well in Township 42S, Range 30E, Section 33, penetrated to 848 feet and was plugged during this program. The second well, located at the Welcome Center and 4 inches in diameter, is 640 feet deep and is used to supplement lake levels on the golf course near the LaBelle Inn. Only a few other wells tapping the Floridan aquifer exist in the vicinity of LaBelle. Generally, the water quality is poor and the flow rate is inadequate for irrigation.

Recovery tests were performed on the two wells at Port LaBelle. These tests were analyzed according to the method of Jacob's Modification of the Theis Equation. Of the two wells, the deeper well flowed 62 gpm and, when fully recovered, the water level was about 28 feet above land surface (43 feet above sea level). The specific capacity of recovery was 2.27 gpm/ft after 90 minutes; when analyzed, data revealed that the transmissivity was 5150 gpd/ft. By contrast, the shallower, Welcome Center well flowed at 21.5 gpm. If allowed to fully recover, the static head would have been about 34 feet above land surface (44 feet above sea level). The specific capacity at recovery was 0.65 gpm/ft after 60 minutes. Calculated transmissivity was 780 gpd/ft.

Storativity and leakance were not determined for the Floridan aquifer at Port LaBelle. The aquifer is probably 1000 feet thick or more beneath LaBelle. Using a guideline provided by Lohman (1972, p. 53), storativity (storage coefficient) is probably 0.001 or more. Likewise, leakance has not been determined. However, as the confining clay is 200 feet thick or more and assuming that the vertical permeability of the confining clay is similar (0.1 gpd/sq. ft) to the clay separating the shallow and intermediate aquifers (it is probably much less permeable because it appears to be more dense), leakance is probably 0.0005 gpd/cu. ft. or less.

The distinct differences in flow rate, water quality, transmissivity, and water-level elevation between these two wells indicate that the deeper well probably tapped a more productive but more saline zone of the Floridan aquifer. This illustrates the trade-off that must be made in using the Floridan aquifer—better quality but lower production from near the top of the aquifer versus poorer quality but greater production from deeper zones of the aquifer.

WATER QUALITY

Shallow Aquifer

General Development Corporation, within its submittals for Increments I, II, and III, has provided water-quality data from wells penetrating the water table in various areas. In addition, two of the exploratory wells constructed under Geraghty & Miller, Inc., direction (Well 71-1, the Jimmie Miller Well, and Well 83-9) tapped the shallow aquifer. As shown in Table 2, the water was similar from both wells. The water is potable

TABLE 2

WATER QUALITY
IN THE SHALLOW AQUIFER

Well 71-1

[redacted]

GDU Stock No. CX75031

CHEMICAL WATER ANALYSIS
Results in Parts Per Million

Location LaBELLE, FLORIDA *Date Collected* 7-6-71

Collector Vince Amy *Date Analyzed* 7-27-71

Source of Sample Test Well No. 1 on Barron Property

Remarks 52 - 62 ft. level Q = 60 GPM

SUMMARY OF ANALYSIS

	P.P.M.		P.P.M.
Total Dissolved Solids 105 °C	375	*Color* (in lab)	20
Total Hardness, as $CaCO_3$	348	*Odor* (in lab)	None
Alkalinity, as $CaCO_3$	348	*Taste* (in lab)	None
Non-Carbonates, as $CaCO_3$	0	**Carbon Dioxide, as* CO_2	42
Bicarbonate, HCO_3	424	**Bicarbonate, as* $CaCO_3$	348
Iron, Fe (in lab)	0.0	**Carbonate, as* $CaCO_3$	0
Sulfate, SO_4	0	** Hydroxide, as* $CaCO_3$	0
Chloride, Cl	30	*Temperature at Collection, °F*	Use 75
Calcium, Ca	107	*pH (Field)*	ND
Magnesium, Mg	19.5	*pH (Laboratory)*	7.2
Fluoride, F	0.5	*pHs*	6.9

*Stability Index (2pHs - pH)** 6.6

Interpretation: Corrosive ___ *Non Corrosive* ___ *Scale Forming* Yes

Appearance Turbid due to suspended limestone

**Calculated*

ND=Not Done

[redacted]

Sidney W. Wells
CHEMIST

Well 83-9

D.H.R.S. #86117

Environmental Services

P.O. Box 10003
[redacted] Riviera Beach, Florida
33404

LABORATORY ANALYSIS — CONSULTING

WATER
WASTEWATER
SOIL
FOOD

INDUSTRIAL
AGRICULTURAL
DOMESTIC

Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

83-9
Sample collected by Geraghty & Miller on 6-22-83 at

Temperature at time of collection	°C	Carbon dioxide, CO_2	mg/l
Total Dissolved Solids (103-105°)	432 mg/l	Hydroxide as $CaCO_3$	mg/l
Total Hardness as $CaCO_3$	295 mg/l	Carbonate as $CaCO_3$	mg/l
Total Alkalinity as $CaCO_3$	270 mg/l	Bicarbonate as $CaCO_3$	mg/l
Non-carbonate Hardness	mg/l	Bacteria, Total Coliform	/100ml
Bicarbonate, HCO_3	mg/l	Arsenic, As	mg/l
Iron, Fe	0.37 mg/l	Barium, Ba	mg/l
Sulfate, SO_4	7 mg/l	Copper, Cu	mg/l
Chloride, Cl	50 mg/l	Cadmium, Cd	mg/l
Calcium, Ca	116 mg/l	Chromium, Cr^{+6}	mg/l
Magnesium, Mg	mg/l	Cyanide	mg/l
Fluoride, F	mg/l	Lead, Pb	mg/l
Hydrogen Sulfide, H_2S	mg/l	Manganese, Mn	mg/l
pH	6.8	Mercury, Hg	mg/l
pHs	6.9	Nitrate, as N	mg/l
Stability Index	7.0	Phenols	mg/l
Saturation Index	-0.1	Selenium, Se	mg/l
MBAS	mg/l	Silver, Ag	mg/l
T Odor		Sodium, Na	mg/l
Color, APHA	50	Turbidity, NTU	
Residual Chlorine: Free Available		Zinc, Zn	mg/l
Combined Available		Calcium Hardness, as $CaCO_3$	290 mg/l
		Magnesium Hardness, as $CaCO_3$	5 mg/l

Collection Date 6-20-83

Michael A. Fiedor
MICHAEL A. FIEDOR, CHEMIST

without treatment for the constituents analyzed. Based on public water supply standards and to provide a high quality product, if the shallow aquifer were tapped for public supply, the utility would likely treat the water to reduce hardness, iron, and color. Although the pH of Well 83-9 was analyzed in the laboratory, the field pH is probably similar.

It appears that the shallow aquifer is suitable for irrigation and lawn sprinkling in Port LaBelle, and probably is suitable for public supply also, if needed. However, there is one area where the water quality in the shallow aquifer probably has been affected by past land use. The flowing well in Section 33 (plugged during this program) had discharged saline water continuously onto the land surface for many years. Some of this water probably recharged the shallow aquifer and degraded it. This degradation is suggested by the water quality of Groundwater Well Station GW-2 (General Development Corporation, December 1979, p. 15-30) which was reported as sulfate, 64.4 mg/l; and conductivity, 800 umhos (Note: This was shown as 800 mhos in the original reference; it probably should have been 800 umhos.). It is likely that degradation occurs only near the surface and within the drainageway of the now-plugged well. As the well has been plugged, water quality now should improve in this area as a result of inflow of fresh recharge.

Intermediate Aquifer

The quality of the intermediate aquifer is well documented in this report (Appendix F) and previous reports (Geraghty & Miller, 1980; Geraghty & Miller, 1982), and in the operational history of General Development Utilities' water plant at LaBelle. Table 3 summarizes the range in water quality for sampled wells in LaBelle that penetrate the intermediate aquifer. As can be seen, based on the analyses performed and to provide a high-quality product that meets public supply standards, well water may have to be blended or treated for total dissolved solids, total hardness, total alkalinity, iron, and color. Most of the test wells, however, were not fully developed and can be expected to produce water with a high color level. The color level is acceptable in present production wells. Likewise, the single sample

TABLE 3

RANGE IN WATER QUALITY IN THE INTERMEDIATE AQUIFER

Constituent	Number of Analyses Available	Range in Concentration*
pH (units)	13	6.8 - 7.5
Total dissolved solids	13	350 - 797
Total hardness	13	271 - 340
Total alkalinity	13	246 - 356
Bicarbonate	3	390 - 434
Sodium	1	68
Iron - total	13	0 - 2.55
Manganese - total	1	<0.05
Sulfate	12	0 - 125
Chloride	13	21 - 99
Calcium	13	52 - 118
Copper - total	1	<0.03
Color (APHA or PCU units)	13	5 - 130
Calcium hardness	9	130 - 295
Magnesium hardness	9	7 - 127
Carbon dioxide	3	18 - 54
Fluoride	5	.24 - 0.7
Turbidity (NT units)	1	0.13
Magnesium	5	5.3 - 16
Nitrogen - total kjeldahl	1	0.894
Nitrate - nitrogen	1	<0.02
Phosphorous - total	1	0.011
Silver - total	2	<0.0007 - <0.01
Silicon	1	9.95
Selenium - total	2	<0.005 - <0.009
Conductivity (umhos)	2	455 - 785
Mercury - total	2	<0.0002 - <0.0005
Arsenic - total	2	<0.01 - <0.05
Barium - total	2	<0.10 - 1.09
Cadmium - total	2	<0.001 - <0.005
Chromium - total	2	<0.01 - <0.01
Lead - total	2	<0.01 - <0.025

* expressed as milligrams per liter, except where shown

showing a high barium concentration was a test well. Incomplete development of that well probably accounts for the presence of barium, which is a component of drilling mud.

With reference to the existing data, there is some indication that water quality is stratified in some areas of the aquifer and that it is slightly better at shallower depth. For example, Well 72-7, screened from 273 to 276 feet below land surface, was sampled in 1973 (Geraghty & Miller, 1980). That well produced water with a total dissolved solids concentration of 630 mg/l; a sulfate concentration of 80 mg/l; and a chloride concentration of 120 mg/l. Production Well 2, 14 feet away from Well 72-7 and screened between 220 and 278 feet below grade, produced water with a total dissolved solids concentration of 500 mg/l; a sulfate concentration of 20 mg/l; and a chloride concentration of 21 mg/l when tested in 1982 (Geraghty & Miller, 1982). This pattern is not evident areally. Some deeper wells produce better-quality water than nearby shallower wells.

Floridan Aquifer

The two flowing wells tested during this program have provided data on the water quality in the Floridan aquifer beneath Port LaBelle as shown in Table 4. The shallower well at the Welcome Center (640 feet deep) contains water that is useable for some irrigation purposes as is, could be blended with fresher water, or could be treated by reverse osmosis for potable use. The deeper well (848 feet deep) produces water that is unuseable for most irrigation. Although the flow rate is much greater from the deeper well, total dissolved solids concentration is more than two times greater; sulfate concentration is seven times greater; and chloride concentration is nearly three times greater in the deeper well.

TABLE 4

WATER QUALITY
IN THE FLORIDAN AQUIFER

Section 33 Well

O.H.R.S. #86117

Environmental Services

P.O. Box 10003
Riviera Beach, Florida
33404

LABORATORY ANALYSIS — CONSULTING

ATER
ASTEWATER
OIL
OOD

Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

INDUSTRIAL
AGRICULTURAL
DOMESTIC

Water Analysis Report

6" Flow Well

Sample collected by Geraghty & Miller on 6-22-83 at

Parameter	Value	Unit	Parameter	Value	Unit
Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	3900	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	588	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	166	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.02	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	2590	mg/l	Copper, Cu		mg/l
Chloride, Cl	1550	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	118	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.3		Mercury, Hg		mg/l
pHs	7.2		Nitrate, as N		mg/l
Stability Index	7.1		Phenols		mg/l
Saturation Index	0.1		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	15		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 295 mg/l

Magnesium Hardness, as $CaCO_3$ 293 mg/l

Collection Date 6-3-83

Michael A. Fiedor
MICHAEL A. FIEDOR, CHEMIST

Welcome Center Well

D.H.R.S. #86117

Environmental Services

P.O. Box 10003
Riviera Beach, Florida
33404

LABORATORY ANALYSIS — CONSULTING

WATER
WASTEWATER
SOIL
FOOD

Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

INDUSTRIAL
AGRICULTURAL
DOMESTIC

Water Analysis Report

Welcome Center Well

Sample collected by Geraghty & Miller on 6-29-83 at

Parameter	Value	Unit	Parameter	Value	Unit
Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	1618	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	390	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	136	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.02	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	345	mg/l	Copper, Cu		mg/l
Chloride, Cl	570	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	107	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.4		Mercury, Hg		mg/l
pHs	7.3		Nitrate, as N		mg/l
Stability Index	7.2		Phenols		mg/l
Saturation Index	0.1		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	10		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 268 mg/l

Magnesium Hardness, as $CaCO_3$ 122 mg/l

Collection Date 6-29-83

Michael A. Fiedor
MICHAEL A. FIEDOR, CHEMIST

WATER AVAILABILITY

Three aquifers are available for use at Port LaBelle. The availability of water from each one will be discussed in this section. Because the intermediate aquifer is the present source of public water supply in Port LaBelle, it will be discussed first and in the greatest detail.

Intermediate Aquifer

The two public supply wells constructed at Port LaBelle demonstrate the high productivity available from individual wells tapping the intermediate aquifer. Production Well 1, eight inches in diameter, was screened in the lower 40 feet (250 to 290) of the intermediate aquifer, which is more than 100 feet thick at this point. When tested in 1973, the well produced 500 gpm with 27 feet of drawdown in a 48-hour test, a specific capacity of 18.5 gpm/foot of drawdown (500/27). Production Well 2, 300 feet north of Production Well 1, is 14 inches in diameter and has a 12-inch-diameter screen between 220 and 278 feet deep. That well produced 1669 gpm with 30.38 feet of drawdown in 21-1/4-hour-test, a specific capacity of 54.9 gpm/foot of drawdown (1669/30.38).

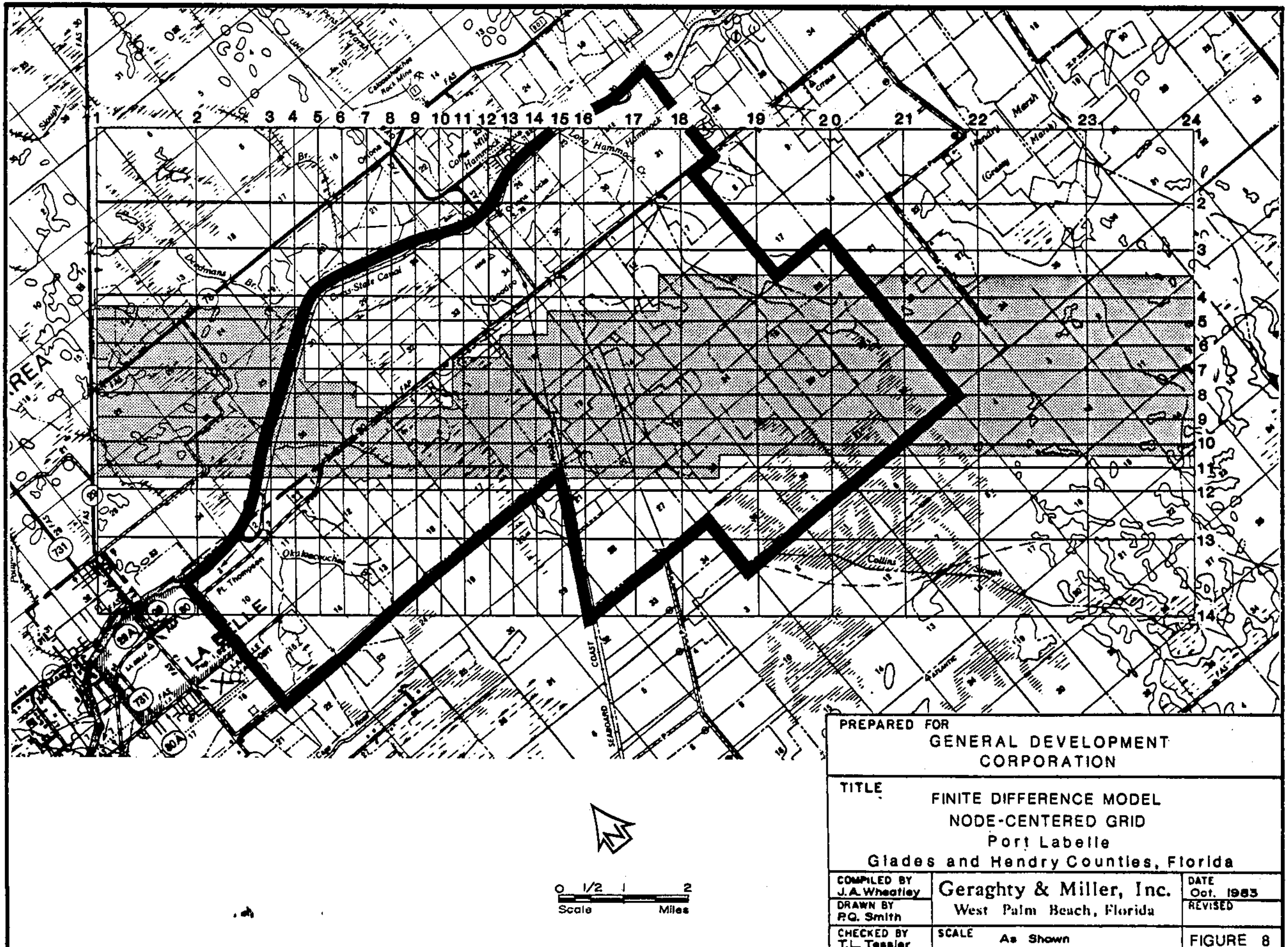
One would expect that the specific capacities of these two wells would be similar, after considering that the screen in Production Well 1 is of smaller diameter and shorter and that the test of Production Well 1 was longer. The specific capacity of Production Well 1 probably is affected by the fact that it was originally constructed as a test well and later converted to a production well. It is likely less efficient than a designed production well. Future production wells may be expected to be as efficient as Production Well 2.

The test of Production Well 2 showed that a boundary to the aquifer occurred nearby. This produced an "apparent transmissivity" in the production well that is about one-half of the true aquifer transmissivity. Applying the apparent transmissivity (119,000 gpd/ft) to a formula presented by Walton (1970, p. 315) and assuming that the well fully penetrates the aquifer (it does not, but it does penetrate the most permeable section), the theoretical specific capacity is 53.0 gpm/ft of drawdown, very close to the tested specific capacity. If Production Well 2 had not been affected by the aquifer boundary, and assuming that the true aquifer transmissivity at that well is about 240,000 gpd/ft, the specific capacity for the test would have been 103.2 gpm/ft. This allows for an empirical means of relating transmissivity to specific capacity for designed production wells. For wells unaffected by aquifer boundaries, the specific capacity may be expected to be about 0.0004 times the true aquifer transmissivity.

In order to establish the availability of water from the intermediate aquifer at Port LaBelle, a computer model was developed to forecast drawdown that could be expected in both the shallow and intermediate aquifers as a result of withdrawals in either or both. The computer code was developed in BASIC language based on the FORTRAN code presented by Prickett and Lonnquist (1971).

The finite-difference model is based on a node-centered grid, as shown in Figure 8. In the shallow aquifer, the outer nodes of the grid were set as constant-head boundaries, as were internal nodes that overlie the Caloosahatchee River. In the intermediate aquifer, external nodes were set as no-flow boundaries, as were nodes that overlie areas in which the aquifer is 20 feet thick or less, as shown in Figure 6. The data files and results of simulations are shown in Appendix G.

The model simulated withdrawals of 14 mgd (million gallons per day) from the intermediate aquifer for periods of one year (354 days) and two years (738 days) with 10 inches per year of net rainfall recharge. The water pumped from wells is derived from storage in the intermediate aquifer, from downward leakage of water stored in the shallow aquifer, from water that can flow into the shallow aquifer along the boundaries of the model, and from recharge to the shallow aquifer. The pumpage of 14 mgd is General Development Utilities' best estimate of the average annual demand of the community at buildout.



PREPARED FOR
GENERAL DEVELOPMENT CORPORATION

TITLE
FINITE DIFFERENCE MODEL
NODE-CENTERED GRID
Port Labelle
Glades and Hendry Counties, Florida

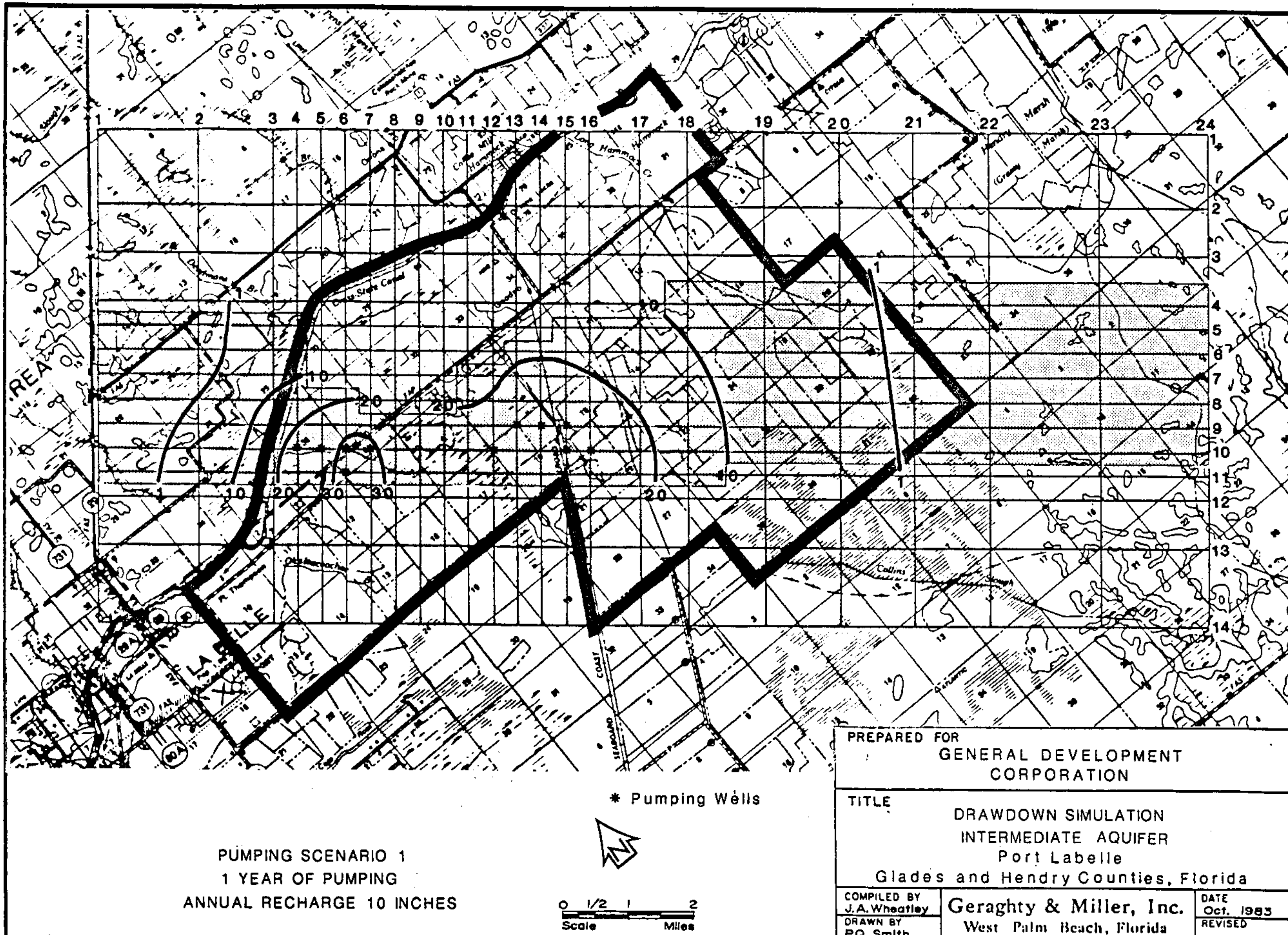
COMPILED BY J.A. Wheatley	Geraghty & Miller, Inc.	DATE Oct. 1983
DRAWN BY R.Q. Smith	West Palm Beach, Florida	REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 8

Two pumping scenarios were simulated. In Scenario 1, five potential wells spaced 2000 feet apart located near the existing water plant were pumped at 1 mgd each, and six potential wells spaced 2000 feet apart located in the western portion of Increment II in Hendry County were pumped at 1.5 mgd each. In Scenario 2, the six potential wells pumping 1.5 mgd each were shifted eastward into the central portion of the Increment III area in Hendry County. The five potential wells near the water plant remained. The purpose in presenting these scenarios is to demonstrate the use of the model as a planning tool. Depending upon how the community is developed and where the demand for water may occur, GDUI may pattern well fields after these or alternative scenarios.

Because of a lack of historical water-level data, especially from the shallow aquifer, and because the intent of the model was to show drawdown due to pumpage, no calibration to existing conditions was made. The drawdowns anticipated to result from the withdrawals are presented in Appendix G. Maps of drawdown in the intermediate and shallow aquifers resulting from withdrawals of 14 mgd for one and two years are shown in Figures 9, 10, 11, and 12 for the first pumping scenario, and Figures 13, 14, 15, and 16 for the second pumping scenario.

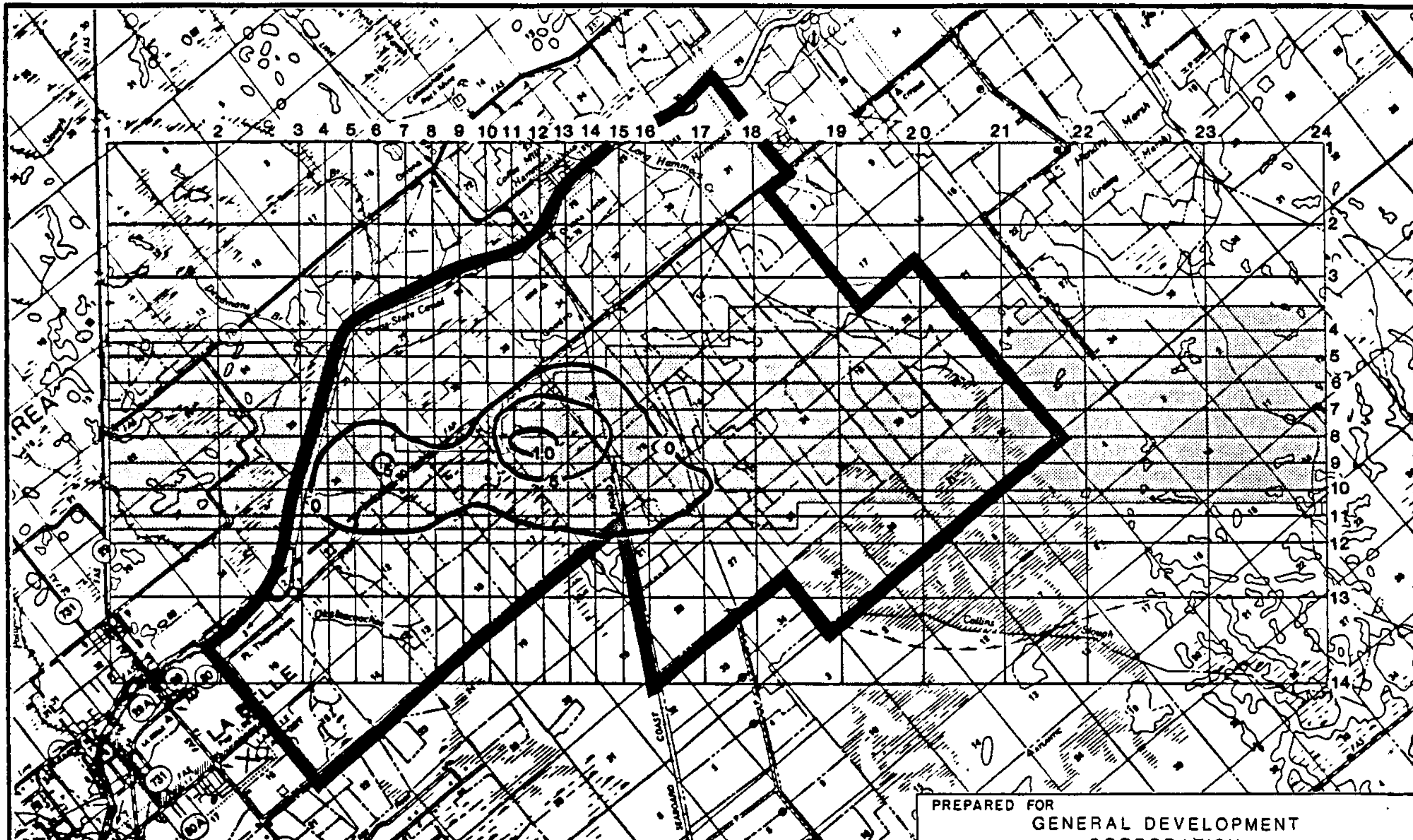
Impacts - The principal impacts that may result from the proposed withdrawals are lowering of water levels in the shallow aquifer within the Port LaBelle area and in the intermediate aquifer beneath adjacent properties. The largest drawdowns in the intermediate aquifer will occur beneath General Development properties in the immediate vicinity of well fields. Drawdowns in the shallow aquifer are limited to those areas that overlie the intermediate aquifer near the well fields. The largest drawdowns in the shallow aquifer occur where the confining bed is thin to absent (see Figure 4).

Under the first scenario, the greatest off-site impacts will be on a parcel of land located immediately east of the present water plant where drawdown in the shallow aquifer may reach 3 feet after two years of pumping. Beneath this same parcel, drawdown in the intermediate aquifer may approach 31 feet after two years of pumping. These impacts are



PUMPING SCENARIO 1
1 YEAR OF PUMPING
ANNUAL RECHARGE 10 INCHES

PREPARED FOR		
GENERAL DEVELOPMENT CORPORATION		
TITLE: DRAWDOWN SIMULATION INTERMEDIATE AQUIFER Port Labelle Glades and Hendry Counties, Florida		
COMPILED BY J.A. Wheatley	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983
DRAWN BY P.Q. Smith		REVISED
CHECKED BY T.L. Tessier	SCALE As Shown	FIGURE 9

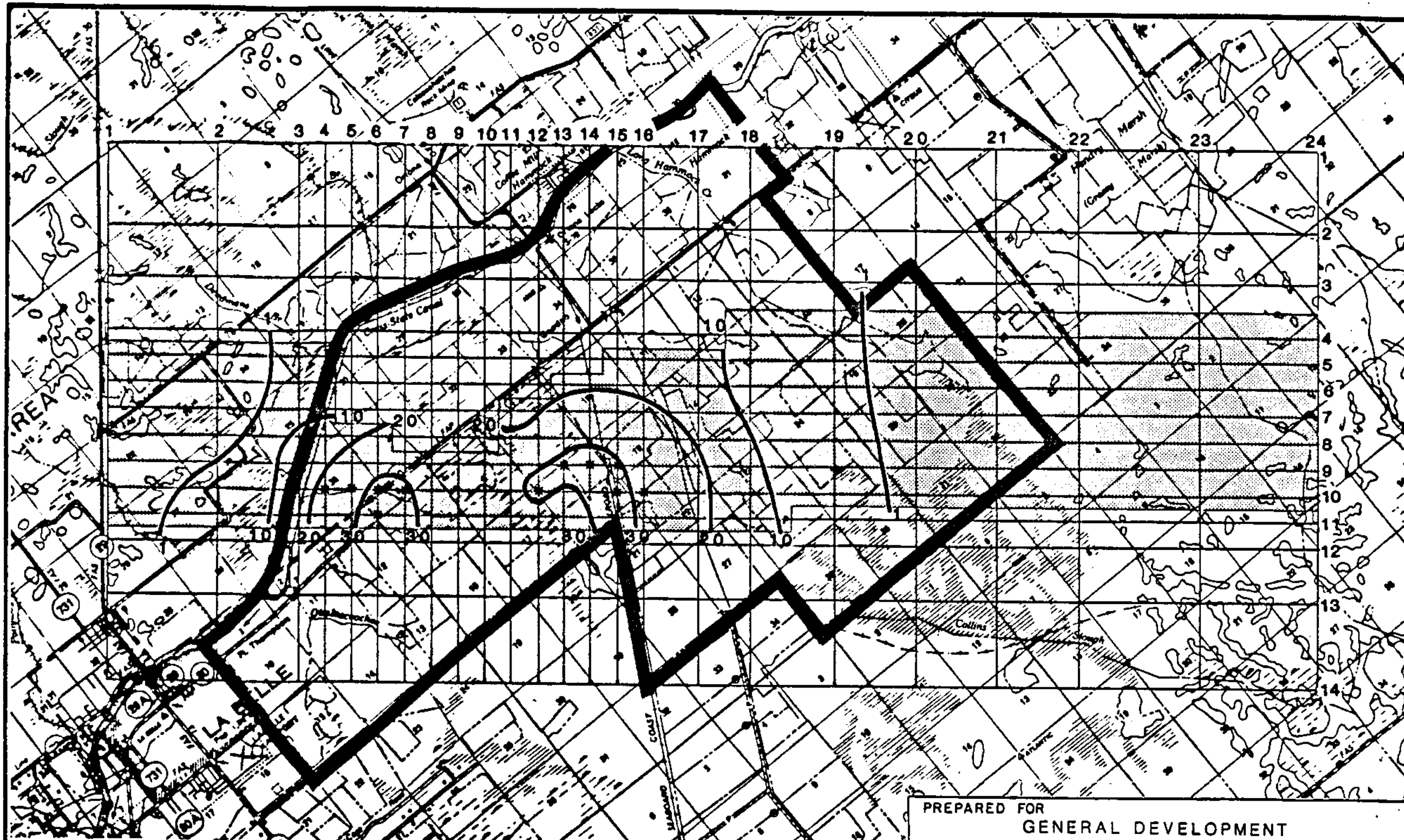


PUMPING SCENARIO 1
1 YEAR OF PUMPING
ANNUAL RECHARGE 10 INCHES

PREPARED FOR
GENERAL DEVELOPMENT CORPORATION

TITLE
DRAWDOWN SIMULATION
SHALLOW AQUIFER
Port Labelle
Glades and Hendry Counties, Florida

COMPILED BY J. A. Wheatley	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983
DRAWN BY R.Q. Smith		REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 10

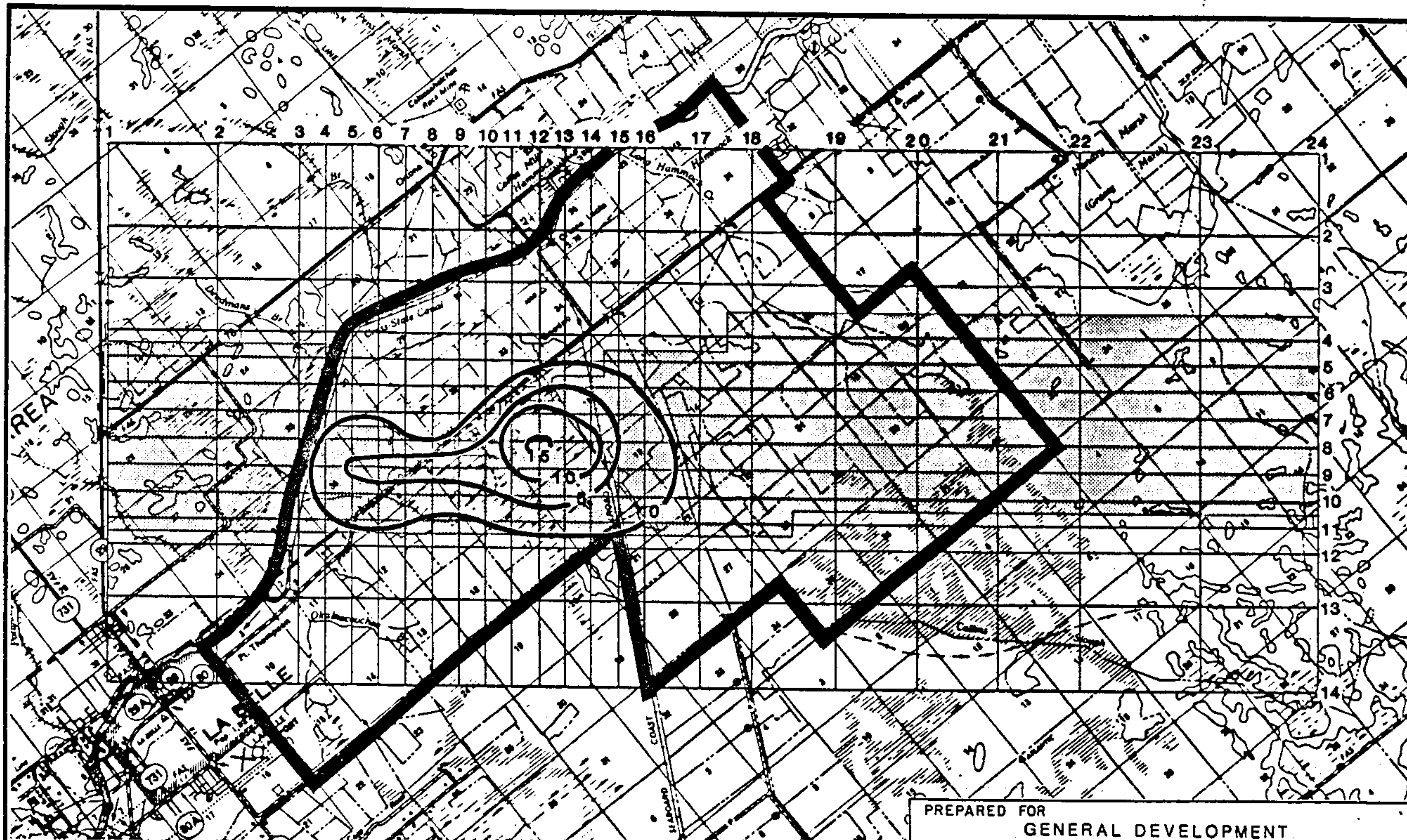


* Pumping Wells

PUMPING SCENARIO 1
2 YEARS OF PUMPING
ANNUAL RECHARGE 10 INCHES

0 1/2 1 2
Scale Miles

PREPARED FOR GENERAL DEVELOPMENT CORPORATION		
TITLE DRAWDOWN SIMULATION INTERMEDIATE AQUIFER Port Labelle Glades and Hendry Counties, Florida		
COMPILED BY J.A. Wheatley DRAWN BY P.Q. Smith	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983 REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 11



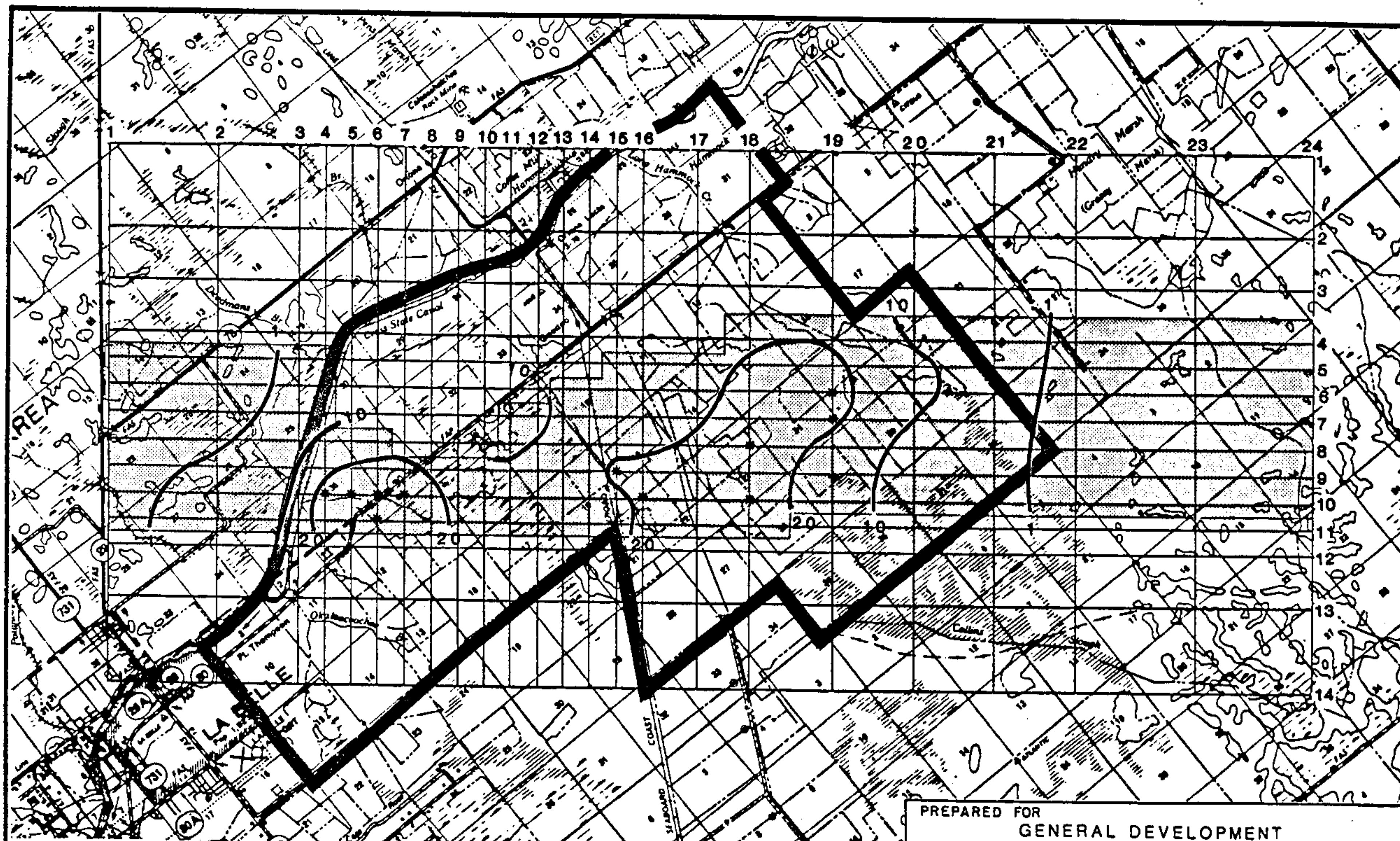
PUMPING SCENARIO 1
2 YEARS OF PUMPING
ANNUAL RECHARGE 10 INCHES

0 1/2 1 2
Scale Miles

PREPARED FOR
GENERAL DEVELOPMENT CORPORATION

TITLE
DRAWDOWN SIMULATION
SHALLOW AQUIFER
Port Labelle
Glades and Hendry Counties, Florida

COMPILED BY J.A. Wheatley DRAWN BY P.Q. Smith	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983 REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 12

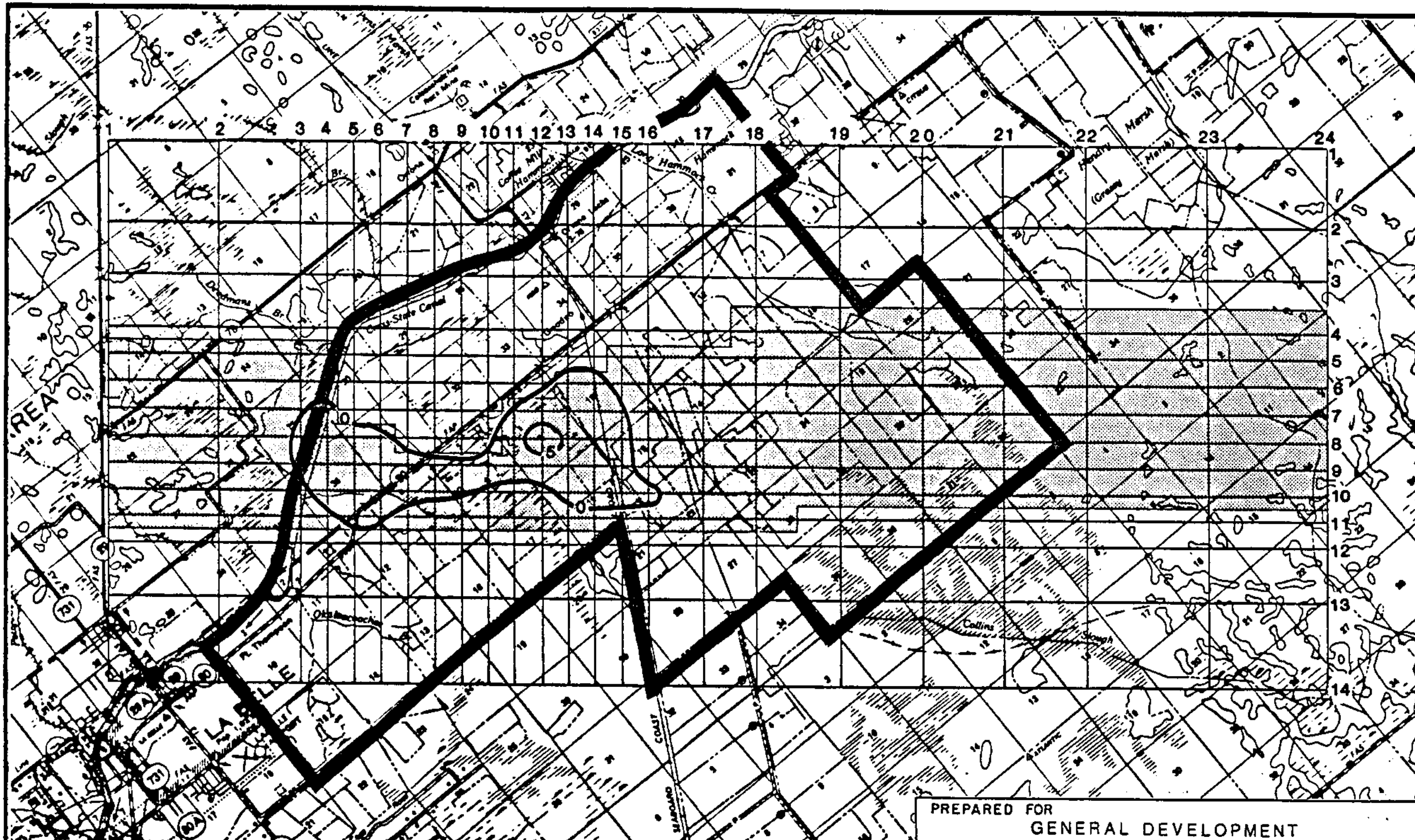


* Pumping Wells

PUMPING SCENARIO 2
1 YEAR OF PUMPING
ANNUAL RECHARGE 10 INCHES

0 1/2 1 2
Scale Miles

PREPARED FOR	GENERAL DEVELOPMENT CORPORATION	
TITLE	DRAWDOWN SIMULATION INTERMEDIATE AQUIFER Port Labelle Glades and Hendry Counties, Florida	
COMPILED BY J.A. Wheatley DRAWN BY P.Q. Smith	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983 REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 13

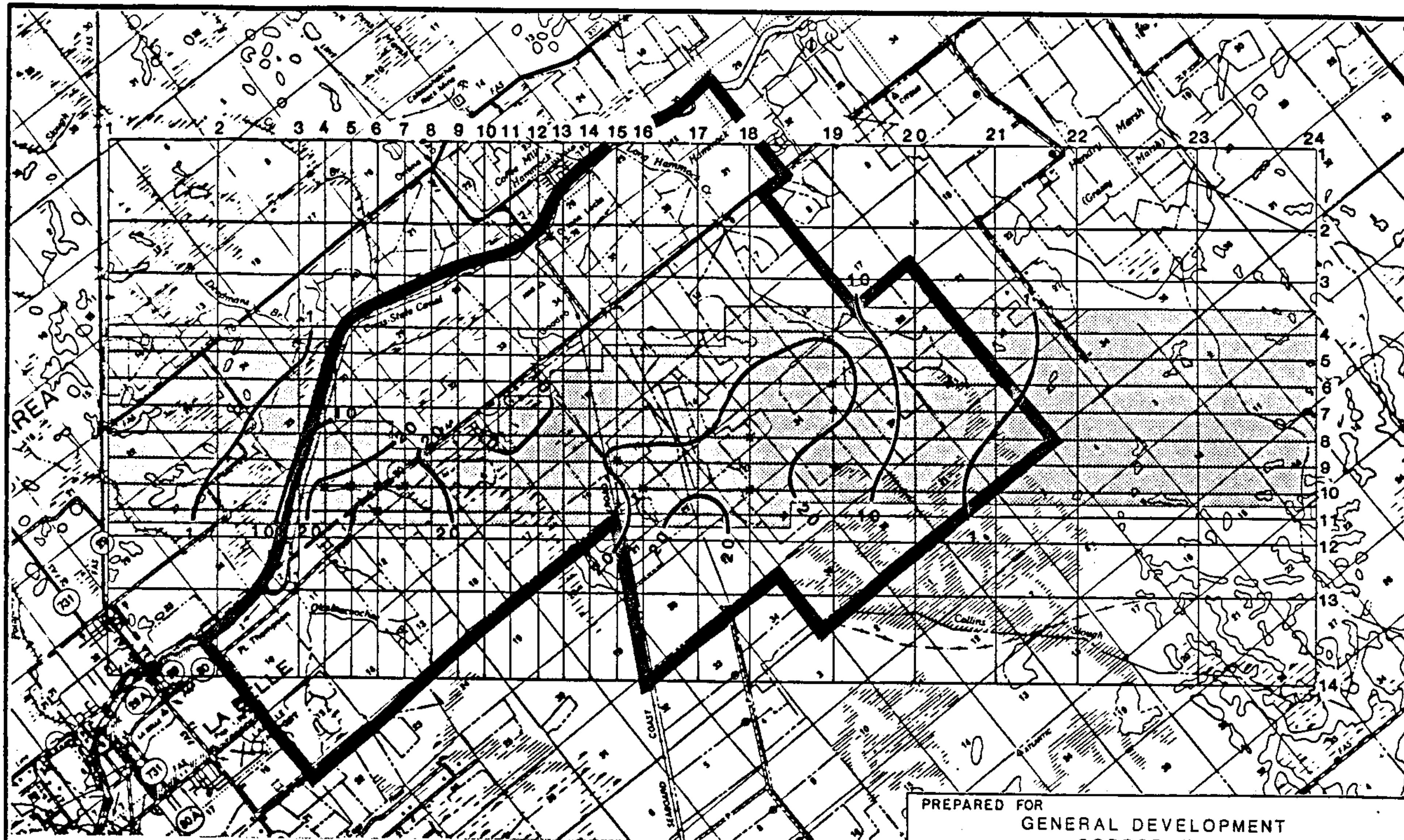


PUMPING SCENARIO 2
1 YEAR OF PUMPING
ANNUAL RECHARGE 10 INCHES

PREPARED FOR
GENERAL DEVELOPMENT CORPORATION

TITLE
DRAWDOWN SIMULATION
SHALLOW AQUIFER
Port Labelle
Glades and Hendry Counties, Florida

COMPILED BY J.A. Wheatley	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983
DRAWN BY P.Q. Smith		REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 14

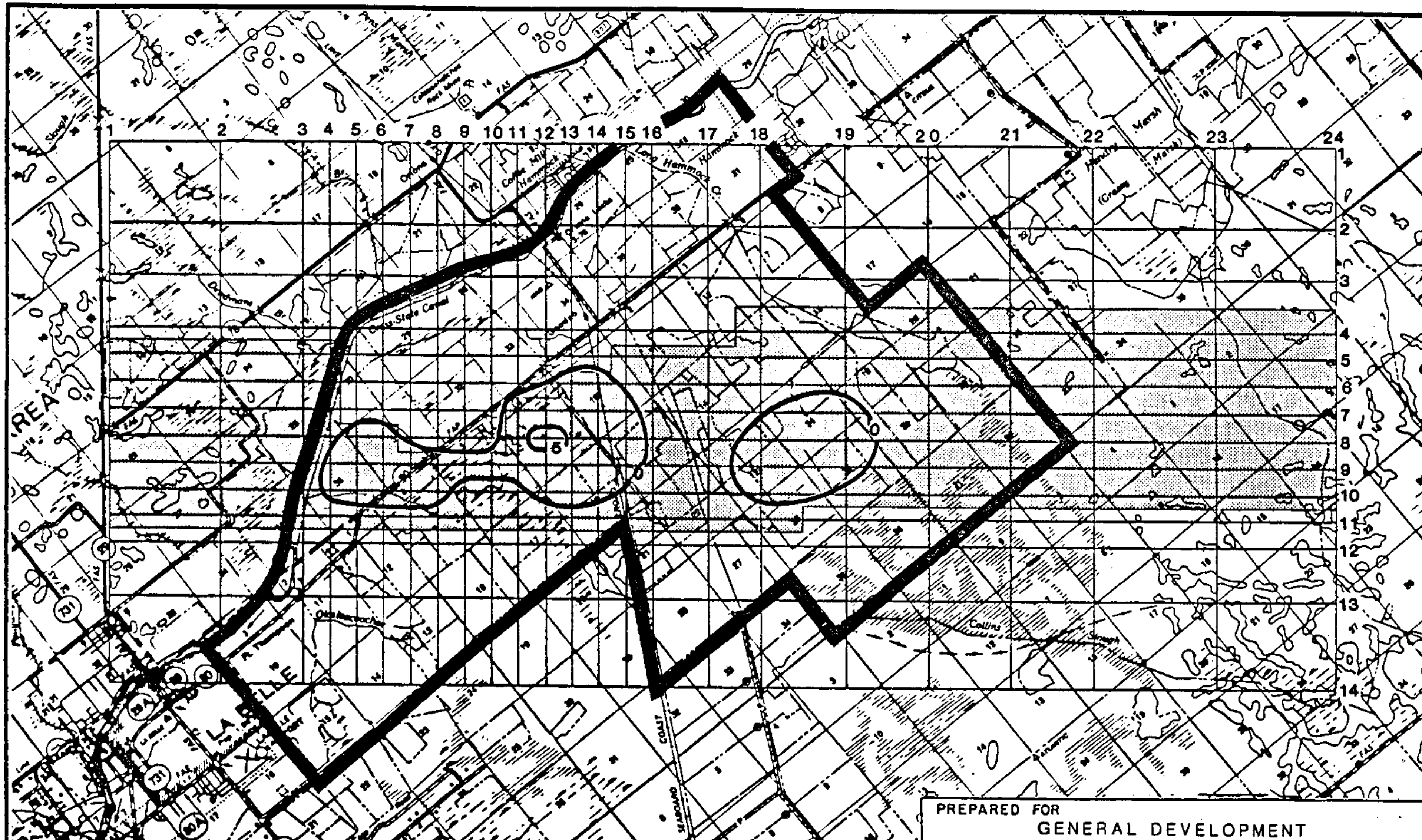


* Pumping, Wells

PUMPING SCENARIO 2
2 YEARS OF PUMPING
ANNUAL RECHARGE 10 INCHES

0 1/2 1 2
Scale Miles

PREPARED FOR GENERAL DEVELOPMENT CORPORATION			
TITLE DRAWDOWN SIMULATION INTERMEDIATE AQUIFER Port Labelle Glades and Hendry Counties, Florida			
COMPILED BY J. A. Wheatley	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983	
DRAWN BY P.Q. Smith		REVISED	
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 15	



PUMPING SCENARIO 2
2 YEARS OF PUMPING
ANNUAL RECHARGE 10 INCHES

Scale 0 1/2 1 2 Miles

PREPARED FOR
GENERAL DEVELOPMENT CORPORATION

TITLE
DRAWDOWN SIMULATION
SHALLOW AQUIFER
Port Labelle
Glades and Hendry Counties, Florida

COMPILED BY J.A. Wheatley	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983
DRAWN BY P.Q. Smith		REVISED
CHECKED BY T.L. Tessler	SCALE As Shown	FIGURE 16

reasonable and acceptable and should not impair the use or development of this land. For the shallow aquifer, the drawdown amounts to only about 5 percent (100% x 3/60) of the aquifer thickness. For the intermediate aquifer, water levels will remain above the top of the aquifer. Drawdown equals only about 21 percent (100% x 31/150) of the available drawdown to the top of the intermediate aquifer.

Although not shown in Figures 10 or 12, the simulation showed a water-level increase in the shallow aquifer in areas not overlying the intermediate aquifer. Because water levels under natural conditions generally lie only one or two feet below land surface, the water-level rise demonstrates that the shallow aquifer in these areas will reject much recharge, resulting in runoff. This is what presently occurs in undeveloped areas of Port LaBelle; because the shallow aquifer is unstressed by pumpage and is brimfull, most of the rainfall is rejected by the aquifer and runs off the property.

Withdrawals under the second pumping scenario offer one alternative plan for reducing the drawdown in the shallow aquifer. By moving the center of pumpage eastward, the water-level difference between the shallow and intermediate aquifers will be reduced. In turn, less downward leakage will occur from the shallow aquifer to the intermediate aquifer east of the water plant so that higher water levels can be maintained. Spreading out the pumpage to the east will reduce drawdowns in the intermediate aquifer also.

Because the intermediate aquifer trends northwest to southeast, the only measureable impacts in the intermediate aquifer outside of Port LaBelle will occur to the northwest across the Caloosahatchee River and to the southeast of Increment III. As a result of Scenario 1, drawdowns in the intermediate aquifer could reach 13 feet after one year of pumping 14 mgd northwest of the Caloosahatchee River; no drawdown will occur southeast of Increment III (Figure 9). With pumpage as described in Scenario 2, drawdown after one year still could reach 12 feet in the intermediate aquifer northwest of the Caloosahatchee River; southeast of Increment III, drawdown of 1 to 3 feet could occur (Figure 13).

The model of withdrawals from the intermediate aquifer is very conservative. It assumes that withdrawals are continuous. Because no underflow is allowed by the model into the intermediate aquifer from the southeast, that source of recharge is ignored. It may be noted that drawdown in the intermediate aquifer does extend to the external model boundaries. When this occurs, additional water must be withdrawn from storage within the aquifer or from leakage under simulation, so that predicted drawdowns will be greater than actual. In the real situation, the cone of depression resulting from withdrawals would continue to expand to capture water from beneath adjacent lands underlain by the intermediate aquifer.

The simulation of two pumping scenarios indicates that wells and well fields can be reasonably located in alternative areas of Port LaBelle and still produce acceptable impacts. This allows General Development Corporation and General Development Utilities the opportunity to remain flexible in land planning, water management, and water-supply development in order to respond to community needs and concerns.

The model simulations were for withdrawals of 14 mgd on a continuous basis to satisfy the average annual needs. In actuality, daily demand will vary to accommodate seasonal population changes and irrigation patterns. The variation may range between something less than 14 mgd and 28 mgd, which is the maximum-day demand anticipated by GDUI. However, peak demands are expected to occur only infrequently. For example, examination of the Port LaBelle water plant records indicates that, even during the worst drought years, average daily pumpage in the three driest months (usually April, May, and June) exceeds the annual daily average by only 30 percent to 35 percent. Because occasional peak demands will occur for only short periods and have little effect on the ground-water system except in the intermediate aquifer in the immediate vicinity of production wells, the impacts of peak withdrawals have not been simulated. The test of Production Well 2 (Geraghty & Miller, Inc., 1982) proved that individual supply wells at Port LaBelle are capable of producing in excess of 3 mgd each. Based on the two pumping scenarios previously presented, five wells would be designed to produce 2 mgd each and six wells would be designed to produce 3 mgd each for a total of 28 mgd.

Salt Water Encroachment —Significant upconing of salty water from the Floridan aquifer through the confining bed is unlikely to occur. Even if pumping levels at production wells approach 100 feet while pumping 28 mgd continuously, resulting in water levels of about 80 feet below sea level, upward leakage will be very small. Assuming that the water level in the Floridan aquifer is 44 feet above sea level, the upward flow rate (seepage velocity) of saline water can be calculated by the equation (Bureau of Reclamation, 1981)

$$V = \frac{P\ I}{n}$$

where P is vertical permeability, I is hydraulic gradient, and n is effective porosity. The vertical permeability of clays confining the Floridan aquifer probably are in the range of 0.001 ft/day and the effective porosity probably is near 0.3. Therefore, the average seepage velocity for the 250-foot-thick confining bed probably will be near 0.0018 ft/day beneath a production well. At that rate, it will take about 400 years of continuous pumpage of 3 mgd for the first drop of saline water to migrate under continuous pumping stress of 28 mgd to the bottom of a production well in the intermediate aquifer.

The stress of withdrawals from the intermediate aquifer could be reduced by distributing the pumpage over a larger area than has been proposed—for example, by installing a greater number of lower-capacity wells in Increment III. However, a small number of higher-capacity wells usually is more efficient and economical for utility operations. General Development Utilities, Inc., may elect to install a greater number of smaller-capacity wells due to growth patterns, availability of land, and land use patterns.

Shallow Aquifer

Despite the volume of water anticipated to be withdrawn from the intermediate aquifer, the shallow aquifer is and will continue to be available for use. As has been noted previously, where the aquifer extends to 40 feet deep or more below land surface, it is sufficiently thick to be useful for potable supply. As shown on Figure 2, the bottom of the aquifer is 40 feet deep where it overlies the intermediate aquifer. It also is more than 40 feet deep in southwest Port LaBelle trending in the direction of the LaBelle Airport. The shallow aquifer could be a valuable resource to that area.

The shallow aquifer will continue to be available for community and individual irrigation. Residents will be able to install shallow wells to tap this resource. Because excess irrigation water will be returned to the same aquifer from which it is withdrawn, this will serve as a conservation measure that will reduce depletion of the intermediate aquifer so that it can be reserved for potable use.

Generally, production from small-diameter wells in the shallow aquifer should be adequate for direct irrigation by most residents. However, because the aquifer is thinner near the Caloosahatchee River, residents in that area may have to use pneumatic pressure storage tanks and zone irrigation in order to produce sufficient water. Also, residents in the vicinity of public supply wells may note some reduction in well yields during severe droughts when downward leakage from the shallow aquifer results in declines in the water table. This yield reduction will be significant only in the immediate vicinity of public supply wells, and only when shallow wells are about 25 feet deep or less or equipped with centrifugal pumps. Residents in these areas should be advised to construct wells to depths greater than 25 feet, and to equip such wells with jet pumps.

Floridan Aquifer

The Floridan aquifer is of little use at Port LaBelle because of its poor production at shallower depth, and poor water quality at greater depth. The only advantage to using the water is that, because wells flow, little or no energy is required for production. The use of this aquifer probably will be limited to its present use—lake recharge—although blending or desalination of this water for potable use is possible in the future.

Respectfully submitted,
GERAGHTY & MILLER, INC.

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Associate

Vincent P. Amy

Vincent P. Amy, C.P.G.
Principal

November 30, 1983

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APPENDIX A

SURFACE RESISTIVITY PROFILES, 1982 AND 1983

APPENDIX A

Surface Resistivity Profiles
1982 and 1983

Surface resistivity profiles were performed in 1982 and 1983. The results of profiles performed in 1980 (Geraghty & Miller, Inc., 1980) indicated that vertical electrical soundings could be valuable in quickly locating potentially productive material to depths as great as 200 feet. However, the 1980 profiles were performed under drought conditions and the dry soil caused difficulty in collecting usable data. The 10 surveys in 1982 and nine surveys in 1983 were conducted over moister soils and produced better data. Locations are shown on Figure 1.

The Wenner electrode configuration was used to perform vertical electrical soundings, with Bison Equipment (Model 2350B). Electrode spacings were increased by 20-foot increments until the spacing reached 160 feet; beyond 160 feet, the spacing was increased at 40-foot increments. The data are shown in Tables A-1 and A-2 for the 19 surveys. Occasionally during the surveys, the potential electrodes made poor contact with the soil, resulting in unusually high apparent resistivity values. These values should be disregarded in examining the data..

Resistivity data can be interpreted by a number of methods. Some methods are fairly simple and straight forward; others are more complex and involve matching against known "type" graphs and computer enhancement of the data. Because the concern at LaBelle was to distinguish between thick sections of clay and non-clay and because there was some geologic control (previously drilled exploratory holes) for the area, these data were interpreted by simple examination of the data and, secondarily by the Moore Cumulative Resistivity Method (1945).

TABLE A-1

APPARENT RESISTIVITIES FROM
VERTICAL SOUNDINGS IN 1982

Electrode Spacing (feet)	Apparent Resistivity (Ohm feet)									
	Profile 82-A	Profile 82-B	Profile 82-C	Profile 82-D	Profile 82-E	Profile 82-F	Profile 82-G	Profile 82-H	Profile 82-I	Profile 82-J
20	230	60	154	288	246	262	106	204	442	228
40	199	228	137	330	173	226	153	241	256	189
60	190	251	173	343	95	238	95	209	238	141
80	171	234	154	303	144	178	76	210	191	164
100	157	213	—	371	148	173	69	182	165	159
120	156	203	222	552	142	142	57	163	316	145
140	137	189	—	440	143	133	57	148	159	141
160	130	163	536	600	135	128	39	134	110	134
180	122	—	—	—	—	—	—	—	—	—
200	128	326	614	162	130	111	109	124	92	126
220	—	—	—	—	—	—	—	—	—	—
240	96	137	—	211	133	109	120	110	199	124
260	—	—	—	—	—	—	—	—	—	—
280	—	116	—	—	99	—	—	111	83	—
300	—	—	—	—	—	—	—	—	—	—

TABLE A-2

APPARENT RESISTIVITIES FROM VERTICAL SOUNDINGS IN 1983

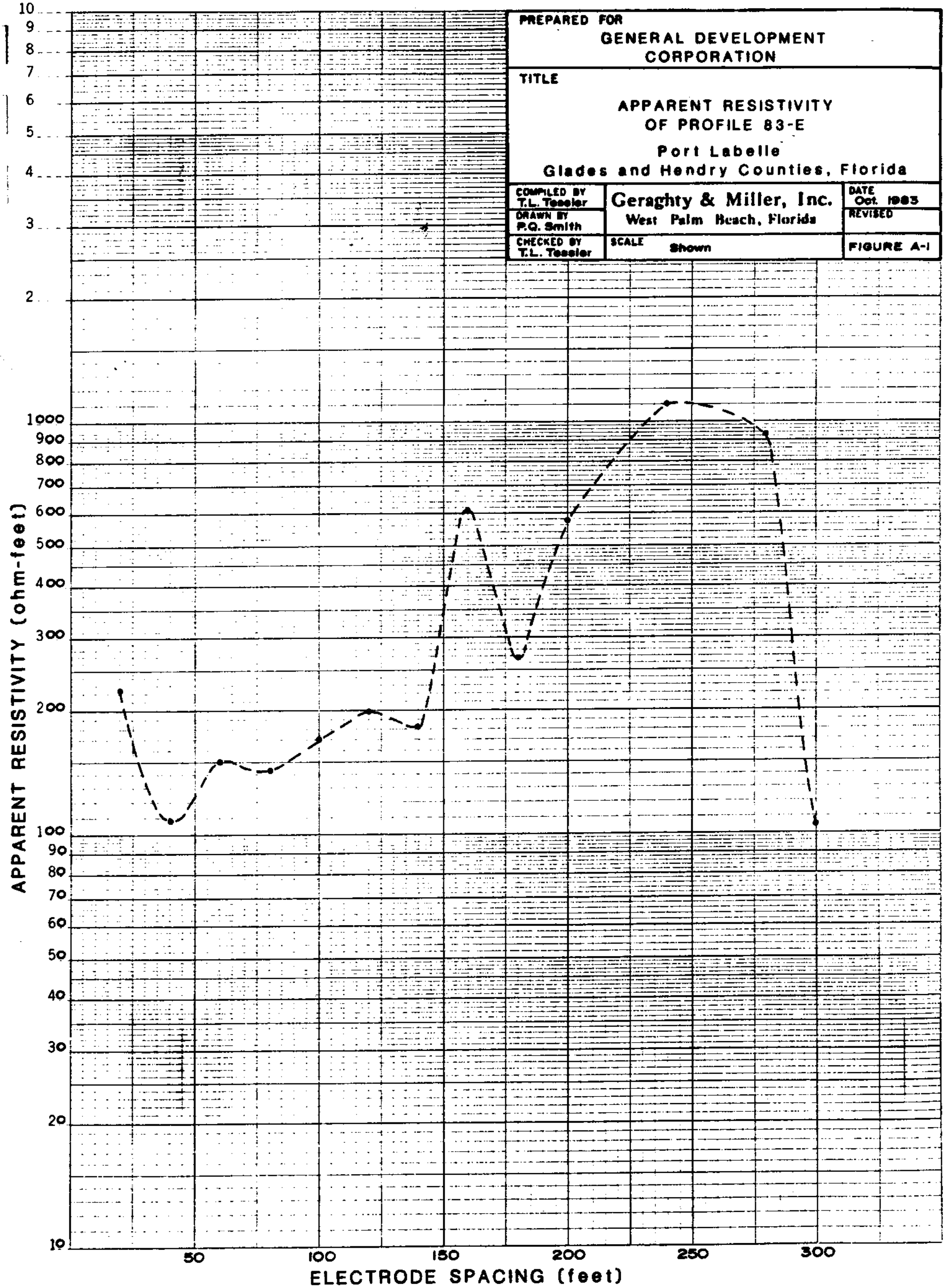
Electrode Spacing (feet)	Apparent Resistivity (Ohm feet)								
	Profile 83-A	Profile 83-B	Profile 83-C	Profile 83-D	Profile 83-E	Profile 83-F	Profile 83-G	Profile 83-H	Profile 83-I
20	252	302	516	1560	222	10	260	118	198
40	196	283	211	668	109	20	103	234	200
60	190	230	182	429	150	272	72	184	213
80	150	195	191	277	143	146	169	205	3190*
100	184	131	165	208	170	76	34	188	209
120	193	136	178	169	199	94	37	162	128
140	130	134	160	99	181	144	48	584*	1650*
160	171	139	149	141	610	1170*	75	120	91
180	275	223	157	157	268	274	110	131	200
200	174	690	158	896	574	532	109	138	218
220	—	—	—	—	—	—	—	—	—
240	214	427	542	137	1100	768	77	102	204
260	—	—	—	—	—	—	—	—	—
280	342	1550*	158	2000*	927	1640*	102	966*	87
300	120	765	161	132	105	930	—	93	104

*likely poor electrode contact; disregard data point

The results from the 1980 profiles had suggested that clay could be distinguished when the apparent resistivity fell below about 200 ohm-feet, and that the depth of penetration approximately corresponded to the electrode spacing. On that basis, data from the profiles suggested that non-clay formations (those that might be expected to produce water) extended to depths between 50 and 100 feet beneath Profiles 82-B, 82-D, 82-F, 82-H, 82-I, 83-B, 83-D, 83-F, 83-H, and 83-I. Data also indicated that non-clay material occurred from below 100 feet deep to greater depth beneath Profiles 82-C, 82-D, 83-A, 83-B, 83-C, 83-E, 83-F, and 83-I. Data from remaining profiles showed that non-clay units extended only to depths of 50 feet or less and that no significant non-clay units occurred between 100 feet and the effective penetration depth of the profile (about 240 feet deep).

Figure A-1 shows graphically a typical plot of apparent resistivity data from Profile 83-E. An exploratory hole (83-3) drilled near Profile 83-E encountered water-producing sand from 235 feet to 339 feet below land surface.

PREPARED FOR GENERAL DEVELOPMENT CORPORATION		
TITLE APPARENT RESISTIVITY OF PROFILE 83-E Port Labelle Glades and Hendry Counties, Florida		
COMPILED BY T.L. Tessler	Geraghty & Miller, Inc. West Palm Beach, Florida	DATE Oct. 1983
DRAWN BY P.Q. Smith		REVISED
CHECKED BY T.L. Tessler	SCALE Shown	FIGURE A-1



APPENDIX B

EXPLORATORY DRILLING, 1982 AND 1983

APPENDIX B

Exploratory Drilling
1982 and 1983

Exploratory drilling in 1982 focused on the vicinity of the existing water plant. Because the data from the 1982 resistivity profiles indicated that clay was dominant at depths greater than 100 feet deep near State Road 80 east of the plant (suggesting that the intermediate aquifer did not occur there), efforts in 1982 were concentrated on following and extending the trend of the intermediate aquifer to the southeast. In 1983, exploration was concentrated in the Increment III development area south of State Road 80, as 1983 resistivity profiles and 1982 drilling results indicated that the intermediate aquifer continued into that area.

Exploratory drilling in 1982 and 1983 was conducted in a similar manner. In 1982, drilling was by Billy D. Green Well Drilling of Plant City, Florida; in 1983, drilling was by Marvin E. Miller & Son of North Fort Myers, Florida. Nominal 4-inch-diameter holes were drilled by the mud-rotary method. If potentially productive material was encountered below 100 feet, that material was penetrated for its full thickness or to the limit of the drilling equipment (300 feet deep in 1982; 360 feet deep in 1983). If no potentially productive material was found below 100 feet, drilling was terminated between 250 feet and 300 feet deep. Six exploratory holes were drilled in 1982; nine holes were drilled in 1983. The lithologic logs follow, prepared by the hydrogeologist on site. Table B-1 provides a summary of the logs. Where potentially productive material was encountered, a monitor well was completed in the exploratory hole.

TABLE B-1

Production Zones in Exploratory Holes
Drilled in 1982 and 1983

Exploratory Hole Number	Total Depth (feet below land surface)	Potential Production Interval (feet below land surface)
82-1	300	4-45, 75-95
82-2	300	5-39
82-3	300	13-46
82-4	300	5-69
82-5	300	5-61, 135-222
82-6	300	16-55, 130-150
83-1	280	0-57, 110-240
83-2	300	0-73, 210-230
83-3	339	25-65, 235-339
83-4	280	50-80, 120-230
83-5	200	0-186
83-6	200	41-68, 138-176
83-7	360	59-83, 286-360
83-8	360	26-54, 150-323
83-9	260	0-65, 212-245

GEOLOGIC LOG OF TEST WELL 82-1 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SILTY SAND - Sand, 85%, clear to frosted, quartz, fine- to medium-grained, sub-angular to sub-rounded; Silt, 15%, dark yellowish orange; Clay, trace, greenish gray.	0 - 4	4
LIMESTONE - Limestone, 100%, brownish gray to pinkish gray, fine- to medium-grained, soft, weathered, good apparent porosity, trace of fine quartz sand in matrix.	4 - 11	7
SHELLY LIMESTONE - Limestone, 70%, medium gray to pinkish gray, fine-grained, soft; Shell, 30%, very pale orange, fine fragments.	11 - 18	7
SHELL AND LIMESTONE (interbedded) - Limestone, 70%, medium dark gray to pinkish gray, fine-grained, moderately hard, fine shell fragments and quartz grains in matrix; Shell, 30%, very pale orange, coarse fragments.	18 - 26	8
SHELL AND LIMESTONE (interbedded) - Limestone, 60%, medium dark gray to very pale orange, medium-grained, moderately soft, with fine shell and quartz in matrix; Shell, 40%, very pale orange, fine to coarse fragments and whole shells.	26 - 45	19
CLAYEY SHELL - Shell, 60%, very pale orange to medium light gray, fine to coarse fragments; Clay, 40%, pale olive, soft, plastic with fine-grained quartz sand in matrix.	45 - 50	5

SANDY SHELLY CLAY - Clay, 50%, pale olive to dusky yellowish green, soft, plastic, with fine-grained quartz sand in matrix; Shell, 30%, very pale orange, very fine to coarse fragments; Sand, 20%, clear to frosted, quartz, very fine-grained.	50 - 65	15
SHELLY CLAYEY SAND - Sand, 50%, clear to frosted, quartz, fine-grained; Shell, 30%, very pale orange to medium dark gray, very fine to medium fragments; Clay, 20%, dusky yellowish green.	65 - 75	10
SHELL AND SAND - Sand, 50%, clear to frosted, quartz, very fine- to fine-grained, sub-rounded; Shell, 50%, very pale orange to light brown, fine fragments; Clay, trace, dusky yellowish green.	75 - 95	20
SHELLY SANDY CLAY - Clay, 60%, dusky yellowish green, soft, plastic; with sand in matrix; Sand, 25%, clear to frosted, quartz and phosphatic, very fine- to fine-grained, sub-angular to sub-rounded; Shell, 15%, very pale orange, fine fragments.	95 - 110	15
SHELLY SANDY CLAY - Clay, 50%, dusky yellowish green, soft, plastic sand in matrix; Sand, 30%, clear to frosted, quartz and phosphatic, very fine- to fine-grained, sub-angular to sub-rounded; Shell 20%, very pale orange, fine fragments.	110 - 120	10
SANDY CLAY - Clay, 60%, dusky yellowish green, soft, plastic; Sand, 40%, clear to frosted, quartz and phosphatic, fine-grained; Shell, trace, very pale orange, fine fragments.	120 - 150	30
SANDY CLAY - Clay, 50%, dusky yellowish green, soft, plastic; Sand, 50%, clear to frosted, quartz, fine-grained; Shell, trace.	150 - 175	25

SANDY CLAY - Clay, 50%, dusky yellowish green, soft, plastic; Sand, 45%, clear to frosted, quartz and phosphatic, fine-grained; Shell, 5%, very pale orange, fine fragments.	175 - 210	35
SANDY CLAY - Clay, 50%, dusky yellowish green, soft, plastic; Sand, 50%, clear to frosted, quartz and phosphatic, fine-grained.	210 - 235	25
SANDY CLAY - Clay, 60%, dusky yellowish green, firm, dry in place; Sand, 40%, clear to frosted, quartz, fine-grained; Shell, trace, very pale orange, fine fragments.	235 - 265	30
SANDY CLAY - Clay, 50%, dusky yellowish green, soft, plastic; Sand, 50%, clear to frosted, quartz and phosphatic, fine-grained; Shell, trace, fragments.	265 - 280	15
SANDY CLAY - Clay, 60%, dusky yellowish green, soft, plastic; Sand, 40%, clear to frosted, quartz and phosphatic, fine- to very coarse-grained, (about 15% of sample is coarse-grained).	280 - 290	10
SANDY CLAY - Clay, 40%, dusky yellowish green, soft, plastic; Sand, 40%, fine-grained, quartz and phosphatic; Clay, 20%, grayish pink, soft, plastic, very phosphatic.	290 -	10+
TOTAL DEPTH	300	

GEOLOGIC LOG
OF
TEST WELL 82-2
LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SILTY SAND - Sand, 80%, clear to frosted, quartz, fine- to medium-grained; Silt, 20%, pale brown to grayish orange.	0 - 5	5
SHELLY, SAND - Sand, 60%, clear to dusky yellow, quartz, fine- to medium coarse-grained; Shell, 40%, white to medium light gray, fine fragments.	5 - 10	5
SHELL WITH LIMESTONE - Shell, 75%, very pale orange to medium light gray, fine fragments; Limestone, 25%, very pale orange to medium light gray, soft, fine-grained.	10 - 23	13
SANDY SHELL AND LIMESTONE - Shell, 50%, very pale orange to medium gray, very coarse fragments and whole shells; Limestone, 30%, medium light gray to dusky yellow, fine-grained; Sand, 20%, clear to frosted, quartz, fine-grained.	23 - 39	16
SHELLY CLAY - Clay, 60%, greenish gray, soft, plastic; Shell, 40%, very pale orange to dusky yellow, soft, plastic.	39 - 42	3
LIMESTONE, SHELL, AND CLAY (interbedded) - Limestone, 50%, medium gray, moderately hard, fine-grained, fine-grained quartz sand in matrix; Shell, 30%, very pale orange to dusky yellow, very coarse fragments; Clay, 20%, greenish gray soft, plastic, with fine-grained quartz sand.	42 - 64	22

SHELLY SANDY CLAY - Clay, 50%, yellowish gray to greenish gray, soft, phosphatic; Sand, 30%, clear to frosted, quartz and phosphatic, fine-grained; Shell, 20%, very pale orange, medium-sized fragments.	64 - 75	11
SHELLY SANDY CLAY - Clay, 50%, greenish gray, soft, plastic; Sand, 35%, clear to black, quartz and phosphatic, fine-grained; Shell, 15%, very pale orange, medium fragments.	75 - 105	30
CLAYEY SAND - Sand, 60%, clear to frosted, quartz, fine- to medium coarse-grained, rounded; Clay, 40%, dusky yellowish green, soft; Shell, trace, coarse fragments.	105 - 135	30
SANDY CLAY - Clay, 75%, grayish olive, soft, plastic; Sand, 25%, clear to frosted, quartz, fine-grained, sub-angular to sub-rounded.	135 - 175	40
SANDY CLAY - Clay, 50%, grayish olive, soft, plastic; Sand, 50%, frosted, quartz, fine- to medium coarse-grained, rounded.	175 - 220	45
SANDY CLAY - Clay, 60%, grayish olive, soft, plastic; Sand, 40%, clear to frosted, quartz, fine-grained; Shell, trace, fine fragments.	220 - 245	25
SANDY CLAY - Clay, 50%, grayish olive, soft, plastic; Sand, 40%, clear to frosted, fine-grained, quartz and phosphatic; Limestone, 10%, light olive gray, fine-grained, soft.	245 - 270	25
SANDY CLAY - Clay, 60%, grayish olive, soft, plastic; Sand, 40%, clear to frosted, quartz, fine-grained, sub-angular.	270 - 280	10
SANDY CLAY - Clay, 50%, grayish olive, firm; Sand, 50%, clear to frosted, quartz and phosphatic, fine- to medium-grained.	280 -	20+
TOTAL DEPTH	300	

GEOLOGIC LOG
OF
TEST WELL 82-3
LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND WITH SHELL - Sand, 60%, pale brown to clear, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded; Shell, 35%, white and tan, small- to medium-sized fragments; Clay, 5%, dusky brown and very pale orange, silty.	0 - 4	4
SHELL WITH CLAYEY SAND - Shell, 70%, bleached, small to large fragments; Sand, 20%, clear, quartz, fine- to coarse-grained, sub-angular to sub-rounded; Clay, 10%, pale yellowish brown, silty.	4 - 9	5
SHELLY SANDSTONE WITH CLAYEY SAND - Shell, 60%, bleached white, medium- to large-sized fragments; Sandstone, 30%, pinkish gray, quartz, fine-grained matrix with shells, moderately soft, quartz grains sub-angular to sub-rounded; Sand, 8%, quartz, pinkish gray to clear, fine-grained, sub-angular to sub-rounded; Clay, trace to 2%, light olive gray, plastic, silty.	9 - 13	4
SHELL AND LIMESTONE - Shell, 60%, white to very pale orange, small- to medium-sized fragments; Limestone, 40%, pinkish gray, cryptocrystalline, hard, some drusy fabric.	13 - 17	4
SHELL AND LIMESTONE WITH CLAY - Shell, 40%, white to very pale orange, small- to large-sized fragments and whole shells; Limestone, 40%, pinkish gray, cryptocrystalline, hard, some drusy fabric; Clay, 20%, very pale orange, plastic, silty, contains very fine shell fragments.	17 - 26	9

SANDSTONE AND LIMESTONE - Sandstone, 60%, olive gray, quartz and phosphatic, coarse-grained with fine-grained phosphatic and quartz in matrix, angular to sub-rounded grains, very hard; Limestone, 30%, pinkish gray, microcrystalline, very hard, shelly; Sand, 10%, clear and frosted, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded.	26 - 35	9
SANDSTONE WITH LIMESTONE - Sandstone, 80%, olive gray, quartz and phosphatic, coarse-grained with fine-grained phosphatic and quartz in matrix, hard; Limestone, 15%, pinkish gray, microcrystalline, very hard, shelly; Sand, 5%, clear and frosted, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded.	35 - 46	11
CLAY, SHELL AND LIMESTONE - Clay, 40%, dark gray, silty; Shell, 35%, bleached, small- to large-sized fragments and whole shells; Limestone, 25%, pinkish gray, cryptocrystalline, hard, some drusy fabric.	46 - 60	14
SHELLY CLAY - Clay, 80%, olive gray, silty, some plasticity; Shells, 20%, white and gray, small fragments, whole and broken shells.	60 - 80	20
SHELLY CLAY WITH LIMESTONE - Clay, 60%, olive gray, silty, some plasticity; Shell, 15%, white and gray, small whole and broken fragments; Limestone, 25%, pinkish gray, cryptocrystalline, hard, some drusy fabric.	80 - 95	15
SHELLY CLAY - Clay, 80%, olive gray, silty, some plasticity; Shell, 20%, white and gray, small-sized whole and broken fragments.	95 - 116	21
CLAY WITH SHELL AND SANDSTONE - Clay, 70%, olive gray, silty, some plasticity; Shell, 20%, white and gray, small whole and broken fragments; Sandstone, 10%, olive gray, black and white speckled, quartz and phosphatic, fine-grained, sub-angular to rounded grains, hard.	116 - 119	3

CLAY WITH SHELLS - Clay, 65%, olive gray, silty, some plasticity; Shells, 35%, small-sized, whole and broken fragments.	119 - 191	72
CLAY WITH SHELLY SAND - Clay, 70%, olive gray, silty, some plasticity; Sand, 20%, clear and frosted grains, quartz, medium-grained, sub-rounded to rounded grains; Shell, 10%, bleached, small fragments and whole shells.	191 - 245	54
CLAY WITH SANDY SHELL - Clay, 40%, medium gray, plastic, silty; Sand, 40%, black, clear and frosted, quartz and phosphatic, coarse-grained, sub-rounded to rounded; Shell 20%, white and gray, medium- to small-sized fragments and whole shells.	245 - 259	14
CLAY WITH SANDY SHELL - Clay, 50%, light gray, plastic, silty; Sand, 30%, frosted, clear and black, quartz and phosphatic, fine-grained, sub-angular to sub-rounded; Shell, 20%, white, small- to medium-sized fragments.	259 - 285	26
CLAY WITH SHELL - Clay, 65%, olive gray, silty, some plasticity; Shell, 35%, white, small- to medium-sized fragments.	285 -	15+
TOTAL DEPTH	300	

GEOLOGIC LOG OF TEST WELL 82-4 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SANDSTONE - Sandstone, 80%, grayish orange, quartz, fine- to medium-grained, sub-angular to sub-rounded grains, well developed matrix; Sand, 20%, grayish olive to clear, quartz, medium-grained, sub-angular to sub-rounded grains.	0 - 3	3
CLAY AND SANDSTONE - Clay, 60%, light olive gray, silty, plastic; Sandstone, 40%, grayish orange, quartz, fine- to medium-grained, sub-angular to sub-rounded grains, well developed matrix.	3 - 5	2
SHELLY SANDSTONE AND CLAYEY LIMESTONE - Sandstone, 40%, olive gray, black and white speckled, quartz and phosphatic, fine-grained, sub-angular to sub-rounded grains, well developed matrix, shelly; Limestone, 30%, yellowish gray to pale orange, soft, very fine-grained; Clay, 30%, very pale orange, silty, plastic.	5 - 15	10
SHELLY SAND WITH SANDSTONE - Sand, 60%, clear, frosted to black, quartz and phosphatic, medium and coarse-grained, fine-grained, sub-angular to sub-rounded grains; Shell, 30%, white and tan, small- to medium-sized fragments and whole shells; Sandstone, 10%, pinkish gray, fine-grained, quartz and phosphatic, sub-angular to sub-rounded grains, well developed matrix.	15 - 32	17
SHELLY SAND WITH CLAY AND SANDSTONE - Sand, 40%, clear, frosted to black, quartz and phoshpatic, medium and coarse-grained, fine-grained, sub-angular to sub-rounded grains; Shell, 20%, white and tan, small- to medium-sized fragments and whole shells; Clay, 20%, grayish olive to medium gray, silty, plastic; Sandstone, 20%, pinkish gray, quartz and phosphatic, fine-grained, sub-angular to sub-rounded grains, well developed matrix.	32 - 37	5

SHELLY SAND WITH SANDSTONE AND LIMESTONE - Sand, 50%, clear, frosted to black, quartz and phosphatic, medium and coarse-grained, fine-grained, sub-angular to sub-rounded grains; Shell, 20%, white and tan, medium- to large-sized fragments; Sandstone, 20%, pinkish gray, quartz and phosphatic, fine-grained, sub-angular to sub-rounded grains, well developed matrix; Limestone, 10%, very pale orange, very fine-grained, fairly well indurated, shelly.	37 - 69	32
CLAY AND SHELLY LIMESTONE - Clay, 60%, grayish olive, silty, plastic; Limestone, 30%, grayish pink to pale yellowish brown, very fine-grained, well indurated, shelly; Shell, 10%, bleached, medium-sized fragments and whole shells.	69 - 81	12
SHELLY SANDSTONE AND SAND - Sandstone, 40%, dark gray to white speckled, quartz, fine- to medium-grained, well developed matrix, grains sub-angular to sub-rounded, cemented shells; Sand, 40%, clear and frosted, quartz, fine- to medium-grained, sub-angular to sub-rounded grains; Shells, 20%, white, tan, small- to medium-sized fragments.	81 - 90	9
CLAY WITH SHELL - Clay, 80%, grayish olive, silty, plastic; Shell, 20%, tan, white, gray, small- to medium-sized fragments.	90 - 173	83
CLAY AND SHELLY SANDSTONE - Clay, 60%, grayish olive, silty, plastic; Sandstone, 30%, dark gray to white speckled, some pinkish gray, quartz, medium-grained, well developed matrix, grains sub-angular to sub-rounded; Shell, 10%, white, tan and gray, small- to medium-sized fragments.	173 - 187	14
CLAY WITH SHELL AND SAND - Clay, 60%, grayish olive, silty, plastic; Sand, 20%, clear, frosted and black, quartz and phosphatic, medium- to coarse-grained, sub-rounded to angular grains; Shell, 20%, gray, tan and white, small- to medium-sized fragments.	187 - 243	56

SAND WITH CLAY AND SHELL - Sand, 50%, clear, frosted and black, quartz and phospatic, medium- to coarse-grained, sub-rounded to angular grains; Clay, 30%, grayish olive, silty, plastic; Shells, 20%, white, tan and gray, small- to medium-sized fragments.	243 - 280	37
CLAY WITH SHELL - Clay, 80%, grayish olive, silty, plastic; Shell, 20%, white, tan and gray, small- to medium-sized fragments.	280 -	20+
TOTAL DEPTH	300	

GEOLOGIC LOG
OF
TEST WELL 82-5
LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 90%, clear to frosted, quartz, medium- to fine-grained, sub-angular to sub-rounded; Organics, 10%, grass roots.	0 - 2	2
SAND - Sand, 100%, white to very pale orange, quartz, medium- to fine-grained, sub-angular to sub-rounded.	2 - 4	2
SANDSTONE AND CLAY - Sandstone, 70%, olive gray, quartz and phosphatic, fine-grained, sub-angular to sub-rounded grains, siliceous, hard; Clay, 20%, light gray, plastic, silty; Clay 10%, olive gray, silty.	4 - 5	1
SANDSTONE - Sandstone, 100%, olive gray to white, quartz and phosphatic, fine-grained, sub-angular to sub-rounded, siliceous, hard.	5 - 18	13
SANDSTONE AND SHELL - Sandstone, 50%, light grayish olive to pinkish gray, quartz and phosphatic, medium- to fine-grained, sub-rounded grains, hard, good matrix; Shell, 50%, white, pink and gray, large to medium fragments and whole shells.	18 - 50	32
SANDSTONE WITH SHELL - Sandstone, 70%, light grayish olive, dark gray and pinkish gray, quartz and phosphatic, medium- to fine-grained, sub-rounded grains, good matrix; Shell, 30%, white, pink and dark gray, large to medium fragments and whole shells.	50 - 61	11
CLAY WITH SHELL - Clay, 70%, dark gray, silty, plastic, lots of small shell fragments in clay; Shell, 30%, gray and pink, small to medium fragments.	61 - 94	33

CLAY WITH SHELLY SAND - Clay, 60%, dark gray to olive gray, silty, plastic; Sand, 30%, frosted, quartz, medium-grained, sub-rounded grains; Shell, 10%, white, pink and gray, small- to large-sized fragments.	94 - 135	41
SHELL AND CLAY - Shell, 60%, white and gray, small to medium fragments; Clay, 40%, grayish olive, silty, plastic.	135 - 151	16
CLAY AND SHELLY SAND - Clay, 50%, grayish olive, silty, plastic; Sand, 30%, clear and frosted, quartz, medium- to coarse-grained, sub-rounded; Shell, 20%, white and gray, small- to medium-sized fragments.	151 - 183	32
SHELLY SAND WITH CLAY - Sand, 60%, clear and frosted, quartz and phosphatic, medium- to coarse-grained, sub-rounded grains; Shell, 20%, white and gray, small- to medium fragments; Clay, 20%, grayish olive, silty, plastic.	183 - 222	39
CLAY AND SHELLY SAND - Clay, 60%, grayish olive, silty; Sand, 30%, clear and frosted, quartz and phosphatic, medium- to coarse-grained, sub-rounded grains; Shell, 10%, white, gray and tan, small- to medium-sized fragments.	222 - 285	63
CLAY WITH SAND - Clay, 80%, grayish olive, silty; Sand, 15%, clear and frosted, quartz and phosphatic, medium- to coarse-grained, sub-rounded grains; Shell, 5%, white, gray and tan, small to medium-sized fragments.	285 -	15+
TOTAL DEPTH	300	

GEOLOGIC LOG OF TEST WELL 82-6 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 95%, clear and frosted, quartz, medium-grained; sub-angular to sub-rounded grains; Shell, 5%, white and tan, small fragments.	0 - 2	2
SAND WITH CLAY AND SHELL - Sand, 60%, clear and frosted, quartz, medium-grained, sub-angular to sub-rounded grains; Clay, 20%, olive gray, silty; Shell, 20%, white and gray small to medium fragments.	2 - 3	1
SHELL WITH CLAY - Shell, 70%, white, medium- to small-sized fragments and whole shells; Clay, 30%, very pale orange, plastic, slightly silty.	3 - 5	2
SANDSTONE WITH SHELL - Sandstone, 65%, pinkish gray, quartz, fine-grained, sub-angular to sub-rounded grains; Shell, 35%, small- and medium-sized fragments.	5 - 11	6
SANDSTONE AND CLAY - Sandstone, 50%, pinkish gray, quartz, fine-grained, sub-angular to sub-rounded grains; Clay, 50%, very pale orange, silty, plastic.	11 - 12	1
SHELL WITH SANDSTONE AND CLAY - Shell, 50%, white and gray, small to large fragments and whole shells; Sandstone, 30%, medium gray and white speckled, quartz and phosphatic, hard, fine- to medium-grained, sub-angular to sub-rounded grains; Clay, 20%, light gray, silty plastic.	12 - 16	4

SHELLY SAND - Sand, 70%, pinkish gray, clear and frosted, quartz, medium-grained, sub-angular to sub-rounded; Shell, 30%, white and gray, medium to large fragments.	16 - 19	3
SANDSTONE AND SHELL - Sandstone, 50%, pinkish gray to dark gray, quartz, fine-grained, sub-angular to sub-rounded, hard, well developed matrix; Shell, 50%, white and gray, small- to large-sized fragments.	19 - 43	24
CLAYEY SHELLY LIMESTONE - Limestone, 50%, medium dark gray, medium- to fine-grained, slightly weathered; Shell, 30%, very pale orange to medium gray, medium fragments; Clay, 20%, medium dark gray, soft, plastic.	43 - 55	12
SANDY CLAY AND LIMESTONE (interbedded) - Clay, 60%, greenish gray, soft, plastic; Limestone, 20%, medium dark gray, fine-grained, moderately hard; Sand, 20%, clear, quartz, fine-grained; Shell, trace, very pale orange, fine fragments.	55 - 70	15
SANDY CLAY - Clay, 50%, greenish gray, very soft, pliable; Sand, 40%, clear to frosted, quartz and phosphatic, fine-grained; Shell, trace, medium gray, medium-sized fragments.	70 - 100	30
SANDY CLAY - Clay, 50%, greenish gray, soft, plastic; Sand, 50%, clear to frosted, quartz and phosphatic; very fine-grained; Limestone, trace, medium dark gray.	100 - 130	30
SAND AND CLAY WITH LIMESTONE (interbedded) - Sand, 50%, clear to frosted, quartz and phosphatic, very fine- to fine-grained; Clay, 25%, greenish gray, soft, plastic; Limestone, 20%, medium dark gray, fine-grained, moderately hard; Shell, 5%, very pale orange to light gray, medium fragments.	130 - 150	20

SANDY CLAY WITH SHELL (interbedded) - Sand, 40%, frosted, quartz, very fine-grained, sub-rounded; Clay, 40%, grayish green, soft, plastic; Shell, 20%, very pale orange to medium gray, fine to medium fragments.	150 - 160	10
SANDY CLAY - Clay, 50%, grayish green, firm, dry in place, plastic; Sand, 35%, frosted, quartz, very fine-grained, sub-rounded; Shell, 15%, very pale orange to medium light gray, fine fragments; Limestone, trace, medium gray.	160 - 200	40
SHELLY SANDY CLAY - Clay, 50%, grayish green, very soft; Sand, 30%, frosted, quartz and phosphatic, very fine- to medium-grained, sub-rounded to rounded; Shell, 20%, very pale orange to medium gray, fine to medium fragments.	200 - 250	50
SANDY CLAY - Clay, 50%, grayish green, soft, plastic; Sand, 35%, clear to frosted; quartz and phosphatic, very fine- to coarse-grained, rounded; Shell, 15%, very pale orange to medium gray, very fine to medium fragments.	250 - 270	20
SANDY CLAY - Clay, 60%, grayish green to white, soft, plastic; Sand, 40%, frosted to black, quartz and phosphatic, very fine-grained.	270 -	30+
TOTAL DEPTH	300	

GEOLOGIC LOG OF TEST WELL 83-1 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SHELLY SAND - Sand, 75%, quartz, very fine- to medium fine-grained, sub-rounded to sub-angular; Shell, 25%, very pale orange, fine to medium fine fragments; Organics, trace, medium brown.	0 - 10	10
CLAYEY SHELLY SAND - Sand, 50%, quartz and phosphatic, very fine- to fine-grained; Shell, 30%, pinkish gray fine fragments; Clay, 20%, pinkish gray, soft.	10 - 15	5
SANDY SHELLY LIMESTONE - Limestone, 50%, very pale orange to pinkish gray, fine-grained, moderately soft, weathered; Shell, 30%, very pale orange to medium light gray, fine to medium fine fragments; Sand, 10%, quartz, very fine-grained; Clay, 10%, light greenish gray, very soft.	15 - 30	15
SHELLY LIMESTONE - Limestone, 70%, pinkish gray, fine-grained, moderately soft, weathered; Shell, 25%, very pale orange, fine to medium fine fragments; Sand, 5%, quartz, very fine-grained, frosted.	30 - 57	27
SHELLY SANDY CLAY - Clay, 50%, dark greenish gray, very soft, very wet; Sand, 30%, quartz, very fine-grained; Shell, 20%, very pale orange to white, coarse fragments.	57 - 75	18
SANDY CLAY - Clay, 60%, dark greenish gray, very soft, very wet; Sand, 35%, quartz, fine-grained, sub-angular to sub-rounded; Shell, 5%, very pale orange, medium fragments.	75 - 94	19

CLAYEY SAND - Sand, 60%, quartz, frosted, fine- to medium-grained, sub-rounded; Clay, 40%, dark greenish gray, soft, pliable.	94 - 110	15
SAND - Sand, 95%, quartz, frosted, medium- to coarse-grained, sub-rounded to rounded; Clay, 5%, greenish gray; Shell, trace, fine fragments.	110 - 145	35
LIMEY SHELLY SAND - Sand, 60%, quartz, frosted, medium-grained, rounded; Shell, 30%, very light gray, fine to medium fine fragments; Limestone, 10%, pinkish gray fine-grained, soft.	145 - 165	20
SHELLY SAND - Sand, 85%, quartz, frosted, medium- to medium coarse-grained, rounded; Shell, 15%, medium light gray, fine fragments.	165 - 195	30
SAND - Sand, 95%, quartz, frosted, medium- to medium coarse-grained, sub-angular to rounded; Shell, 5%, very pale orange, fine fragments.	195 - 215	20
SAND - Sand, 100%, quartz and phosphatic, frosted, medium-grained, sub-rounded to rounded.	215 - 230	15
SILTY SAND - Sand, 90%, quartz, fine- to medium-grained, sub-angular to sub-rounded; Silt, 10%, very pale orange to light olive green.	230 - 240	10
CLAYEY SAND - Sand, 50%, quartz and phosphatic, very fine-grained; Clay, 40%, dusky yellow green, soft; Shell, 10%, white, fine fragments.	240 - 260	20
SANDY CLAY - Clay, 50%, dusky yellow green, firm plastic; Sand, 30%, quartz, clear to frosted, very fine-grained, sub-angular to sub-rounded; Sand, phosphatic, 20%, very fine-grained, black sub-rounded.	260 - 280	20+
TOTAL DEPTH	280	

GEOLOGIC LOG OF TEST WELL 83-2 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, clear to pale yellowish brown, quartz, very fine- to fine-grained, sub-angular to sub-rounded.	0 - 6	6
SHELLY SAND - Sand, 80%, clear to frosted, quartz, very fine- to medium-grained; Shell, 20%, very pale orange to white, fine fragments.	6 - 28	22
SANDY SHELLY LIMESTONE - Limestone, 60%, very pale orange to medium dark gray, fine-grained, moderately soft, with fine quartz sand in matrix; Shell, 20%, very pale orange to dark gray, fine fragments; Sand, 20%, quartz, very fine- to fine-grained, sub-angular to sub-rounded.	28 - 59	31
SILTY SHELLY SAND - Sand, 75%, clear to frosted, quartz, very fine- to fine-grained, sub-angular to sub-rounded; Shell, 15%, white, fine fragments; Silt, 10%, very pale orange.	59 - 73	14
SHELLY SANDY CLAY - Clay, 40%, greenish gray, very soft, wet; Sand, 40%, clear, quartz, very fine-grained; Shell, 20%, white, fine fragments.	73 - 110	37
SHELLY SANDY CLAY - Clay, 50%, grayish olive, soft, plastic; Sand, 30%, quartz and phosphatic, very fine-grained; Shell, 20%, very pale orange, fine fragments.	110 - 135	25
SANDY CLAY - Clay, 60%, grayish olive green, soft, plastic; Sand, 40%, quartz, very fine-grained, sub-angular to sub-rounded.	135 - 160	25

SANDY CLAY - Clay, 70%, grayish olive, firm to dry in place; Sand, 30%, quartz, very fine-grained.	160 - 195	35
LIMEY SANDY CLAY - Clay, 50%, grayish olive, soft, plastic; Sand, 30%, clear, quartz, fine-grained; Limestone, 20%, medium light gray, fine-grained, soft, silty, phosphatic.	195 - 210	15
SILTY SAND - Sand, 80%, clear, quartz, fine- to medium-grained, sub-angular; Silt, 20%, pale yellowish brown; Shell, trace, fine fragments.	210 - 230	20
SANDY CLAY - Clay, 60%, grayish olive, firm, plastic; Sand, 40%, black, quartz with trace of phosphate, fine-grained.	230 - 260	30
SILTY SAND AND CLAY (interbedded) - Clay, 50%, grayish olive, soft, wet; Sand, 35%, quartz, very fine- to fine-grained, sub-angular to sub-rounded; Silt, 15%, grayish olive green.	260 -	40+
TOTAL DEPTH	300	

GEOLOGIC LOG OF TEST WELL 83-3 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, clear to pale yellowish orange, quartz, fine-grained, sub-angular.	0 - 5	5
CLAYEY SANDY SHELL - Shell, 50%, white to pale yellowish orange, fine to medium fragments with small whole shells; Sand, 30%, clear to frosted, quartz, fine-grained; Clay, 20%, medium light gray, soft.	5 - 15	10
SHELL AND LIMESTONE WITH SAND (interbedded) - Limestone, 40%, medium gray, fine-grained, moderately hard; Shell, 40%, white to pale yellowish orange to medium gray, fine- to medium fine fragments and small whole shells; Sand, 20%, clear to frosted, quartz, fine-grained.	15 - 25	10
SHELLY SANDY LIMESTONE - Limestone, 60%, medium gray, fine-grained, hard; Sand, 20%, quartz, fine-grained; Shell, 20%, white to medium gray, fine to medium fragments.	25 - 65	40
SAND WITH LIMESTONE AND CLAY - Sand, 50%, quartz, very fine-grained, sub-rounded; Limestone, 25%, medium gray, medium-grained; Clay, 25%, pale olive, soft silty.	65 - 75	10
SHELLY CLAYEY SAND - Sand, 70%, frosted, quartz, medium- to coarse-grained, rounded; Clay, 20%, pale olive, soft, plastic, silty; Shell, 10%, very pale orange, fine fragments.	75 - 90	15
SANDY CLAY - Clay, 50%, dark greenish gray, soft, silty plastic; Sand, 50%, quartz, very fine-grained, sub-angular; Sand, trace, phosphate.	90 - 120	30

SANDY CLAY - Clay, 50%, dark greenish gray, firm, dry in place; Sand, 50%, clear and frosted, quartz, very fine-grained, sub-angular to sub-rounded.	120 - 160	40
SANDY CLAY - Clay, 50%, greenish gray, soft, plastic; Sand, 45%, clear to frosted, quartz, very fine-grained, sub-angular to sub-rounded; Shell, 5%, white fine fragments.	160 - 195	35
SANDY CLAY - Clay, 50%, greenish gray, soft, plastic; Sand, 45%, clear to frosted, quartz, very fine-grained; Sand, phosphatic, 5%, black, very fine-grained.	195 - 225	30
CLAYEY SAND - Sand, 60%, frosted, quartz, fine- to coarse-grained, rounded; Clay, 40%, dusky yellowish green, soft, wet; Shell, trace, fragments.	225 - 235	10
SAND - Sand, 95%, frosted, quartz, fine- to medium coarse-grained, sub-rounded to rounded; Silt, 5%, pale yellowish green.	235 - 275	40
SAND - Sand, 95%, clear to frosted, quartz, very fine- to medium-grained, sub-rounded; Silt, 5%, pale yellowish green.	275 - 315	40
SAND - Sand, 85%, clear to frosted, quartz, very fine- to medium-grained, sub-angular to sub-rounded; Silt, 10%, yellowish green; Sand, phosphatic, 5%, black, very fine-grained; Clay, trace, grayish green.	315 -	24+
TOTAL DEPTH	339	

GEOLOGIC LOG
TEST WELL 83-4
LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND WITH ORGANICS - Sand, 90%, clear to moderate brown, quartz, fine-grained, sub-angular; Organics, 10%, moderate brown.	0 - 5	5
SAND - Sand, 100%, clear to frosted, quartz, fine-grained, sub-angular to sub-rounded.	5 - 20	15
SHELLY SAND - Sand, 70%, clear to frosted, quartz, very fine-grained, sub-rounded; Shell, 30%, very pale orange to moderate brown, medium fragments; Clay, trace, brownish gray.	20 - 50	30
SHELLY SANDY LIMESTONE - Limestone, 50%, medium light gray to dark gray, fine-grained, quartz sand in matrix; Sand, 30%, clear to frosted, quartz, fine-grained; Shell, 20%, very pale orange to medium gray, fine fragments.	50 - 80	30
CLAYEY SHELLY SAND - Sand, 50%, quartz, medium- to coarse-grained, rounded; Shell, 35%, very pale orange, fine to medium fragments; Clay, 15%, pale yellowish green, soft, silty.	80 - 98	18
CLAYEY SAND - Sand, 60%, clear to frosted, quartz, very fine-grained, sub-angular to sub-rounded; Clay, 40%, grayish olive, soft, plastic; Shell, trace, fragments.	98 - 120	22
SILTY SAND - Sand, 90%, quartz, fine-grained, sub-angular to sub-rounded; Silt, 10%, pale yellowish green.	120 - 130	10

SAND - Sand, 100%, clear to frosted, quartz, fine- to medium coarse-grained, rounded; Sand, trace, phosphatic, black, fine-grained.	130 - 155	25
CLAYEY SILTY SAND - Sand, 75%, frosted, quartz, fine- to medium-grained, rounded; Silt, 15%, pale yellowish green; Clay, 10%, pale yellowish green, soft, as thin partings.	155 - 172	17
SAND - Sand, 100%, clear to frosted, quartz, fine- to coarse-grained, sub-rounded to rounded; Silt, trace, pale yellowish green.	172 - 230	58
CLAYEY SAND - Sand, 85%, clear to frosted, quartz, fine- to medium-grained, sub-angular to sub-rounded; Clay, 15%, pale yellowish green, soft, silty.	230 - 243	13
CLAYEY SAND - Sand, 60%, clear to frosted, quartz, fine- to medium fine-grained, sub-angular to sub-rounded; Clay, 40%, grayish green, soft plastic.	243 -	37+
TOTAL DEPTH	280	

GEOLOGIC LOG OF TEST WELL 83-5 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, quartz, dark yellowish brown to moderate yellowish brown, fine- to medium-grained, sub-angular to sub-rounded; Organics, trace.	0 - 5	5
SHELL WITH SAND - Shell, 80%, bleached, whole and broken medium-sized fragments; Sand, 20%, quartz, pale yellowish brown to clear, fine- to medium-grained, sub-angular to sub-rounded.	5 - 17	12
SAND AND SHELL - Sand, 60%, pale yellowish brown, quartz, fine- to medium-grained, sub-angular; Shell, 40%, bleached and gray, medium-sized fragments.	17 - 41	24
SANDY SHELL WITH SANDSTONE - Shell, 40%, gray and bleached, small- and medium-sized fragments; Sand, 35%, pale yellowish brown, quartz, fine- to medium-grained, sub-angular; Sandstone, 25%, quartz and phosphatic, dark yellowish brown to gray, fine- to medium-grained, moderately hard, sub-angular to sub-rounded grains.	41 - 65	24
SANDY SHELL WITH SANDSTONE - Shell, 60%, bleached and gray, small- and medium-sized fragments; Sand, 20%, pale yellowish brown to clear, quartz, medium-grained, sub-angular; Sandstone, 20%, pale yellowish brown, quartz, fine- to medium-grained, moderately hard, sub-angular grains.	65 - 80	15
SAND WITH SHELL - Sand, 75%, clear, quartz, coarse- to medium-grained, sub-angular; Shell, 25%, gray and bleached, medium- to fine-sized fragments.	80 - 89	9

SANDY SHELL WITH SANDSTONE - Shell, 40%, gray and bleached, coarse to medium-sized whole and broken fragments; Sand, 30%, clear, quartz, coarse-grained, sub-angular; Sandstone, 30%, clear and pale yellowish brown, quartz, coarse-to medium-grained, grains sub-angular, well cemented in calcareous matrix.	89 - 102	13
SAND - Sand, 95%, clear, quartz, coarse-grained, sub-angular; Shell, 5%, gray and bleached, medium to large fragments and whole shells.	102 - 186	84
CLAY WITH SAND - Clay, 70%, grayish olive, plastic; Sand, 30%, clear, quartz, coarse-grained, sub-angular.	186 -	14+
TOTAL DEPTH	200	

GEOLOGIC LOG OF TEST WELL 83-6 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, very dusky red, quartz, fine- to medium-grained, sub-angular to sub-rounded.	0 - 3	3
SAND AND SHELL - Sand, 60%, dark yellowish brown, quartz, fine- to medium-grained, sub-angular to sub-rounded; Shell, 40%, white and bleached, small to medium-sized fragments.	3 - 4	1
SANDSTONE AND CLAYEY SHELL - Sandstone, 60%, pale brown, quartz, fine-grained, sub-angular to sub-rounded grains, moderately hard, calcareous matrix; Shell, 30%, tan and white, small to medium-sized fragments; Clay, 10%, very pale orange, plastic.	4 - 6	2
CLAYEY SHELL AND SANDSTONE - Shell, 80%, tan, white and gray, small- to medium-sized fragments and whole shells; Clay, 10%, very pale orange, plastic; Sandstone, 10%, pale brown, quartz and trace phosphatic, fine-grained, sub-angular to sub-rounded grains, moderately hard, calcareous matrix.	6 - 30	24
CLAYEY SHELL - Shell, 60%, white, tan and gray, small- to large-sized whole and fragmented shells; Clay, 40%, grayish olive, plastic, silty.	30 - 41	11
SHELL AND SANDSTONE - Shell, 60%, white, tan and gray, small- to medium-sized whole and broken shells; Sandstone, 35%, pale brown, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains, moderately hard, calcareous matrix; Clay, 5%, grayish olive, plastic, silty.	41 - 49	8

SANDSTONE AND SANDY SHELL - Sandstone, 45%, pale brown, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains, moderately hard, calcareous matrix; Shell, 30%, tan, white and gray, small- to medium-sized whole and broken shells; Sand, 25%, pale yellowish brown, quartz, fine- to medium-grained, sub-angular to sub-rounded.	49 - 68	19
CLAYEY SHELL WITH SANDSTONE - Shell, 70%, white, tan and gray, small- to medium-sized whole and broken shells; Clay, 20%, yellowish gray to grayish yellow, plastic, silty; Sandstone, 10%, pale yellowish brown, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains.	68 - 85	17
SHELLY SANDY CLAY - Clay, 40%, yellowish gray, plastic, silty; Shell, 30%, tan, white and gray, small- to medium-sized fragments and whole shells; Sand, 30%, pale yellowish brown, quartz and some phosphatic, fine- to medium-grained, sub-angular to sub-rounded.	85 - 105	20
SAND AND SHELL - Sand, 60%, clear, quartz, coarse- to medium-grained, sub-angular; Shell, 40%, tan and white, large- to small-sized fragments.	105 - 107	2
SHELLY SAND AND CLAY - Sand, 40%, clear, quartz, coarse- to medium-grained, sub-angular; Clay, 40%, grayish olive, plastic, silty; Shell, 20%, tan and white, small- to medium-sized fragments.	107 - 115	8
SHELLY SAND AND CLAY - Sand, 60%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 30%, grayish olive, plastic, silty; Shell, 10%, tan, gray and white, small to medium fragments.	115 - 125	10
SHELLY SAND WITH CLAY - Sand, 70%, clear, quartz, medium- and coarse-grained, sub-angular; Clay, 20%, grayish olive, plastic, silty; Shell, 10%, tan, gray and white, small to medium fragments.	125 - 138	13

SHELLY SAND - Sand, 90%, quartz and phosphatic (some), clear and black, medium-grained, sub-angular; Shell, 10%, white, tan and gray, small- to medium-sized fragments; Clay, trace, grayish olive, plastic, silty.	138 - 176	38
CLAY AND SHELLY SAND - Clay, grayish olive, 60%, plastic, silty; Sand, 30%, quartz and phosphatic, clear and black, medium- to coarse-grained, sub-angular; Shell, 10%, tan, white and gray, small- to medium-sized fragments.	176 -	24+
TOTAL DEPTH	200	

GEOLOGIC LOG OF WELL TEST 83-7 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, moderate brown, quartz, fine- to medium-grained, sub-angular to sub-rounded.	0 - 4	4
SHELL AND SAND - Shell, 60%, bleached and white, small fragments; Sand, 40%, grayish orange pink, quartz, fine- to medium-grained, sub-angular to sub-rounded.	4 - 5	1
SANDSTONE AND CLAYEY SHELL - Sandstone, 50%, pale brown, quartz and phosphatic, medium-grained, moderately hard, in calcareous matrix; Shell, 30%, bleached and white, small-sized fragments; Clay, 20%, dark yellowish orange, plastic, silty.	5 - 7	2
SANDSTONE AND CLAYEY SHELL - Sandstone, 60%, yellowish gray, quartz and phosphatic, fine- to coarse-grained, moderately hard, in calcareous matrix; Shell, 30%, bleached and white, broken small-sized fragments; Clay, 10%, grayish yellow to yellowish gray, plastic, silty.	7 - 15	8
CLAYEY SHELL - Shell, 70%, gray, white and tan, small- to large-sized broken fragments; Clay, 30%, yellowish gray, plastic, silty.	15 - 21	6
SANDY SHELL AND SANDSTONE - Shell, 50%, tan, white and gray, small-sized broken fragments; Sandstone, 30%, grayish orange pink, quartz and phosphatic, fine- to medium-grained, moderately hard, in calcareous matrix, sub-angular to sub-rounded grains; Sand, 20%, pale yellowish brown, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains.	21 - 38	17

CLAYEY SHELL WITH SANDSTONE - Shell, 60%, tan, white and gray, small- to medium-sized fragments; Clay, 20%,. moderate brown, plastic, silty; Sandstone, 20%, grayish orange pink, quartz and phosphatic, fine- to medium-grained, moderately hard, grains sub-angular to sub-rounded, in calcareous matrix.	38 - 44	6
SANDY SHELLY CLAY - Clay, 50%, light gray,, plastic, silty; Shell, 40%, white, tan and gray, small-sized fragments; Sand, 10%, pale yellowish brown, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains.	44 - 59	15
SANDSTONE AND SANDY SHELL - Sandstone, 40%, pale yellowish brown, quartz and phosphatic, fine- to medium-grained, moderately hard, sub-angular to sub-rounded grains; Shell, 40%, white, tan and gray, small- to medium-sized broken fragments; Sand, 20%, pale yellowish brown, quartz, fine- to medium-grained, sub-angular to sub-rounded grains.	59 - 83	24
SHELLY SANDY CLAY - Clay, 60%, olive gray, plastic, silty; Shell, 30%,. white, tan and gray, small- to medium-sized fragments; Sand, 10%, clear, quartz, fine- to medium-grained, sub-angular.	83 - 107	24
SANDY CLAY - Clay, 70%, olive gray, plastic, silty; Sand, 20%, clear, quartz, fine- to coarse-grained, sub-angular; Shell, 10%, white, tan and gray, small fragments.	107 - 125	18
CLAYEY SHELLY SAND - Sand, 40%, clear, quartz and phosphatic, medium- to coarse-grained, sub-angular; Clay, 40%, grayish olive, plastic, silty; Shell, 20%, white, tan and gray, small- to medium-sized fragments.	125 - 132	7

SHELLY SANDY CLAY - Clay, 60%, grayish olive, plastic, silty; Shell, 30%, white, tan and gray, small- to medium-sized fragments and whole shells; Sand, 10%, clear, quartz, medium- to coarse-grained, sub-angular.	132 - 170	38
SHELLY SANDY CLAY - Clay, 40%, grayish olive, plastic, silty; Shell, 30%, white, tan and gray, small- to medium-sized fragments and whole shells; Sand, 30%, clear, quartz, medium- to coarse-grained, sub-angular.	170 - 259	89
SAND AND SHELLY CLAY - Sand, 40%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 40%, grayish olive, plastic, silty; Shell, 20%, white, tan, and gray, fine- to medium-sized broken fragments.	259 - 286	27
SAND AND SHELLY CLAY - Sand, 60%, clear, quartz, medium-grained, sub-angular; Clay, 20%, grayish olive, plastic, silty; Shell, 20%, tan, white and gray, small- to medium-sized broken fragments.	286 - 297	11
SAND - Sand, 90%, clear, quartz and phosphatic, medium-grained, sub-angular; Shell, 10%, white, tan and gray, small- to medium-sized broken fragments; Clay, trace, grayish olive.	297 - 337	40
SAND WITH SHELLY CLAY - Sand, 70%, clear, quartz, fine- to medium-grained, sub-angular; Clay, 20%, grayish olive, plastic, silty; Shell, 10%, white, tan and gray, small- to medium-sized fragments.	337 -	23+
TOTAL DEPTH	360	

GEOLOGIC LOG
OF
TEST WELL 83-8
LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, moderate brown, quartz, fine- to medium-grained, sub-angular to sub-rounded; Organics, trace.	0 - 8	8
SAND AND SHELL - Sand, 50%, yellowish gray, quartz, fine- to medium-grained, sub-angular to sub-rounded; Shell, 50%, bleached, small- to medium-sized fragments.	8 - 16	8
CLAYEY SHELL AND SAND - Shell, 50%, bleached, small- to medium-sized fragments; Sand, 40%, yellowish gray, quartz, fine- to medium-grained, sub-angular to sub-rounded; Clay, 10%, yellowish gray, plastic, silty.	16 - 26	10
SANDSTONE AND SHELLY SAND - Sandstone, 50%, grayish orange pink to yellowish gray, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains; Sand, 30%, yellowish gray, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains; Shell, 20%, bleached and white, small-sized fragments.	26 - 50	24
CLAY WITH SANDSTONE - Clay, 65%, dusky brown, plastic, silty; Sandstone, 35%, grayish orange pink, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains.	50 - 52	2
SANDSTONE AND SANDY SHELL - Sandstone, 40%, light olive gray, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains; Shell, 40%, white, tan and gray, small-sized fragments; Sand, 20%, yellowish gray, quartz, fine- to medium-grained, sub-angular to sub-rounded.	52 - 64	12

CLAY WITH SANDSTONE AND SANDY SHELL - Clay, 50%, greenish gray, plastic, silty; Sandstone, 20%, light gray, quartz, medium-grained, sub-angular grains; Shell, 20%, white, tan and gray, small to large fragments and whole shells; Sand, 10%, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains.	64 - 94	30
CLAY AND SHELLY SAND - Clay, 40%, medium dark gray, plastic, silty; Sand, 40%, clear, quartz, medium- to coarse-grained, sub-angular; Shell, 20%, white, gray and tan, small- to medium-sized fragments.	94 - 102	8
CLAY AND SHELLY SAND - Clay, 40%, grayish olive, plastic, silty; Sand, 40%, clear, quartz, medium- to coarse-grained, sub-angular; Shell, 20%, white, gray and tan, small- to medium-sized fragments.	102 - 130	28
CLAYEY SHELLY SAND - Sand, 70%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 20%, grayish olive, plastic, silty; Shell, 10%, white, tan and gray, small- to medium-sized fragments.	130 - 150	20
SAND WITH SHELLY CLAY - Sand, 90%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 5%, grayish olive, plastic, silty; Shell, 5%, white, tan and gray, small-sized fragments.	150 - 255	105
CLAYEY SHELLY SAND - Sand, 40%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 40%, grayish olive, plastic, silty; Shell, 20%, white, tan and gray, small- to medium-sized fragments.	255 - 264	9
SAND WITH SHELLY CLAY - Sand, 90%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 5%, grayish olive, plastic, silty; Shell, 5%, white, tan and gray, small fragments.	264 - 275	11

SAND - Sand, 95%, clear, quartz, medium- to coarse-grained, sub-angular; Shell, 5%, white, tan and gray, small fragments.	275 - 323	48
SAND AND SHELLY CLAY - Sand, 50%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 40%, grayish olive, plastic, silty; Shell, 10%, white, tan and gray, small-sized fragments.	323 - 329	6
CLAY WITH SHELLY SAND - Clay, 70%, grayish olive, plastic, silty; Sand, 20%, clear, quartz, medium- to coarse-grained, sub-angular; Shell, 10%, white, tan and gray, small fragments.	329 -	31+
TOTAL DEPTH	360	

GEOLOGIC LOG OF TEST WELL 83-9 LABELLE, FLORIDA

Sample Description	Depth Interval (feet)	Thickness (feet)
SAND - Sand, 100%, moderate brown, quartz, fine- to medium-grained, sub-angular to sub-rounded.	0 - 4	4
SAND AND SHELL - Shell, 60%, bleached and tan, small- to medium-sized fragments; Sand, 40%, light yellowish brown, quartz, fine- to medium-grained, sub-angular to sub-rounded.	4 - 20	16
SANDSTONE AND SANDY SHELL - Sandstone, 40%, grayish orange pink, quartz and phosphatic, fine- to medium-grained, moderately hard, sub-angular to sub-rounded grains, calcareous matrix; Shell, 40%, bleached and tan, small- to medium-sized fragments; Sand, 20%, light yellowish brown, quartz, medium-grained, sub-angular grains.	20 - 45	25
SANDSTONE, LIMESTONE AND SANDY SHELL - Sandstone, 25%, medium to light gray, quartz and phosphatic, fine- to medium-grained, moderately hard, sub-angular to sub-rounded grains; Limestone, 25%, very pale orange, very fine-grained, moderately soft (carbonate mud); Shell, 40%, white, tan and gray, small to large whole and broken shells and corals; Sand, 10%, light yellowish brown, quartz, fine- to medium-grained, sub-angular to sub-rounded.	45 - 65	20
SANDSTONE, LIMESTONE AND CLAYEY SANDY SHELL - Sandstone, 20%, medium to light gray, quartz and phosphatic, fine- to medium-grained, moderately hard, sub-angular to sub-rounded grains; Limestone, 10%, very pale orange, very fine-grained, moderately soft; Shell, 30%, white, tan, gray, small to large broken and whole shells and corals; Clay, 20%, light gray, plastic, silty; Sand, 20%, light yellowish brown, quartz, fine- to medium-grained, sub-angular to sub-rounded.	65 - 71	6

CLAY AND SHELLY SAND - Clay, 40%, grayish olive, plastic, silty; Sand, 30%, clear and black, quartz and phosphatic, fine- to coarse-grained, sub-angular to sub-rounded grains; Shell, 30%, gray, tan and white, large to small fragments.	71 - 85	14
CLAY AND SHELLY SAND - Clay, 60%, grayish olive, plastic, silty; Sand, 30%, clear and black, quartz and phosphatic, fine- to coarse-grained, sub-angular to sub-rounded; Shell, 10%, white, tan and gray, large- to small-sized fragments.	85 - 124	39
CLAY AND SHELLY SAND - Clay, 40%, grayish olive, plastic, silty; Sand, 30%, clear and black, quartz and phosphatic, fine- to medium-grained, sub-angular to sub-rounded grains; Shell, 30%, white, tan and gray, small- to medium-sized fragments.	124 - 195	71
CLAY AND SHELLY SAND - Clay, 40%, grayish olive, plastic, silty; Sand, 40%, clear, quartz, medium- to coarse-grained, sub-angular; Shell, 20%, white, tan and gray, small- to medium-sized fragments.	195 - 212	17
SANDY SHELL AND CLAY - Sand, 70%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 20%, grayish olive, plastic, silty; Shell, 10%, white, tan and gray, small- to medium-sized fragments.	212 - 220	8
CLAYEY SAND - Sand, 90%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 10%, grayish olive, plastic, silty; Shell, trace, small fragments.	220 - 234	14
CLAYEY SHELLY SAND - Sand, 60%, clear, quartz, medium- to coarse-grained, sub-angular; Clay, 30%, grayish olive, plastic, silty; Shell, 10%, white and tan, small- to medium-sized fragments.	234 - 245	11

CLAY AND SHELLY SAND - Clay, 60%, grayish olive, plastic, silty; Sand, 30%, clear, quartz, medium- to coarse-grained, sub-angular; Shell, 10%, white and tan, small- to medium-sized fragments.	245 -	15+
TOTAL DEPTH	260	

APPENDIX C

GEOPHYSICAL LOGGING, 1982 AND 1983

APPENDIX C

Geophysical Logging
1982 and 1983

Borehole geophysical logging was performed on many of the exploratory holes drilled in 1982 and 1983, and on two flowing wells on General Development Corporation (GDC) property. One of the flowing wells, known as the Welcome Center Well, is located at the GDC Welcome Center and is used to maintain levels in some of the lakes on the golf course nearby. The second flowing well was an abandoned well in Section 33 T42S R30E. Because that well was in poor condition and discharging saline water onto the land surface, it was plugged as part of this program.

Geophysical logging was conducted on selected holes when these logs could provide useful information. In some holes, where it could not be determined from the formation samples where the most prooductive material was located, gamma-ray, electric, and caliper logs were performed. In others, where it was obvious that productive material existed but the clay/non-clay contact was not well defined, a gamma-ray log only was performed. In others, no geophysical logs were prepared as no potentially productive material was located. The geophysical logs follow. For purposes of report reproduction, many of the logs have been photo-reduced without alteration of graphical scales. A summary of the logging is shown on Table C-1.

Gamma-ray logs are useful in distinguishing between clay and non-clay formations. Typically, clays contain more radioactive minerals than non-clays; the gamma radiation released by these minerals are detected by the scintillation counter of the gamma-ray logging tool and are registered as relative deflections of the gamma-ray log. Unfortunately in South Florida, phosphate minerals are often found in the sand and sandstone deposits. These minerals produce gamma radiation that is as high or higher than most clays. Therefore, proper interpretation of a gamma-ray log requires examination of the lithologic log, too.

TABLE C-1

SUMMARY OF
GEOPHYSICAL LOGS COMPILED

Exploratory Hole	Logged Depth (feet below land surface	Geophysical Logs Performed	Data Compiled in Report
80-1	312	electric, gamma, caliper	Geraghty & Miller, 1980
80-2	300	electric, gamma, caliper	Geraghty & Miller, 1980
80-3	300	electric, gamma, caliper	Geraghty & Miller, 1980
Production Well 2	300	electric, gamma, caliper	Geraghty & Miller, 1982
82-3	302	electric, gamma, caliper	This report
82-4	302	electric, gamma, caliper	This report
82-5	301	electric, gamma, caliper	This report
82-6	301	electric, gamma, caliper	This report
83-1	180	gamma	This report
83-2	229	gamma	This report
83-4	215	gamma	This report
83-5	147	gamma	This report
83-8	325	gamma	This report
83-9	60	gamma	This report
Welcome Center	616 625	gamma, caliper electric, temperature fluid conductivity	This report
Section 33	830	electric, gamma, caliper temperature, fluid conductivity, flow meter	This report

Electric resistivity logs sense the resistivity of lithologic formations and the entrapped fluid. Higher resistivity generally is associated with "clean" formation containing water with low mineral content, such as sands and limestones containing fresh water. Lower resistivity generally indicates formations with soluble minerals, such as clays, or containing water with high mineral content, such as sands and limestones containing salt water. Steel well casing interferes with the electric log; electric logs in the cased portions of the flowing wells cannot be interpreted.

As shown in the geophysical logs, the surficial sands produce large deflections in the gamma-ray logs and moderate deflections in the electric resistivity logs. This suggests that the formation is fairly "clean" (lacking in clay) but contains phosphatic sand, accounting for the gamma radiation.

The pattern is most evident in the upper 60 feet of Exploratory Hole 82-3 where the gamma-ray log deflected 200 counts near the bottom of the surficial sand. The clean sand is reflected in a 20-ohm deflection on the resistivity log near the same depth. Expanded hole size in the caliper logs reflects some "washout" of unconsolidated sand.

The confining clay that separates the shallow aquifer from deeper aquifers appears as moderate deflections on the gamma-ray log and a subdued resistivity log. The caliper log in confining clay is usually only slightly larger to much smaller than the drill bit size.

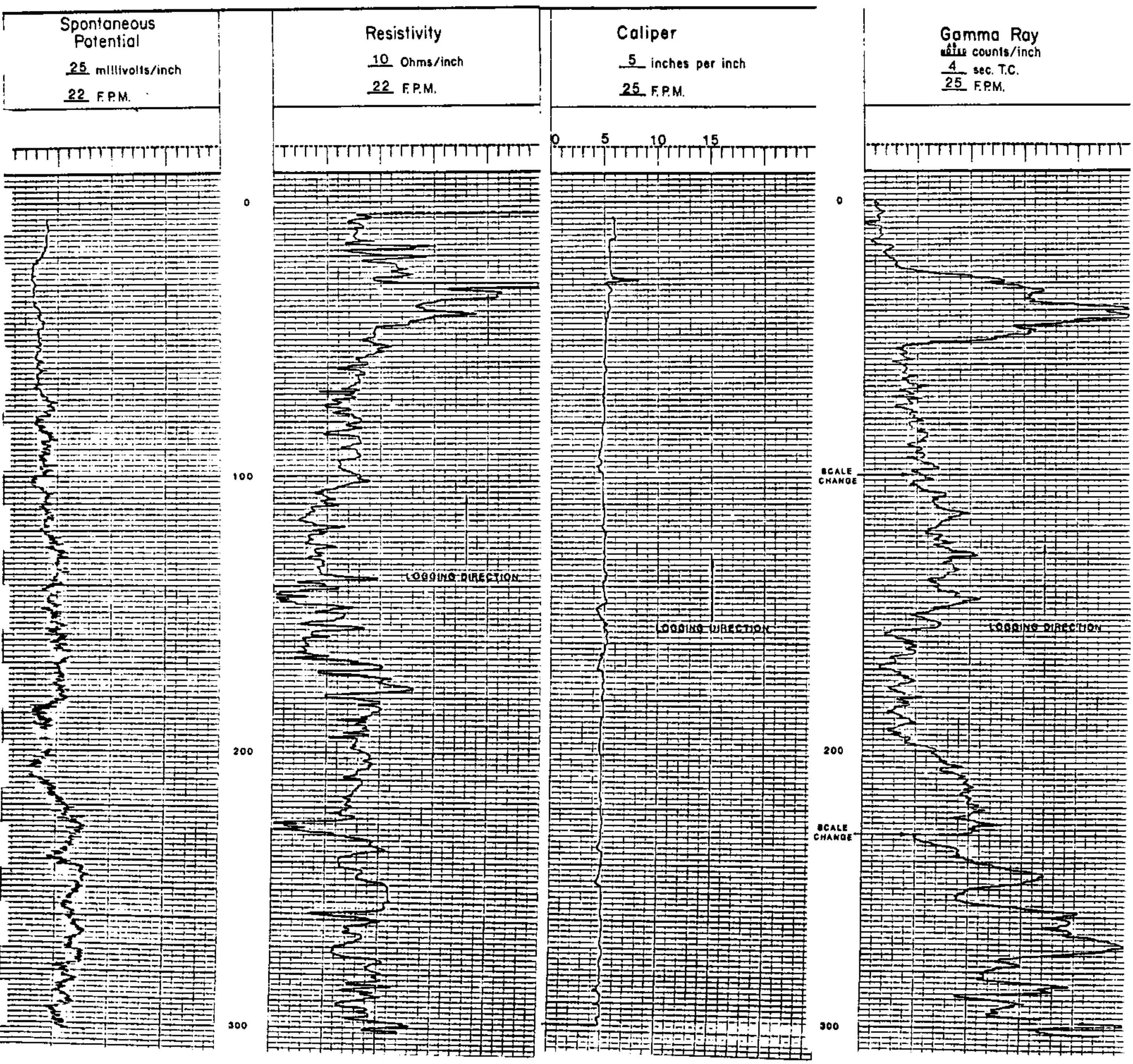
When the medium- to coarse-grained sand in the intermediate aquifer is encountered, a subtle yet distinct reduction in the gamma-ray deflections appears. Resistivity deflections are greater, often extending as far as those appearing within the surficial sand. The caliper log occasionally shows washouts, although the heavy drilling mud required to keep the borehole open in this sand will often minimize washouts.

Geophysical logs of the flowing wells on the property are most interesting, as no geologic information is available at depths greater than the deepest exploratory holes. The electric logs of the Section 33 Well and of the Welcome Center Well indicate that these wells are cased to 308 feet and 276 feet below land surface, respectively. Subdued resistivity and large deflections in the gamma-ray log indicate that the casings are seated in clay that continues to about 580 feet in the Section 33 Well and 550 feet in the Welcome Center Well. Permeable limestone (indicated by deflections on the resisitivity logs) occurs below these depths. "Kicks" in the field conductivity and temperature logs at 610 feet (Section 33) and 570 feet (Welcome Center) suggest that a major inflow of water occurs at these depths. A second deflection in the temperature log of the Section 33 Well indicates that a second inflow occurs at about 680 feet below grade.

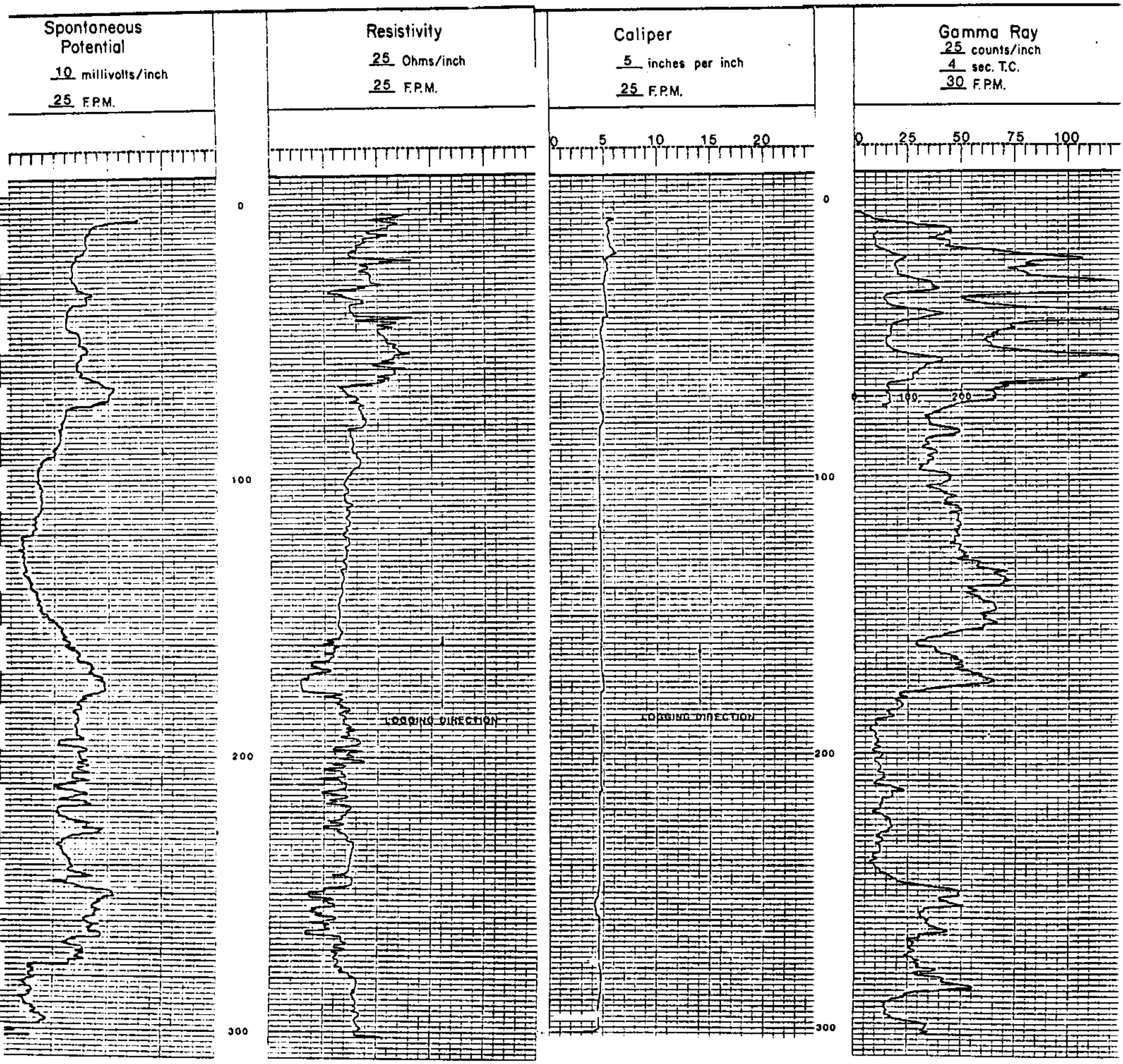
The caliper log of the Welcome Center Well indicates that the borehole size varies by an inch within the well casing. It appears that the upper 100 feet of 4-inch-diameter casing is telescoped inside a larger, 5-inch-diameter casing.

Geraghty & Miller, Inc.

Well 82-3

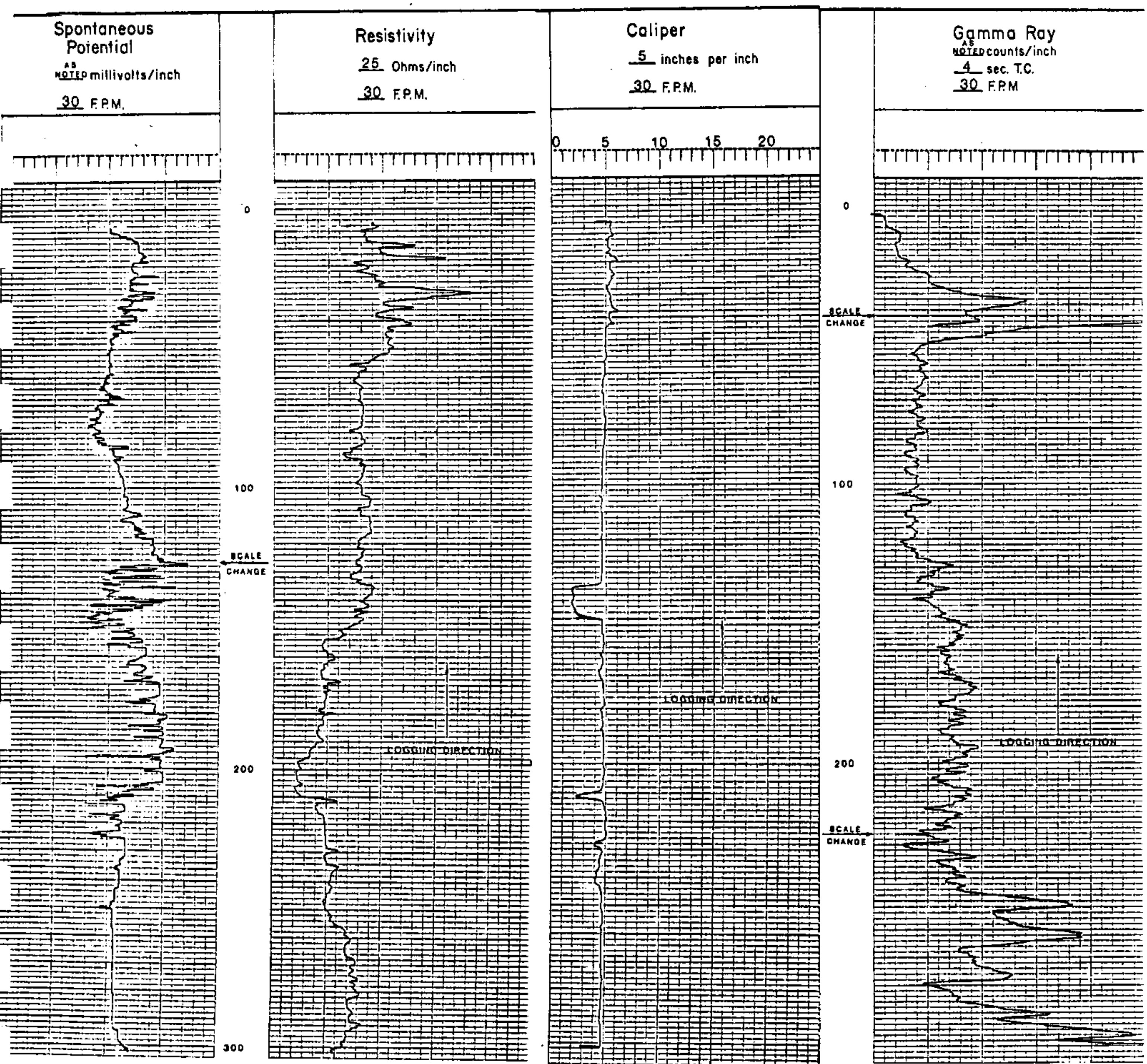


Well 82-4


Spontaneous Potential
10 millivolts/inch
25 F.P.M.
Resistivity
25 Ohms/inch
25 F.P.M.
Caliper
5 inches per inch
25 F.P.M.
0 5 10 15 20
Gamma Ray
25 counts/inch
4 sec. T.C.
30 F.P.M.
0 25 50 75 100
0 100 200
0
100
200
300
LOGGING DIRECTION
LOGGING DIRECTION

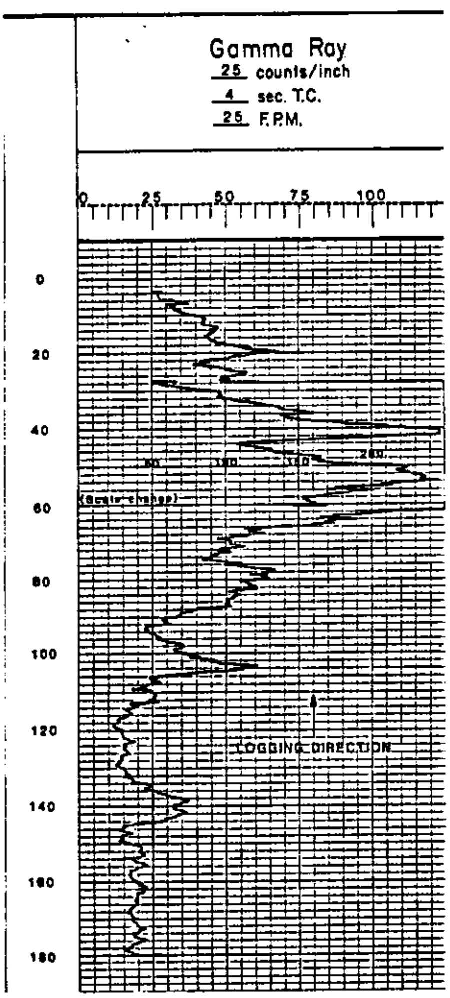
Geraghty & Miller, Inc.

Well 82-6

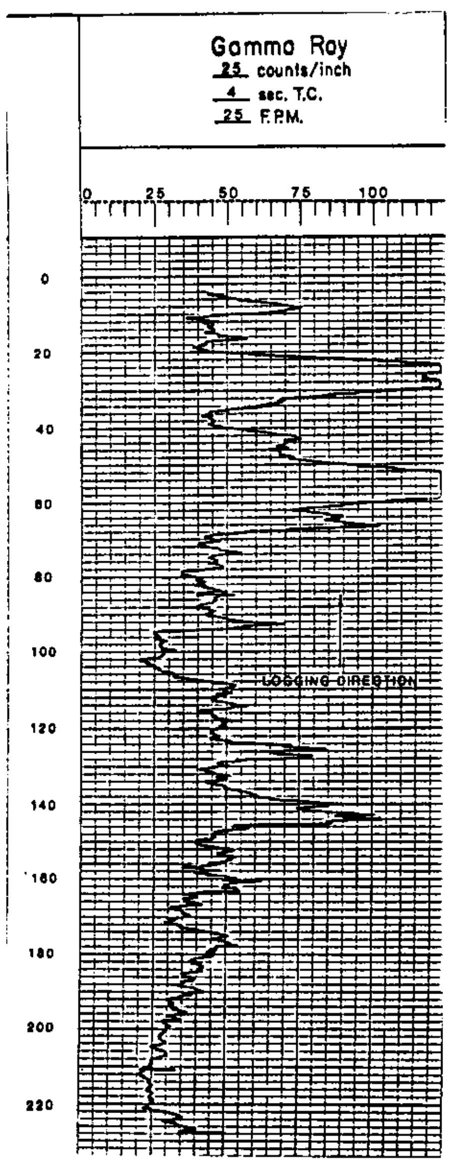


Geraghty & Miller, Inc.

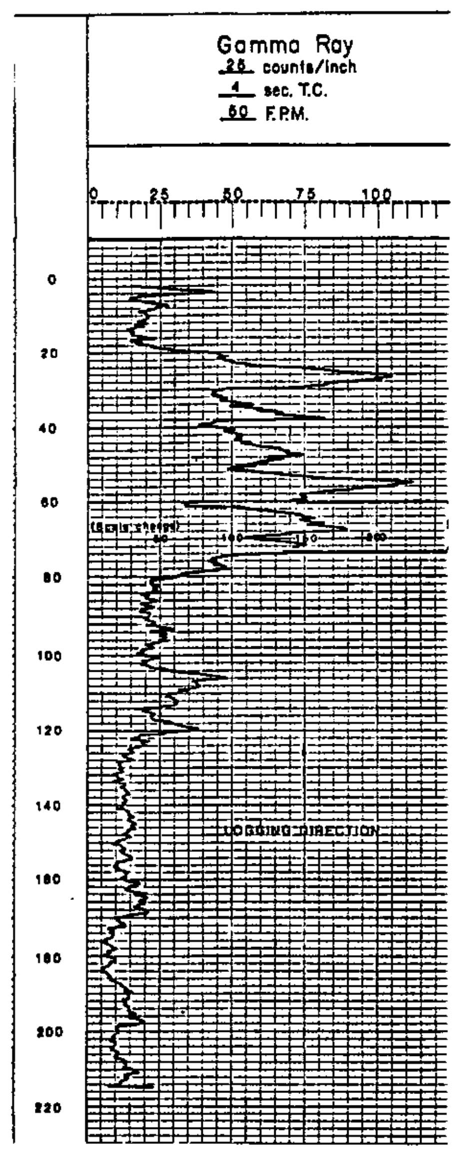
Well 83-1



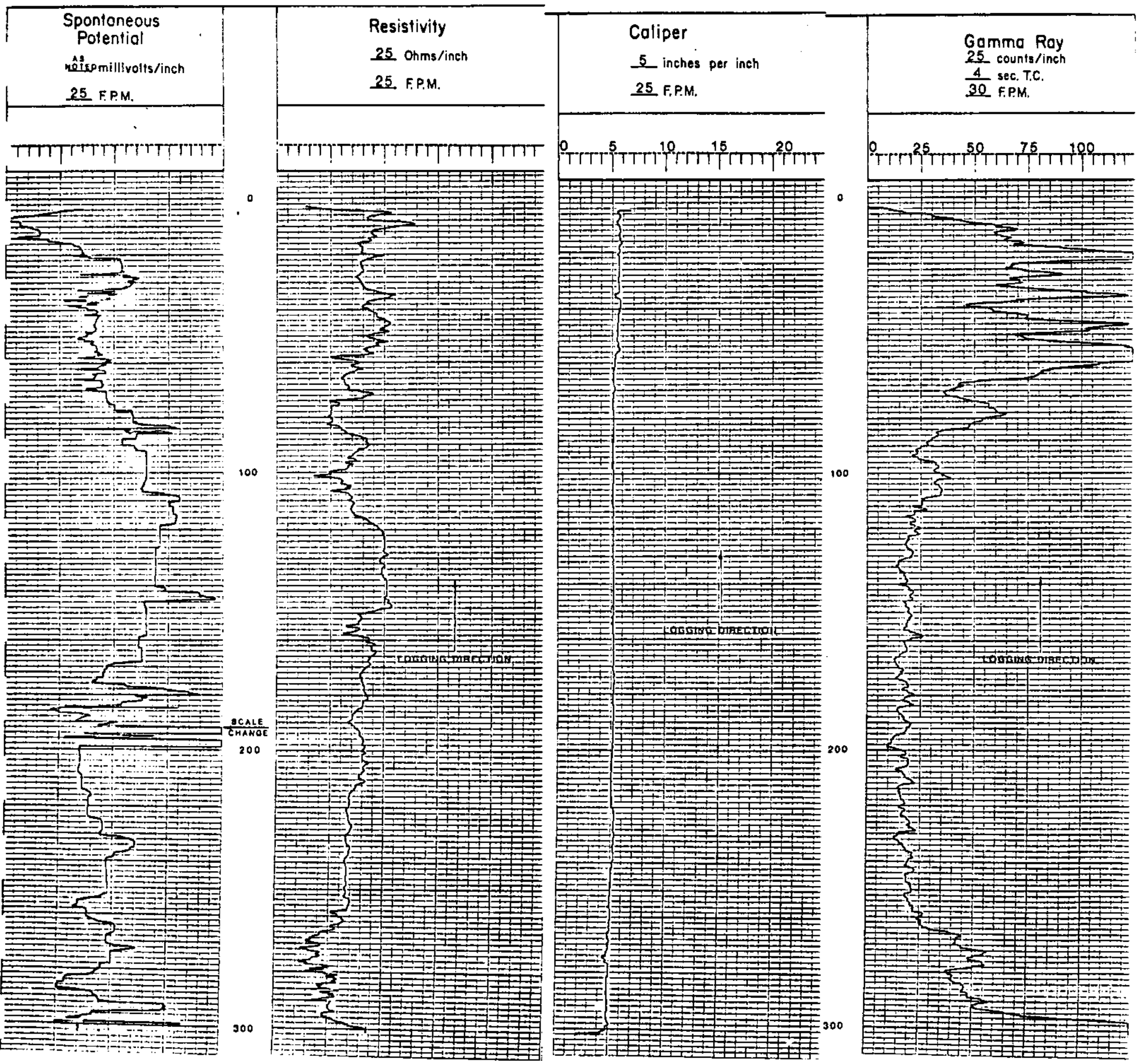
Well 83-2

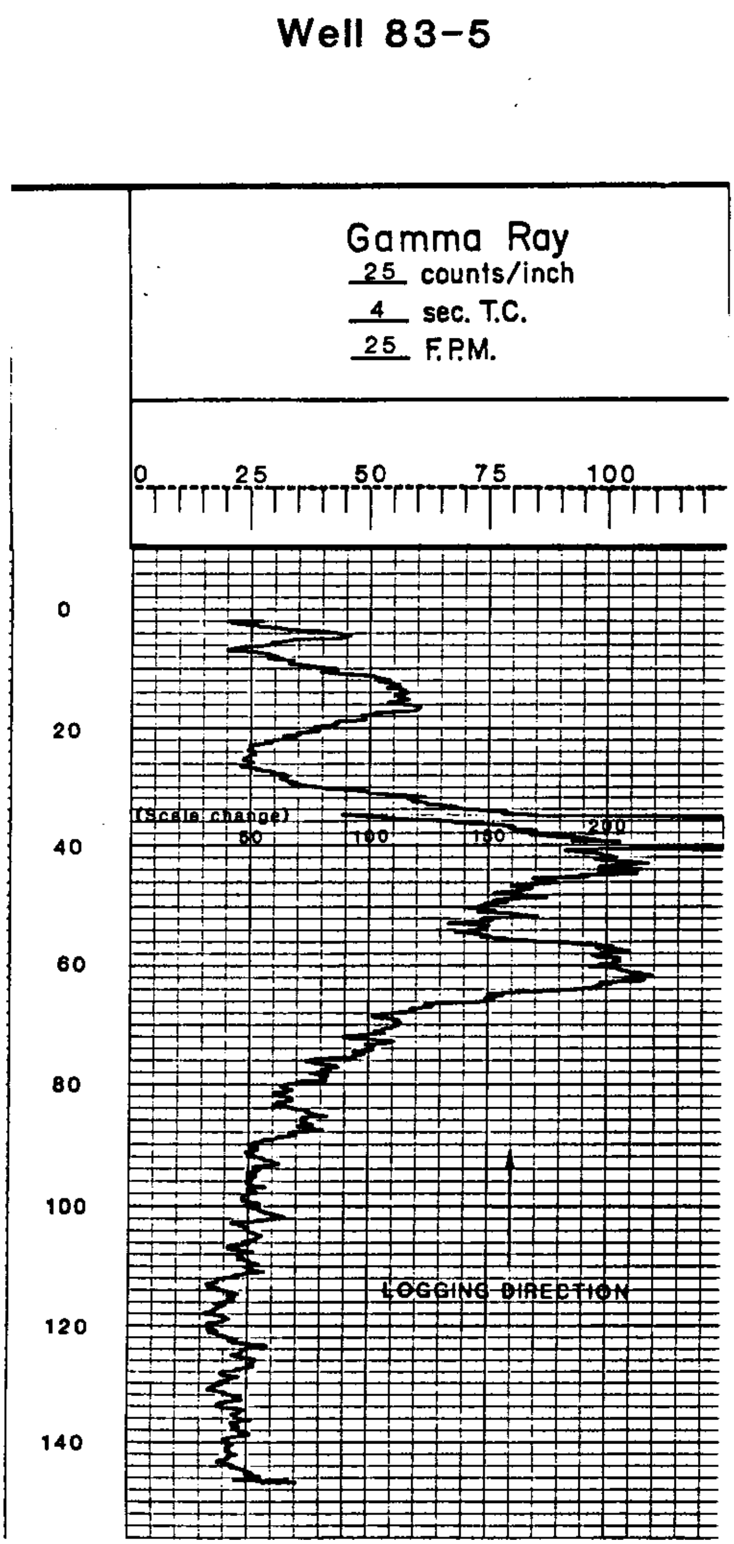


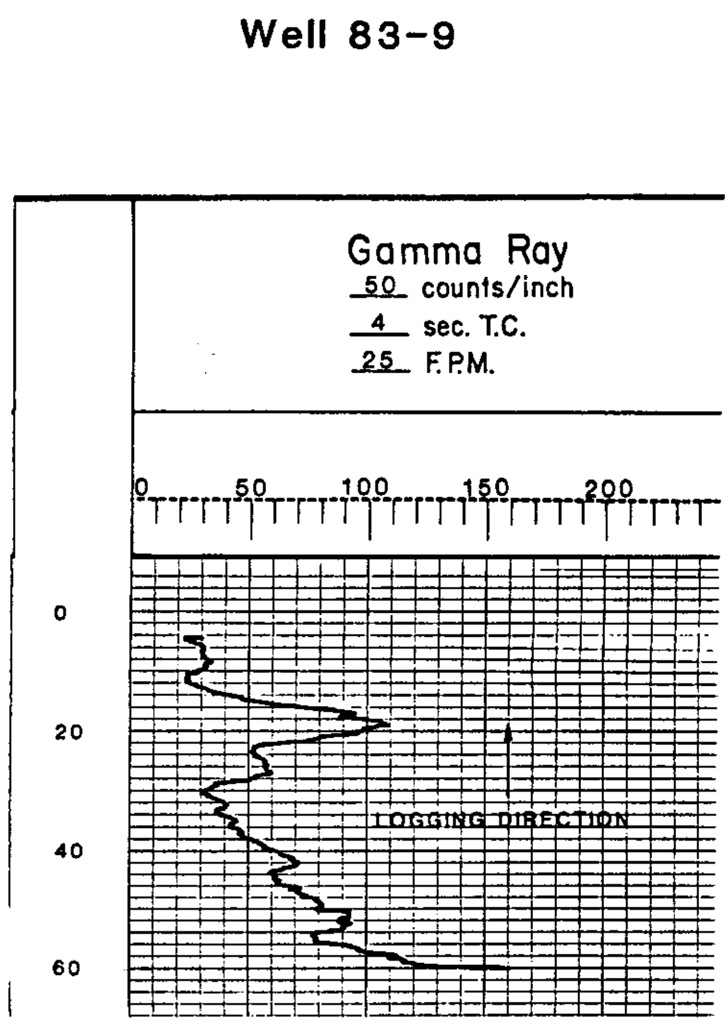
Well 83-4



Well 82-5

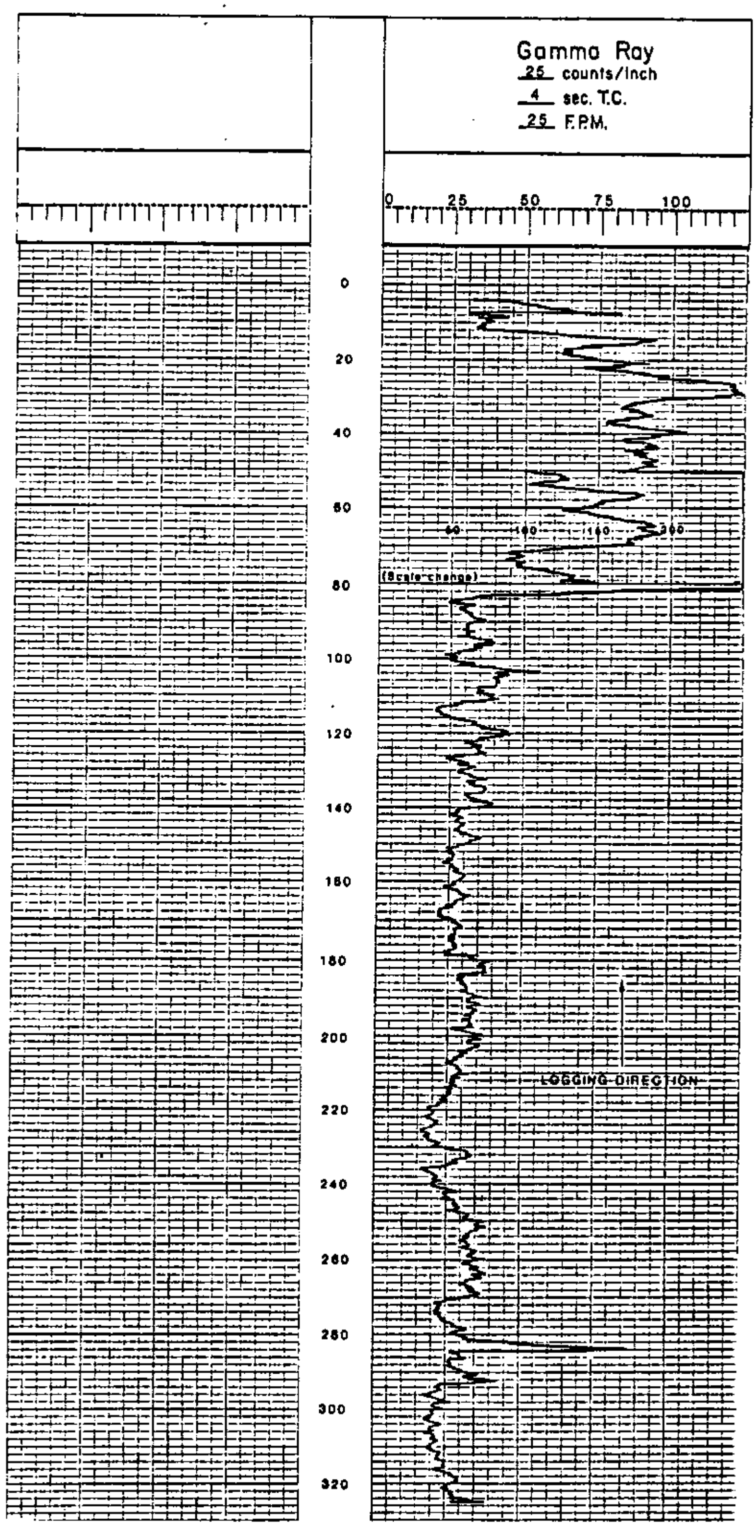

Spontaneous Potential
AS NOTED millivolts/inch
25 F.P.M.
Resistivity
25 Ohms/inch
25 F.P.M.
Caliper
5 inches per inch
25 F.P.M.
0 5 10 15 20
Gamma Ray
25 counts/inch
4 sec. T.C.
30 F.P.M.
0 25 50 75 100
0
100
200
300
SCALE CHANGE
LOGGING DIRECTION


Well 83-5
Gamma Ray
25 counts/inch
4 sec. T.C.
25 F.P.M.
0 25 50 75 100
(Scale change)
50 100 150 200
0
20
40
60
80
100
120
140
LOGGING DIRECTION


Well 83-9
Gamma Ray
50 counts/inch
4 sec. T.C.
25 F.P.M.
0 50 100 150 200
0
20
40
60
LOGGING DIRECTION

Geraghty & Miller, Inc.

Well 83-8



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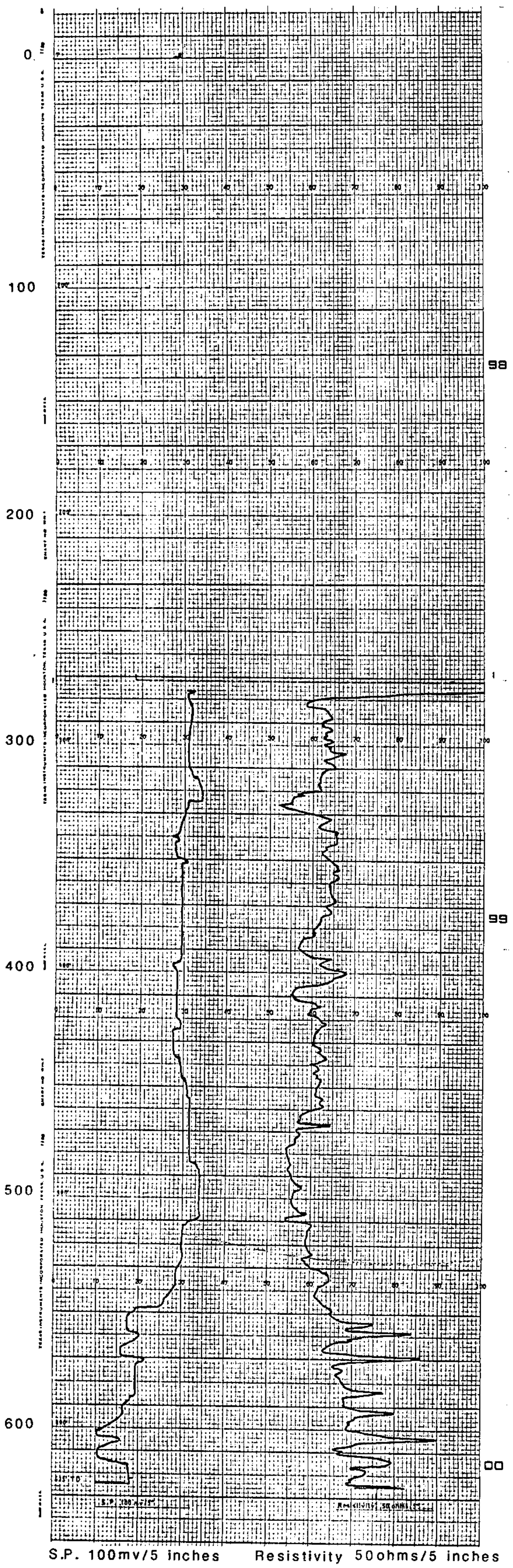
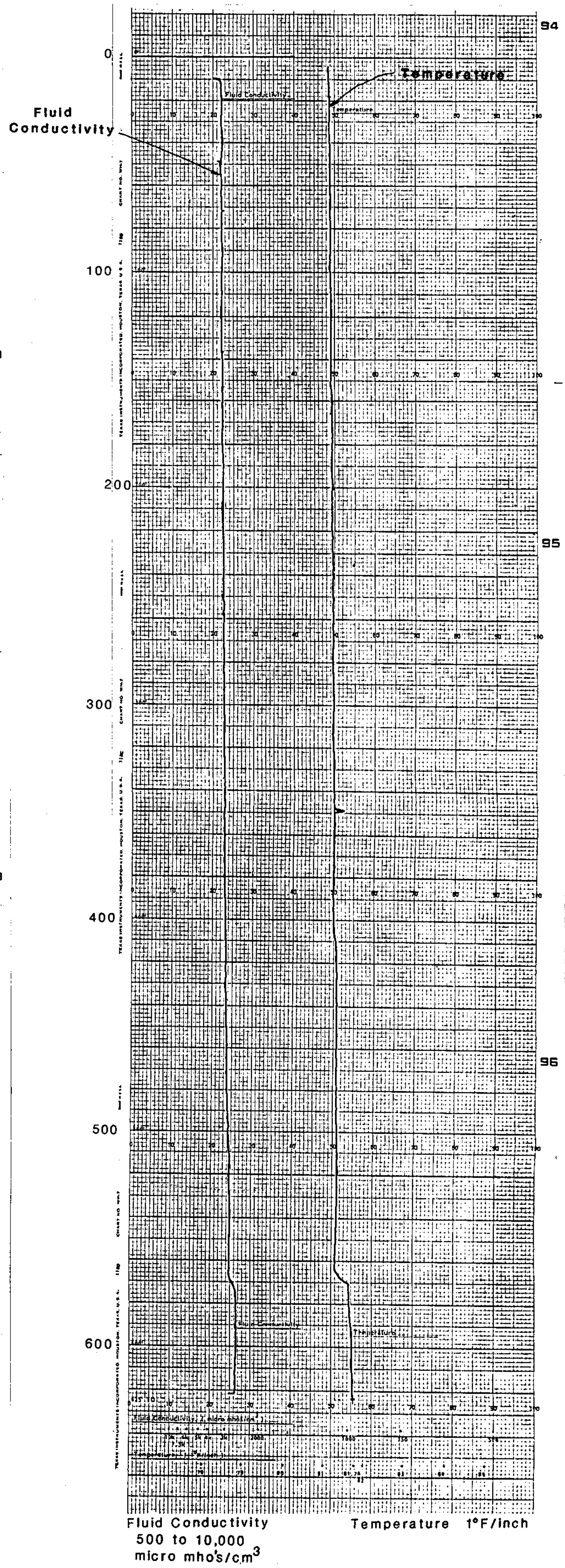
P.O. Box 14311
Gainesville, FL 32604
904-372-5950

WELCOME CENTER WELL

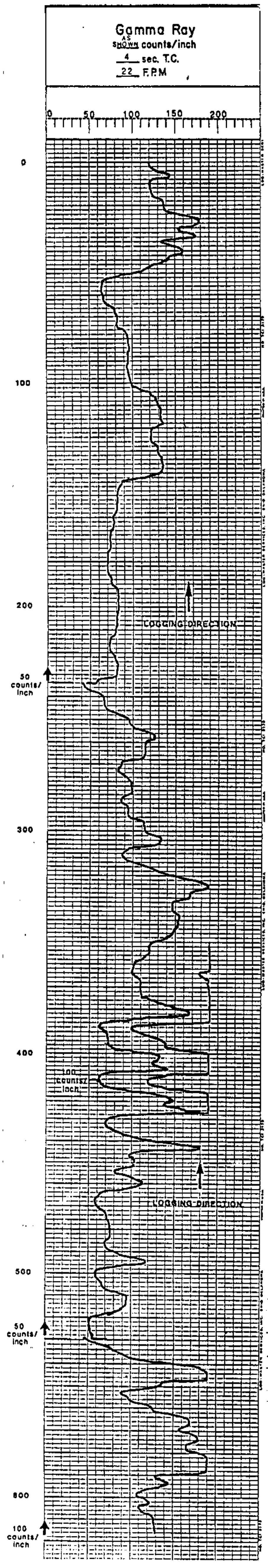
Electric

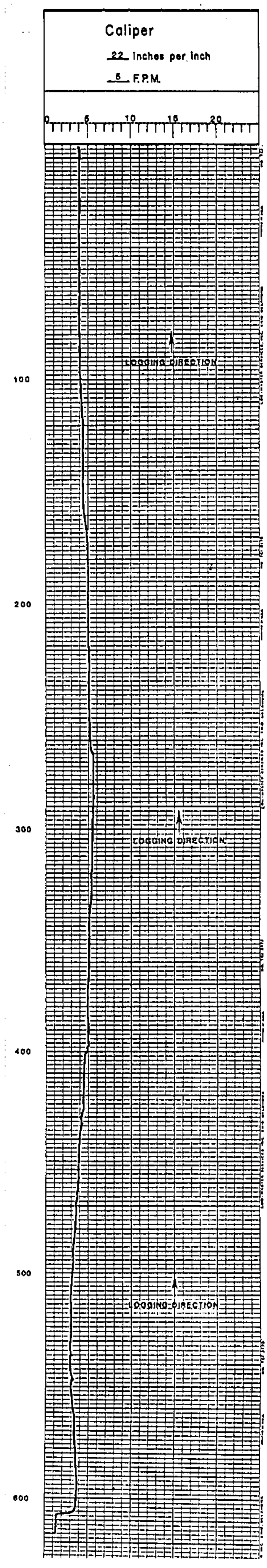


Fluid Conductivity Temperature



WELCOME CENTER WELL





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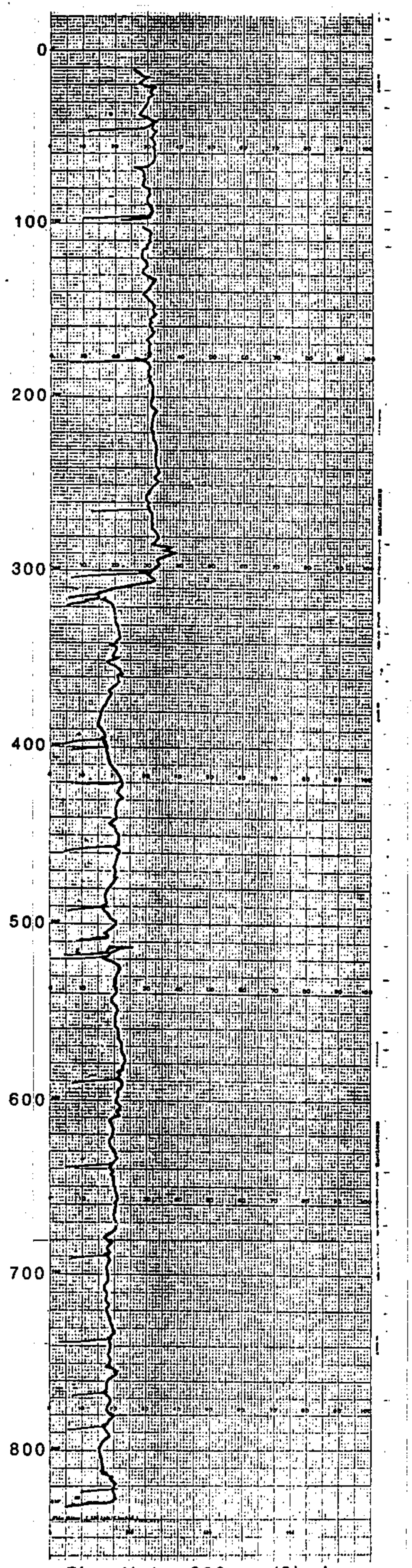
904-372-5950

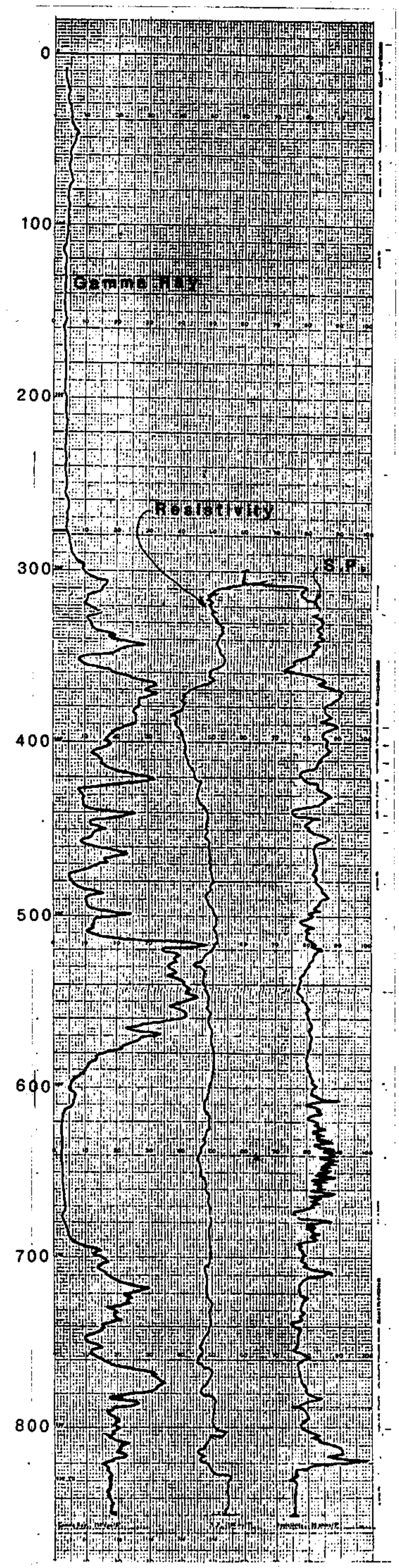
SECTION 33 WELL

Flow Meter



Flow Meter 600cpm/5inches

Gamma Ray
Electric



Gamma
250 C.P.S./5 inches

S.P. 100mv/5inches
Resistivity 20ohms/5inches

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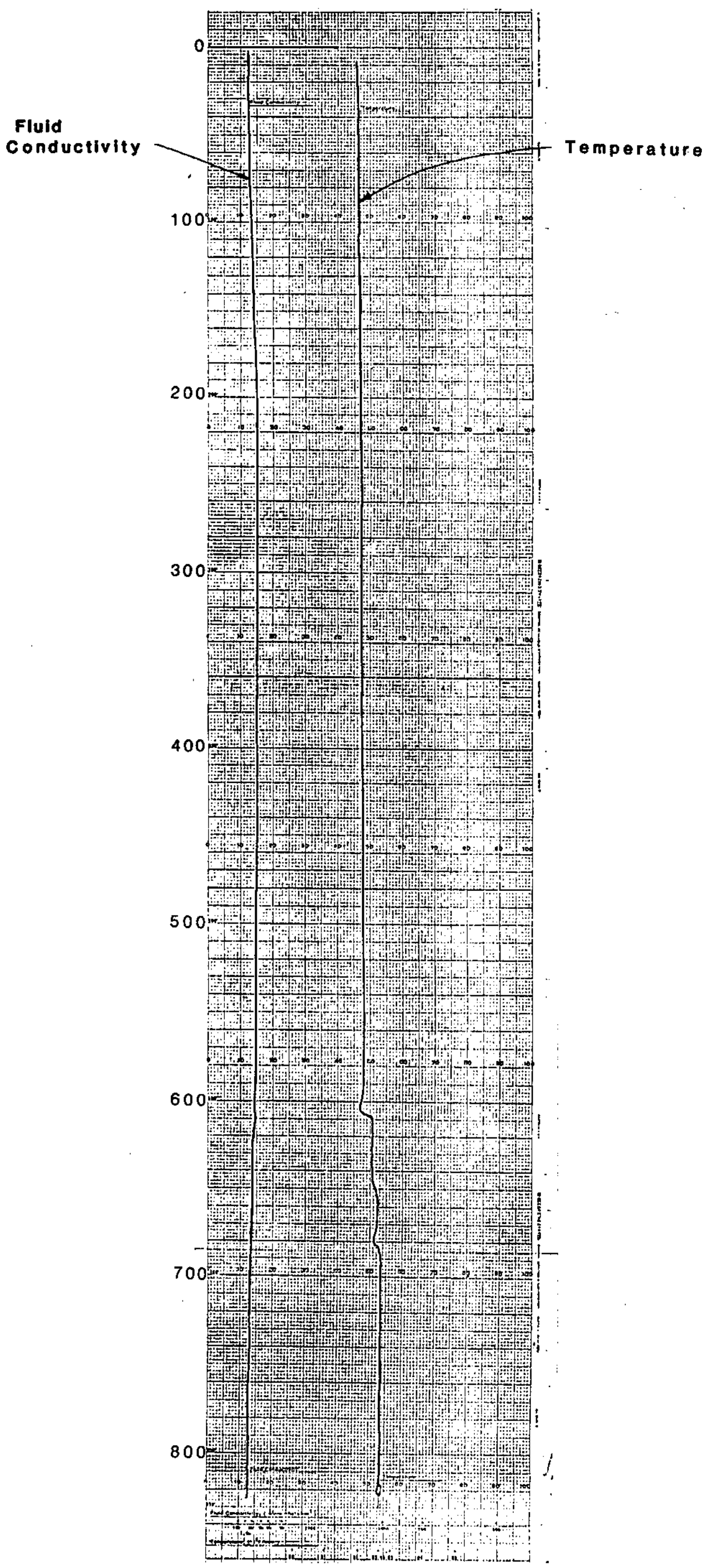
P.O. Box 14311
Gainesville, FL 32604
904-372-5950

SECTION 33 WELL

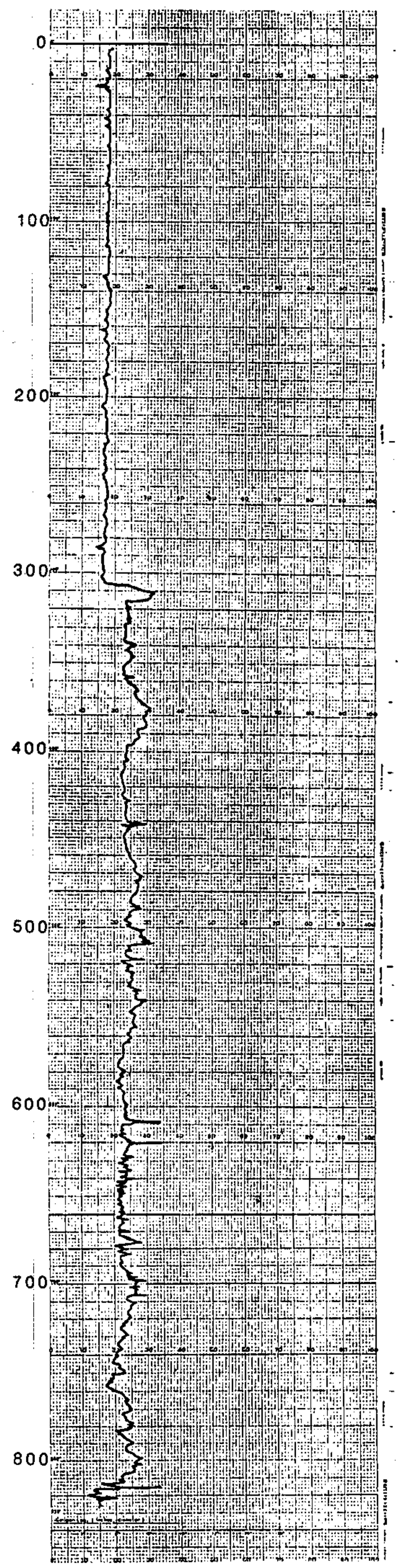
Temperature
Fluid Conductivity



Fluid Conductivity 500 to 10,000 micro mho'S/cm^3

Temperature 1°F/inch

Caliper



Caliper 2inches/1inch

APPENDIX D

WELL TESTING, 1982 AND 1983

APPENDIX D

Well Testing
1982 and 1983

At each location where the exploratory hole encountered potentially productive material, a 2-inch-diameter monitor well was constructed with PVC casing and well screen. Well construction details are shown in Table D-1. After developing each well to a turbidity-free condition, the well was pumped for one-half hour at a constant rate. After pumping, recovering water levels were measured. These data were analyzed graphically using the method called Jacob's Modification of the Theis Equation. Test data are summarized in Table D-2.

The two flowing wells on the property were tested similarly. Each of these wells was allowed to flow freely overnight to achieve a constant flow rate. After the rate was measured, the well head was shut in, and the recovering water level was measured in a manometer tube extending up the mast of the drilling rig. Table D-2 also contains the summary of these test data, analyzed according to Jacob's Modification of the Theis Equation.

In order to estimate the transmissivity of the intermediate aquifer in the vicinity of each well tested, a statistical procedure, multiple linear regression analysis, was applied to the test data. This was considered to be necessary because the single controlled pumping test at Port LaBelle was performed at the water plant, remote from the more extensive portion of the intermediate aquifer underlying Increments II and III. It was assumed that apparent transmissivity of the aquifer is a linearly dependent variable that relates to the degree of aquifer thickness by the well screen and the full aquifer thickness as independent variables. The degree of aquifer penetration by the well screen is not usually considered to be a linear function; however, this has been shown to be approximately valid for any given well radius and

TABLE D-1

DATA FROM WELLS
TESTED IN 1982 AND 1983

Well	Production Interval Tested (feet)	Screened Interval (feet)	Pumped Rate (gpm)	Vacuum Gauge Reading (inches, Hg)
82-1	70 - 95	70 - 95	25	25
82-5	135 - 222	120 - 150*	49	26
82-6	130 - 150	90 - 140*	4.5	27
83-1	110 - 240	140 - 190	57	15
83-2	210 - 230	210 - 230	16.5	25
83-3	235 - 339	235 - 275	37.5	18
83-4	120 - 230	180 - 230	50	17
83-5	0 - 186	100 - 150	50	14.5
83-6	138 - 176	130 - 170*	33.3	15
83-7	286 - 360	290 - 335	43	20
83-8	150 - 323	275 - 320	33.3	24.5
83-9	0 - 65	30 - 60	33.3	22.5
Section 33	580 - 850**	580 - 850**	62	Flowing
Welcome Center	550 - 625**	550 - 625**	21.5	Flowing

Notes

* Some screen is outside production interval
** Estimated from geophysical logs

TABLE D-2

SUMMARY OF RECOVERY TEST DATA
1982 AND 1983

Well	Pumping Rate (gpm)	Change in Water Level Per Log Cycle During Recovery* (feet)	Apparent Tested Transmissivity (gpd/ft)
82-1	25	0.46	14,350
82-5	49	0.46	28,100
82-6	4.5	2.81	420
83-1	57	0.16	94,050
83-2	16.5	0.31	14,050
83-3	37.5	0.15	66,000
83-4	50	0.29	45,500
83-5	50	0.143	92,300
83-6	33.3	0.26	33,800
83-7	43	0.13	87,300
83-8	33.3	0.12	73,300
83-9	33.3	0.235	37,400
Section 33	62	3.18	5,150
Welcome Center	21.5	7.30	780

* Graph of water level versus t/t'

vertical to horizontal permeability ratio (Walton, 1962, p. 8). Table D-3 summarizes the data used in the multiple linear regression analysis, presents the derived equation, and compares the apparent transmissivity at each well derived from the test data with that calculated from the equation. It also shows the predicted true aquifer transmissivity which could be expected. The equation for predicting transmissivity may be verified by applying it to the aquifer parameters derived from data from Wells 80-2 and 80-3 during the test of PW2 (see Appendix E of this report). At Well 80-2, where the aquifer is 120 feet thick, tested transmissivity was 200,000 gpd/ft, and the transmissivity calculated from multilinear regression is 180,440 gpd/ft. At Well 80-3, where the aquifer is 125 feet thick, tested transmissivity was 170,000 gpd/ft; the transmissivity calculated from multilinear regression analysis is 188,600 gpd/ft.

TABLE D-3

MULTILINEAR REGRESSION ANALYSIS OF INTERMEDIATE AQUIFER TEST DATA

Well	Effective Screened Thickness (feet)	Effective Aquifer Thickness (feet)	Apparent Tested Transmissivity (gpd/ft)	Calculated Apparent Transmissivity (gpd/ft)	Calculated Aquifer Transmissivity (gpd/ft)
82-1	20	20	14,350	17,235	17,235
82-5	15*	87	28,100	21,905	126,582
82-6	10*	20	420	2,697	17,235
83-1	50	130	94,050	80,452	196,760
83-2	20	20	14,050	17,235	17,235
83-3	40	104	66,000	61,280	154,327
83-4	50	110	45,500	76,888	164,119
83-5	50	181**	92,300	89,540	279,995
83-6	32*	38	33,800	37,889	46,612
83-7	45	74	87,300	63,204	105,366
83-8	45	173	73,300	80,845	266,938

Multilinear Regression Equation:

(1453.86) x (Screen length in feet)
+(178.191) x (Aquifer thickness in feet)
-15405.7

Transmissivity= ________ gpd/ft

Coefficient of Determination = .836 Correlation Coefficient = .914
Standard Error = 15477

* Screen partially penetrates aquifer
** Accounts for water table at 5 feet below land surface

APPENDIX E

ESTIMATING HYDROLOGIC COEFFICIENTS FOR THE INTERMEDIATE AQUIFER

APPENDIX E

Estimating Hydrologic Coefficients for the Intermediate Aquifer

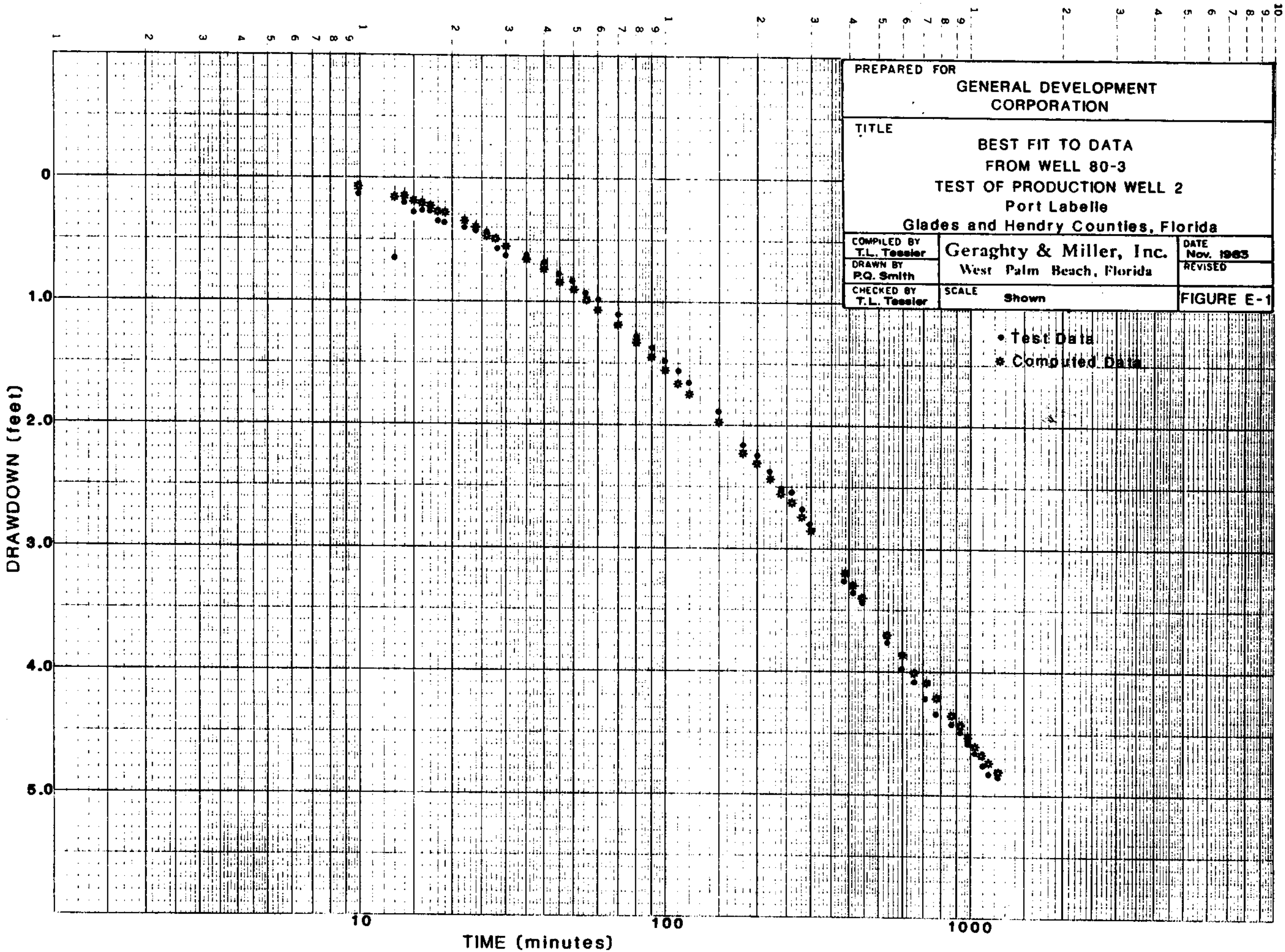
The constant-rate pumping test conducted in 1982 of Production Well 2 provided data about water-level responses to pumpage in the water plant area (Geraghty & Miller, Inc., 1982). One of the most important facts established during that test was the existence of a hydrologic boundary to the intermediate aquifer southwest of the water plant. The effect of the boundary caused drawdowns in the observation wells to increase rapidly during the early stages of the test; the influence of the boundary masked the effect of any leakage that might have occurred. It was recognized that some leakage from the shallow aquifer to the intermediate aquifer must have occurred as the water level in a well screened within the confining bed declined during the test. However, for the purpose of estimating the yield of Production Well 2, a detailed analysis of leakage potential was not made at that time. Instead, classical techniques for determining transmissivity, storage coefficient, and distance to the image well were employed only in evaluating that test.

To estimate the leakage potential of the confining bed separating the shallow and intermediate aquifers, the water-level data collected during the 1982 test of Production Well 2 were re-analyzed, assuming that vertical leakage did occur. Various reasonable values for transmissivity, storage coefficient, leakance, and distance to the image well were used to calculate drawdowns (computer generated) that could have occurred in Wells 71-1, 80-2, and 80-3. These were compared to the test data until a reasonable "best fit" was obtained. The derived parameters are shown in Table E-1. Based on the lithologic conditions observed at Wells 71-1, 80-2, and 80-3, the average vertical permeability of the confining bed at each location is shown also. Figure E-1 shows the test data from Well 80-3 and the computed data which best match those data.

TABLE E-1

"BEST FIT" HYDROLOGIC COEFFICIENTS FOR DATA OBTAINED DURING TEST OF PRODUCTION WELL 2

	Well 71-1	Well 80-2	Well 80-3
Transmissivity (gpd/ft)	190,000	200,000	170,000
Storage coefficient (dimensionless)	0.00035	0.00035	0.0004
Distance to image well (feet)	5000	4650	6000
Leakance (gpd/cu. ft.)	0.002	0.001	0.002
Confining bed thickness (feet)	40	39	52
Vertical permeability of confining bed (gpd/sq. ft.)	0.08	0.04	0.10



PREPARED FOR
GENERAL DEVELOPMENT CORPORATION
TITLE
BEST FIT TO DATA FROM WELL 80-3 TEST OF PRODUCTION WELL 2
Port Labelle
Glades and Hendry Counties, Florida
COMPILED BY T.L. Tessler
DRAWN BY P.Q. Smith
CHECKED BY T.L. Tessler
Geraghty & Miller, Inc.
West Palm Beach, Florida
SCALE Shown
DATE Nov. 1983
REVISED
FIGURE E-1
• Test Data
✱ Computed Data
DRAWDOWN (feet)
0
1.0
2.0
3.0
4.0
5.0
10
100
1000
TIME (minutes)

Leakage from the water-table aquifer to the intermediate aquifer is an important factor in the availability of water at LaBelle. Because the Floridan aquifer is separated from the intermediate aquifer by several hundred feet of clay and marl, the water-table aquifer, which is recharged by rainfall, represents the only major water source to support withdrawals from the intermediate aquifer. The term "leakance" represents the average vertical permeability of the confining layers between two aquifers divided by the thickness of the confining layers.

Another method of determining leakance has been employed also. The method is known as the "ratio" method and was suggested by Neuman and Witherspoon (1969). In this method, drawdown data collected in a test from a nearby observation well screened within the confining layer are compared to real or predicted drawdowns in the aquifer at the same point and time. In the LaBelle test, an observation well, located 34 feet east of the pumped well (Production Well 2) and screened to 135 feet below land surface, was measured. The bottom of the well was 35 feet above the top of the intermediate aquifer, as determined by geologic and geophysical logs. After 1000 minutes, drawdown in the observation well was 0.41 feet; the predicted drawdown in the intermediate aquifer (assuming a non-leaky artesian aquifer with a transmissivity of 240,000 gpd/ft; a storage coefficient of 0.0004; and an image well 3200 feet away) at the same point and time was 11.25 feet. Assuming a representative specific storage for the confining layer of 0.0001 (see Neuman and Witherspoon, 1969), the average vertical permeability is 0.16 gpd/sq. ft. for the material between the bottom of the observation well and the top of the intermediate aquifer. Assuming that this permeability is representative of the whole confining bed (about 115 feet thick) at this location, leakance is 0.0014 gpd/cu. ft.

Based upon the two methods of analysis, average vertical permeability of the confining bed between the shallow and intermediate aquifers at Port LaBelle is assumed to be about 0.1 gpd/sq. ft, and leakance has been calculated using that value and the lithologic determinations of confining bed thickness.

APPENDIX F

WATER QUALITY FROM TESTED WELLS, 1982 AND 1983

APPENDIX F

Water Quality from Tested Wells 1982 and 1983

A water sample was obtained from each of the monitor wells constructed in 1982 and 1983 (except Well 82-6), from the flowing well at the Welcome Center and the flowing well in Section 33. Samples from the wells constructed in 1982 were analyzed at the General Development Utilities, Inc., (GDUI) water plant for hardness. The remaining samples were analyzed by Environmental Services, Riviera Beach, Florida for constituents that affect treatability. The data reports follow.

Water quality from samples of wells penetrating the shallow (Well 83-9) and intermediate aquifers is similar. The water is typically hard (total hardness near 300 mg/l), low in chlorides (less than 100 mg/l), and variably high in iron (to 2.55 mg/l). Well 83-8 was unusually high in sulfate (125 mg/l). Color ranged between 10 and 50 APHA units, except from Well 83-5 where color was 130 units. For the constituents sampled, all of these wells produced potable water suitable for public supply after treatment.

The two flowing wells samples exhibited contrasting water quality. The water from the deeper well in Section 33 was much more mineralized than from the Welcome Center Well. The Welcome Center Well produces water of a quality that is suitable for irrigation and could be readily treated by desalination for potable use. The deeper well produced water that had nearly 10 percent salinity and contained almost 2600 mg/l of sulfate.

D.H.R.S. #86117

Environmental Services

P.O. Box 10003
Riviera Beach, Florida
33404

LABORATORY ANALYSIS — CONSULTING

WATER
WASTEWATER
SOIL
FOOD

INDUSTRIAL
AGRICULTURAL
DOMESTIC

Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

83-1

Sample collected by Geraghty & Miller on 6-29-83 at ______

Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	541	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	307	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	314	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.44	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	24	mg/l	Copper, Cu		mg/l
Chloride, Cl	62	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	107	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	6.9		Mercury, Hg		mg/l
pHs	6.9		Nitrate, as N		mg/l
Stability Index	6.9		Phenols		mg/l
Saturation Index	0.0		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	25		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ — 268 mg/l

Magnesium Hardness, as $CaCO_3$ — 39 mg/l

Collection Date 6-28-83

Michael A. Fiedor

MICHAEL A. FIEDOR, CHEMIST

D.H.R.S. #86117

Environmental Services

P.O. Box 10003
Riviera Beach, Florida
33404

LABORATORY ANALYSIS — CONSULTING

WATER
WASTEWATER
SOIL
FOOD

Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

INDUSTRIAL
AGRICULTURAL
DOMESTIC

83-2

Water Analysis Report

Sample collected by Geraghty & Miller on 6-29-83 at ______

Temperature at time of collection	°C	Carbon dioxide, CO_2	mg/l
Total Dissolved Solids (103-105°)	573 mg/l	Hydroxide as $CaCO_3$	mg/l
Total Hardness as $CaCO_3$	325 mg/l	Carbonate as $CaCO_3$	mg/l
Total Alkalinity as $CaCO_3$	284 mg/l	Bicarbonate as $CaCO_3$	mg/l
Non-carbonate Hardness	mg/l	Bacteria, Total Coliform	/100ml
Bicarbonate, HCO_3	mg/l	Arsenic, As	mg/l
Iron, Fe	0.08 mg/l	Barium, Ba	mg/l
Sulfate, SO_4	34 mg/l	Copper, Cu	mg/l
Chloride, Cl	87 mg/l	Cadmium, Cd	mg/l
Calcium, Ca	92 mg/l	Chromium, Cr^{+6}	mg/l
Magnesium, Mg	mg/l	Cyanide	mg/l
Fluoride, F	mg/l	Lead, Pb	mg/l
Hydrogen Sulfide, H_2S	mg/l	Manganese, Mn	mg/l
pH	7.1	Mercury, Hg	mg/l
pHs	7.0	Nitrate, as N	mg/l
Stability Index	6.9	Phenols	mg/l
Saturation Index	0.1	Selenium, Se	mg/l
MBAS	mg/l	Silver, Ag	mg/l
T Odor		Sodium, Na	mg/l
Color, APHA	20	Turbidity, NTU	
Residual Chlorine: Free Available		Zinc, Zn	mg/l
Combined Available			

Collection Date 6-29-83

Calcium Hardness, as $CaCO_3$ 230 mg/l

Magnesium Hardness, as $CaCO_3$ 95 mg/l

Michael A. Fiedor

MICHAEL A. FIEDOR, CHEMIST

D.H.R.S. #86117

Environmental Services

P.O. Box 10003
Riviera Beach, Florida
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LABORATORY ANALYSIS — CONSULTING

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Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

83-3

Sample collected by Geraghty & Miller on 6-22-83 at ____

Parameter	Value	Unit	Parameter	Value	Unit
Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	567	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	329	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	258	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.03	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	104	mg/l	Copper, Cu		mg/l
Chloride, Cl	76	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	81	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.1		Mercury, Hg		mg/l
pHs	7.1		Nitrate, as N		mg/l
Stability Index	0.0		Phenols		mg/l
Saturation Index			Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	25		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 202 mg/l

Magnesium Hardness, as $CaCO_3$ 127 mg/l

Collection Date 6-13-83

Michael A. Fiedor

D.H.R.S. #86117

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Water Analysis Report

83-4

Sample collected by Geraghty & Miller on 6-22-83 at ______

Parameter	Value	Unit	Parameter	Value	Unit
Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	437	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	317	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	306	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.28	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	10	mg/l	Copper, Cu		mg/l
Chloride, Cl	30	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	118	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.1		Mercury, Hg		mg/l
pHs	6.8		Nitrate, as N		mg/l
Stability Index	6.5		Phenols		mg/l
Saturation Index	0.3		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	40		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 295 mg/l

Magnesium Hardness, as $CaCO_3$ 22 mg/l

Collection Date 6-17-83

Michael A. Fiedor

MICHAEL A. FIEDOR, CHEMIST

D.H.R.S. #86117

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West Palm Beach, FL 33401

Water Analysis Report

83-5

Sample collected by Geraghty & Miller on 6-22-83 at ______

Parameter	Result	Units	Parameter	Result	Units
Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	357	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	277	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	266	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	2.55	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	7	mg/l	Copper, Cu		mg/l
Chloride, Cl	22	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	108	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	6.8		Mercury, Hg		mg/l
pHs	6.9		Nitrate, as N		mg/l
Stability Index	7.0		Phenols		mg/l
Saturation Index	-0.1		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	130		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 270 mg/l

Magnesium Hardness, as $CaCO_3$ 7 mg/l

Collection Date 6-20-83

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Water Analysis Report

83-6

Sample collected by Geraghty & Miller on 6-22-83 at ________

Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	797	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	292	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	290	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	1.56	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	22	mg/l	Copper, Cu		mg/l
Chloride, Cl	99	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	103	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.1		Mercury, Hg		mg/l
pHs	7.0		Nitrate, as N		mg/l
Stability Index	0.1		Phenols		mg/l
Saturation Index			Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	15		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 258 mg/l

Magnesium Hardness, as $CaCO_3$ 34 mg/l

Collection Date 6-16-83

Michael A. Fiedor

D.H.R.S. #86117

Environmental Services

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1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

83-7

Sample collected by Geraghty & Miller on 6-22-83 at

Temperature at time of collection	°C	Carbon dioxide, CO_2	mg/l
Total Dissolved Solids (103-105°)	444 mg/l	Hydroxide as $CaCO_3$	mg/l
Total Hardness as $CaCO_3$	333 mg/l	Carbonate as $CaCO_3$	mg/l
Total Alkalinity as $CaCO_3$	328 mg/l	Bicarbonate as $CaCO_3$	mg/l
Non-carbonate Hardness	mg/l	Bacteria, Total Coliform	/100ml
Bicarbonate, HCO_3	mg/l	Arsenic, As	mg/l
Iron, Fe	0.13 mg/l	Barium, Ba	mg/l
Sulfate, SO_4	7 mg/l	Copper, Cu	mg/l
Chloride, Cl	41 mg/l	Cadmium, Cd	mg/l
Calcium, Ca	109 mg/l	Chromium, Cr^{+6}	mg/l
Magnesium, Mg	mg/l	Cyanide	mg/l
Fluoride, F	mg/l	Lead, Pb	mg/l
Hydrogen Sulfide, H_2S	mg/l	Manganese, Mn	mg/l
pH	7.0	Mercury, Hg	mg/l
pHs	6.8	Nitrate, as N	mg/l
Stability Index	6.6	Phenols	mg/l
Saturation Index	0.2	Selenium, Se	mg/l
MBAS	mg/l	Silver, Ag	mg/l
T Odor		Sodium, Na	mg/l
Color, APHA	35	Turbidity, NTU	
Residual Chlorine: Free Available		Zinc, Zn	mg/l
Combined Available			

Collection Date 6-20-83

Calcium Hardness, as $CaCO_3$ 272 mg/l

Magnesium Hardness, as $CaCO_3$ 61 mg/l

Michael A. Fiedor

MICHAEL A. FIEDOR, CHEMIST

D.H.R.S. #86117

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Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

83-8

Sample collected by Geraghty & Miller on 6-22-83 at ______

Parameter	Value	Unit
Temperature at time of collection		°C
Total Dissolved Solids (103-105°)	573	mg/l
Total Hardness as $CaCO_3$	271	mg/l
Total Alkalinity as $CaCO_3$	246	mg/l
Non-carbonate Hardness		mg/l
Bicarbonate, HCO_3		mg/l
Iron, Fe	0.18	mg/l
Sulfate, SO_4	125	mg/l
Chloride, Cl	74	mg/l
Calcium, Ca	52	mg/l
Magnesium, Mg		mg/l
Fluoride, F		mg/l
Hydrogen Sulfide, H_2S		mg/l
pH	7.1	
pHs	7.3	
Stability Index	7.5	
Saturation Index	-0.2	
MBAS		mg/l
T Odor		
Color, APHA	35	
Residual Chlorine: Free Available		
Combined Available		

Parameter	Value	Unit
Carbon dioxide, CO_2		mg/l
Hydroxide as $CaCO_3$		mg/l
Carbonate as $CaCO_3$		mg/l
Bicarbonate as $CaCO_3$		mg/l
Bacteria, Total Coliform		/100ml
Arsenic, As		mg/l
Barium, Ba		mg/l
Copper, Cu		mg/l
Cadmium, Cd		mg/l
Chromium, Cr^{+6}		mg/l
Cyanide		mg/l
Lead, Pb		mg/l
Manganese, Mn		mg/l
Mercury, Hg		mg/l
Nitrate, as N		mg/l
Phenols		mg/l
Selenium, Se		mg/l
Silver, Ag		mg/l
Sodium, Na		mg/l
Turbidity, NTU		
Zinc, Zn		mg/l

Calcium Hardness, as $CaCO_3$ — 130 mg/l

Magnesium Hardness, as $CaCO_3$ — 141 mg/l

Collection Date 6-20-83

Michael A. Szidor

D.H.R.S. #86117

Environmental Services

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Riviera Beach, Florida
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LABORATORY ANALYSIS CONSULTING

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1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

83-9
Sample collected by Geraghty & Miller on 6-22-83 at ______

Parameter	Value	Unit
Temperature at time of collection		°C
Total Dissolved Solids (103-105°)	432	mg/l
Total Hardness as Ca CO_3	295	mg/l
Total Alkalinity as Ca CO_3	270	mg/l
Non-carbonate Hardness		mg/l
Bicarbonate, HCO_3		mg/l
Iron, Fe	0.37	mg/l
Sulfate, SO_4	7	mg/l
Chloride, Cl	50	mg/l
Calcium, Ca	116	mg/l
Magnesium, Mg		mg/l
Fluoride, F		mg/l
Hydrogen Sulfide, H_2S		mg/l
pH	6.8	
pHs	6.9	
Stability Index	7.0	
Saturation Index	-0.1	
MBAS		mg/l
T Odor		
Color, APHA	50	
Residual Chlorine: Free Available		
Combined Available		

Collection Date 6-20-83

Parameter	Value	Unit
Carbon dioxide, CO_2		mg/l
Hydroxide as Ca CO_3		mg/l
Carbonate as Ca CO_3		mg/l
Bicarbonate as Ca CO_3		mg/l
Bacteria, Total Coliform		/100ml
Arsenic, As		mg/l
Barium, Ba		mg/l
Copper, Cu		mg/l
Cadmium, Cd		mg/l
Chromium, Cr^{+6}		mg/l
Cyanide		mg/l
Lead, Pb		mg/l
Manganese, Mn		mg/l
Mercury, Hg		mg/l
Nitrate, as N		mg/l
Phenols		mg/l
Selenium, Se		mg/l
Silver, Ag		mg/l
Sodium, Na		mg/l
Turbidity, NTU		
Zinc, Zn		mg/l

Calcium Hardness, as $CaCO_3$ 290 mg/l
Magnesium Hardness, as $CaCO_3$ 5 mg/l

Michael A. Fiedor
MICHAEL A. FIEDOR, CHEMIST

D.H.R.S. #86117

Environmental Services

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LABORATORY ANALYSIS — CONSULTING

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Geraghty & Miller, Inc.
1665 Palm Beach Lakes Blvd., #604
West Palm Beach, FL 33401

Water Analysis Report

6" Flow Well

Sample collected by Geraghty & Miller on 6-22-83 at ______

Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	3900	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	588	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	166	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.02	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	2590	mg/l	Copper, Cu		mg/l
Chloride, Cl	1550	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	118	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.3		Mercury, Hg		mg/l
pHs	7.2		Nitrate, as N		mg/l
Stability Index	7.1		Phenols		mg/l
Saturation Index	0.1		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	15		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available			Calcium Hardness, as $CaCO_3$	295	mg/l
			Magnesium Hardness, as $CaCO_3$	293	mg/l

Collection Date 6-3-83

Michael A. Fiedor

MICHAEL A. FIEDOR, CHEMIST

D.H.R.S. #86117

Environmental Services

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Riviera Beach, Florida
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Water Analysis Report

Welcome Center Well

Sample collected by Geraghty & Miller on 6-29-83 at ____

Temperature at time of collection		°C	Carbon dioxide, CO_2		mg/l
Total Dissolved Solids (103-105°)	1618	mg/l	Hydroxide as $CaCO_3$		mg/l
Total Hardness as $CaCO_3$	390	mg/l	Carbonate as $CaCO_3$		mg/l
Total Alkalinity as $CaCO_3$	136	mg/l	Bicarbonate as $CaCO_3$		mg/l
Non-carbonate Hardness		mg/l	Bacteria, Total Coliform		/100ml
Bicarbonate, HCO_3		mg/l	Arsenic, As		mg/l
Iron, Fe	0.02	mg/l	Barium, Ba		mg/l
Sulfate, SO_4	345	mg/l	Copper, Cu		mg/l
Chloride, Cl	570	mg/l	Cadmium, Cd		mg/l
Calcium, Ca	107	mg/l	Chromium, Cr^{+6}		mg/l
Magnesium, Mg		mg/l	Cyanide		mg/l
Fluoride, F		mg/l	Lead, Pb		mg/l
Hydrogen Sulfide, H_2S		mg/l	Manganese, Mn		mg/l
pH	7.4		Mercury, Hg		mg/l
pHs	7.3		Nitrate, as N		mg/l
Stability Index	7.2		Phenols		mg/l
Saturation Index	0.1		Selenium, Se		mg/l
MBAS		mg/l	Silver, Ag		mg/l
T Odor			Sodium, Na		mg/l
Color, APHA	10		Turbidity, NTU		
Residual Chlorine: Free Available			Zinc, Zn		mg/l
Combined Available					

Calcium Hardness, as $CaCO_3$ 268 mg/l

Magnesium Hardness, as $CaCO_3$ 122 mg/l

Collection Date 6-29-83

Michael A. Fiedor

MICHAEL A. FIEDOR, CHEMIST

APPENDIX G

DESIGN OF THE COMPUTER MODEL
AND DATA FILES USED IN SIMULATIONS

APPENDIX G

Design of the Computer Model and Data Files Used in Simulations

It was recognized that, if major withdrawals were to come from the intermediate aquifer, recharge must be derived from the shallow aquifer. Therefore, a computer model was developed to represent a two-aquifer system, linked by a leaky confining bed. Although the model can account for evapotranspiration losses from the water table, this option was not used in the simulation of the ground-water system at Port LaBelle. Recharge to the shallow aquifer was simulated at 10 inches per year.

Shallow Aquifer Representation

Constant-head boundaries were placed at the model limits of the shallow aquifer because it was recognized that many areas outside the model are perennially wet and will serve as a continuing source of water. Underflow occurs naturally from areas northwest and southeast of Port LaBelle toward the Caloosahatchee River. Because of this underflow and because the Caloosahatchee River receives water from Lake Okeechobee, model nodes at the river were specified as constant head.

The input hydrologic parameters representing the shallow aquifer are transmissivity and storativity (or specific yield). Transmissivity was specified as 20000 gpd/ft in the shallow aquifer. This conservatively low value was chosen for two reasons:

1. Although the tested transmissivity at Well 83-9 was greater than 40000 gpd where the aquifer was 60 feet thick, the aquifer appears to thin toward the Caloosahatchee River and transmissivity may be lower than in the interior areas of Port LaBelle.

2. The model cannot account for reduction in transmissivity of the water table due to dewatering; although the shallow aquifer is 50 feet thick or more in areas of Port LaBelle where it overlies the

intermediate aquifer, it is felt that using the conservatively low value of 20000 gpd/ft will account for any aquifer dewatering that might occur.

Storativity, or specific yield, of the shallow aquifer was set as 0.2 (dimensionless). A water table does exist beneath Port LaBelle, and the representative specific yield should be appropriate. A value of 0.2 commonly is used in south Florida to represent the surficial sands typically found in the area.

No shallow pumpage or drainage canals were represented in the model, although it is recognized that these features will be part of the hydrologic regime of the development. Likewise, the surface-water management plan for Port LaBelle calls for the use of natural sloughs and depressions as retention/detention areas; this plan will encourage recharge to the shallow aquifer beyond that which is occurring presently.

Intermediate Aquifer Representation

The water-level map of the intermediate aquifer (Figure 7) showed that underflow occurs in the intermediate aquifer from the southeast toward the northwest beneath Port LaBelle. This flow probably is derived from rainfall recharge to the shallow aquifer in the perennially wet areas southeast of Port LaBelle. The recharge leaks downward into the intermediate aquifer and then flows northwestward beneath the project.

Despite the obvious presence of natural underflow, no-flow boundaries were placed at the model limits of the intermediate aquifer so that all of the water withdrawn during the computer simulation wold be derived from within the property. Internal nodes of the model which lie in areas where the aquifer is 20 feet thick or less also were designated as no-flow boundaries.

The parameters necessary to describe the intermediate aquifer hydrologically are transmissivity, storativity or storage coefficient, and leakance. To estimate transmissivity, the equation derived from multilinear regression analysis of test data (Table D-3) was applied to the aquifer thickness map (Figure 6). For simplicity, only five transmissivity values were calculated. Where the aquifer thickness was 20 feet or less, the transmissivity was assumed to be zero; where the aquifer was 21 to 50 feet thick, an average thickness of 36 feet was assumed so the transmissivity was 43,000 gpd/ft. In areas where an aquifer thickness of 51 to 100 feet was found, the average thickness was assumed to be 76 feet, resulting in a transmissivity of 108,000 gpd/ft. Where the aquifer was mapped as 101 to 150 feet thick, an average thickness of 126 feet was assumed which equates to a transmissivity of 190,000 gpd/ft. Finally, where the aquifer was 151 feet thick or more, the average thickness was assumed to be 161 feet and the aquifer transmissivity was 248,000 gpd/ft.

The storage coefficient of the intermediate aquifer has been derived only in the vicinity of the water plant during the test of Production Well 2. Because only the order of magnitude of the storage coefficient is significant in evaluating continued withdrawals from an aquifer that is being replenished by recharge, the storage coefficient determined during the test, 0.0004, was applied to the entire intermediate aquifer model.

Leakance is the most important hydrologic parameter at Port LaBelle because recharge to the intermediate aquifer under major stress must be derived from the shallow aquifer. Leakance is representative of the average vertical permeability of a confining layer divided by its thickness. As shown in Appendix E, the vertical permeability of the confining bed separating the shallow and intermediate aquifers at the water plant is 0.16 gpd/sq. ft. To the north and east, vertical permeability ranged from 0.04 to 0.1 gpd/sq. ft. Using the differences between Figures 2 and 5 to estimate confining bed thickness, a representative leakance can be estimated. Where the confining bed is 20 feet thick or less, it was assumed to be 10 feet thick and have a leakance of 0.01 (0.1/10) gpd/cu. ft. For a 20- to 50-foot confining bed thickness, the thickness was assumed to average 35 feet, resulting in a leakance of 0.003 (0.1/35) gpd/cu. ft. The average confining bed was assumed to be 75 feet thick and have a leakance of 0.001 (0.1/75) gpd/cu. ft. in areas where the confining bed was 50 to 100 feet thick. For the 100- to 150-foot thickness interval, the average thickness was assumed to be 125 feet and the leakance was estimated to be 0.0008 (0.1/125) gpd/cu. ft. With the confining bed thickness between 150 and 200 feet, the average thickness was assumed to be 175 feet, setting the average leakance at 0.0006 (0.1/175) gpd/cu. ft. Where the intermediate aquifer was 20 feet thick or less, leakance was set at zero gpd/cu. ft. because there was no significant aquifer into which leakage could migrate.

Leakance upward from the Floridan aquifer was assumed to be zero gpd/cu. ft. Because of the low permeability and great thickness expected to be found in the confining bed above the Floridan aquifer, no significant leakage is expected to take place.

TIME SINCE PUMPING STARTED ,IN DAYS = 0
NUMBER OF ITERATIONS = 0
ERROR = 0

ARTESIAN AQUIFER HEADS

	1	2	3	4	5	6	7	8	9
1=									
2=									
3=									
4=									
5=	0.00	0.00	0.00	0.00	0.00				
6=	0.00	0.00	0.00	0.00	0.00				
7=	0.00	0.00	0.00	0.00	0.00				
8=	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=									
13=									
14=									

	10	11	12	13	14	15	16	17	18
1=									
2=									
3=									
4=									0.00
5=						0.00	0.00	0.00	0.00
6=				0.00	0.00	0.00	0.00	0.00	0.00
7=		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8=		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=									
13=									
14=									

	19	20	21	22	23	24
1=						
2=						
3=						
4=	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00
11=						
12=						
13=						
14=						

SCENARIO 1
DATA FILE

WATER TABLE HEADS

	1	2	3	4	5	6	7	8	9
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	10	11	12	13	14	15	16	17	18
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	19	20	21	22	23	24
1=	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	0.00	0.00	0.00	0.00	0.00
3=	0.00	0.00	0.00	0.00	0.00	0.00
4=	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00
12=	0.00	0.00	0.00	0.00	0.00	0.00
13=	0.00	0.00	0.00	0.00	0.00	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00

SCENARIO 1
DATA FILE

ARTESIAN AQUIFER Q (GPD)

	1	2	3	4	5	6	7	8	9
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	0	0	0	0	0	0
10=	0	0	0	1000000	1000000	1000000	1000000	0	0
11=	0	0	0	0	0	1000000	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	10	11	12	13	14	15	16	17	18
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	1500000	1500000	1500000	0	0	0
10=	0	0	1500000	0	0	1500000	1500000	0	0
11=	0	0	0	0	0	0	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	19	20	21	22	23	24
1=	0	0	0	0	0	0
2=	0	0	0	0	0	0
3=	0	0	0	0	0	0
4=	0	0	0	0	0	0
5=	0	0	0	0	0	0
6=	0	0	0	0	0	0
7=	0	0	0	0	0	0
8=	0	0	0	0	0	0
9=	0	0	0	0	0	0
10=	0	0	0	0	0	0
11=	0	0	0	0	0	0
12=	0	0	0	0	0	0
13=	0	0	0	0	0	0
14=	0	0	0	0	0	0

SCENARIO 1
DATA FILE

WATER TABLE Q

	1	2	3	4	5	6	7	8	9
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	0	0	0	0	0	0
10=	0	0	0	0	0	0	0	0	0
11=	0	0	0	0	0	0	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	10	11	12	13	14	15	16	17	18
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	0	0	0	0	0	0
10=	0	0	0	0	0	0	0	0	0
11=	0	0	0	0	0	0	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	19	20	21	22	23	24
1=	0	0	0	0	0	0
2=	0	0	0	0	0	0
3=	0	0	0	0	0	0
4=	0	0	0	0	0	0
5=	0	0	0	0	0	0
6=	0	0	0	0	0	0
7=	0	0	0	0	0	0
8=	0	0	0	0	0	0
9=	0	0	0	0	0	0
10=	0	0	0	0	0	0
11=	0	0	0	0	0	0
12=	0	0	0	0	0	0
13=	0	0	0	0	0	0
14=	0	0	0	0	0	0

SCENARIO 1
DATA FILE

ARTESIAN AQUIFER TRANSMISSIVITY

	1	2	3	4	5	6	7	8	9
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	43000	43000	43000	43000	0	0	0	0	0
6=	43000	43000	43000	43000	0	0	0	0	0
7=	43000	43000	43000	43000	0	0	0	0	0
8=	43000	43000	108000	108000	108000	108000	0	0	0
9=	43000	43000	108000	108000	108000	108000	43000	43000	108000
10=	43000	43000	190000	190000	190000	190000	108000	108000	108000
11=	43000	43000	43000	43000	108000	108000	43000	43000	43000
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	10	11	12	13	14	15	16	17	18
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	43000
5=	0	0	0	0	0	43000	43000	43000	108000
6=	0	0	0	43000	43000	43000	43000	108000	108000
7=	0	43000	43000	108000	108000	108000	108000	108000	108000
8=	0	108000	108000	190000	190000	190000	190000	190000	108000
9=	108000	190000	190000	190000	190000	248000	248000	190000	43000
10=	108000	108000	108000	190000	190000	248000	248000	43000	43000
11=	43000	43000	43000	43000	43000	43000	43000	43000	43000
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	19	20	21	22	23	24
1=	0	0	0	0	0	0
2=	0	0	0	0	0	0
3=	0	0	0	0	0	0
4=	43000	43000	43000	43000	43000	43000
5=	108000	108000	108000	108000	108000	108000
6=	108000	108000	108000	108000	108000	108000
7=	43000	43000	43000	43000	43000	43000
8=	43000	43000	43000	43000	43000	43000
9=	43000	43000	43000	43000	43000	43000
10=	43000	43000	43000	43000	43000	43000
11=	0	0	0	0	0	0
12=	0	0	0	0	0	0
13=	0	0	0	0	0	0
14=	0	0	0	0	0	0

SCENARIO 1
DATA FILE

WATER TABLE TRANSMISSIVITY

	1	2	3	4	5	6	7	8	9
1=	20000	20000	20000	20000	20000	20000	20000	20000	20000
2=	20000	20000	20000	20000	20000	20000	20000	20000	20000
3=	20000	20000	20000	20000	20000	20000	20000	20000	20000
4=	20000	20000	20000	20000	20000	20000	20000	20000	20000
5=	20000	20000	20000	20000	20000	20000	20000	20000	20000
6=	20000	20000	20000	20000	20000	20000	20000	20000	20000
7=	20000	20000	20000	20000	20000	20000	20000	20000	20000
8=	20000	20000	20000	20000	20000	20000	20000	20000	20000
9=	20000	20000	20000	20000	20000	20000	20000	20000	20000
10=	20000	20000	20000	20000	20000	20000	20000	20000	20000
11=	20000	20000	20000	20000	20000	20000	20000	20000	20000
12=	20000	20000	20000	20000	20000	20000	20000	20000	20000
13=	20000	20000	20000	20000	20000	20000	20000	20000	20000
14=	20000	20000	20000	20000	20000	20000	20000	20000	20000

	10	11	12	13	14	15	16	17	18
1=	20000	20000	20000	20000	20000	20000	20000	20000	20000
2=	20000	20000	20000	20000	20000	20000	20000	20000	20000
3=	20000	20000	20000	20000	20000	20000	20000	20000	20000
4=	20000	20000	20000	20000	20000	20000	20000	20000	20000
5=	20000	20000	20000	20000	20000	20000	20000	20000	20000
6=	20000	20000	20000	20000	20000	20000	20000	20000	20000
7=	20000	20000	20000	20000	20000	20000	20000	20000	20000
8=	20000	20000	20000	20000	20000	20000	20000	20000	20000
9=	20000	20000	20000	20000	20000	20000	20000	20000	20000
10=	20000	20000	20000	20000	20000	20000	20000	20000	20000
11=	20000	20000	20000	20000	20000	20000	20000	20000	20000
12=	20000	20000	20000	20000	20000	20000	20000	20000	20000
13=	20000	20000	20000	20000	20000	20000	20000	20000	20000
14=	20000	20000	20000	20000	20000	20000	20000	20000	20000

	19	20	21	22	23	24
1=	20000	20000	20000	20000	20000	20000
2=	20000	20000	20000	20000	20000	20000
3=	20000	20000	20000	20000	20000	20000
4=	20000	20000	20000	20000	20000	20000
5=	20000	20000	20000	20000	20000	20000
6=	20000	20000	20000	20000	20000	20000
7=	20000	20000	20000	20000	20000	20000
8=	20000	20000	20000	20000	20000	20000
9=	20000	20000	20000	20000	20000	20000
10=	20000	20000	20000	20000	20000	20000
11=	20000	20000	20000	20000	20000	20000
12=	20000	20000	20000	20000	20000	20000
13=	20000	20000	20000	20000	20000	20000
14=	20000	20000	20000	20000	20000	20000

SCENARIO 1
DATA FILE

CONFINING BED LEAKANCE

	1	2	3	4	5	6	7	8	9
1=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5=	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000	0.000000	0.000000
6=	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000	0.000000	0.000000
7=	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000	0.000000	0.000000
8=	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000
9=	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000
10=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
11=	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800
12=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	10	11	12	13	14	15	16	17	18
1=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000400
5=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000800	0.000800	0.000600	0.000400
6=	0.000000	0.000000	0.000000	0.003000	0.003000	0.000800	0.000800	0.000600	0.000600
7=	0.000000	0.010000	0.010000	0.003000	0.003000	0.000800	0.000800	0.000600	0.000800
8=	0.000000	0.010000	0.010000	0.003000	0.003000	0.000800	0.000800	0.000600	0.000800
9=	0.003000	0.003000	0.003000	0.003000	0.003000	0.000800	0.000800	0.000800	0.001000
10=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
11=	0.000800	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
12=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	19	20	21	22	23	24
1=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4=	0.000400	0.000400	0.000400	0.000400	0.000400	0.000400
5=	0.000400	0.000400	0.000400	0.000400	0.000400	0.000400
6=	0.000600	0.000600	0.000600	0.000600	0.000600	0.000600
7=	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800
8=	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000
9=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
10=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
11=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
12=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

SCENARIO 1
DATA FILE

ARTESIAN AQUIFER STORAGE COEFF.

	1	2	3	4	5	6	7	8	9
1=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
2=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
3=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
4=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
5=	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040	0.00040	0.00040
6=	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040	0.00040	0.00040
7=	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040	0.00040	0.00040
8=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040
9=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
10=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
11=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
12=	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
14=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040

	10	11	12	13	14	15	16	17	18
1=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
2=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
3=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
4=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
5=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
6=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
7=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
8=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
9=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
10=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
11=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
12=	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
14=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040

	19	20	21	22	23	24
1=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
2=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
3=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
4=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
5=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
6=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
7=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
8=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
9=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
10=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
11=	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
13=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
14=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040

SCENARIO 1
DATA FILE

WATER TABLE STORAGE FACTOR

	1	2	3	4	5	6	7	8	9
1=	C	C	C	C	C	C	C	C	C
2=	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
3=	C	0.20000	0.20000	0.20000	0.20000	0.20000	C	C	C
4=	C	0.20000	0.20000	0.20000	C	C	0.20000	0.20000	0.20000
5=	C	0.20000	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000
6=	C	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000
7=	C	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000
8=	C	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000
9=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
10=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
11=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
12=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
13=	C	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
14=	C	C	C	C	C	C	C	C	C

	10	11	12	13	14	15	16	17	18
1=	C	C	C	C	C	C	C	C	C
2=	0.20000	C	C	C	0.20000	0.20000	0.20000	0.20000	0.20000
3=	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
4=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
5=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
6=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
7=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
8=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
9=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
10=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
11=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
12=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
13=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
14=	C	C	C	C	C	C	C	C	C

	19	20	21	22	23	24
1=	C	C	C	C	C	C
2=	0.20000	0.20000	0.20000	0.20000	0.20000	C
3=	0.20000	0.20000	0.20000	0.20000	0.20000	C
4=	0.20000	0.20000	0.20000	0.20000	0.20000	C
5=	0.20000	0.20000	0.20000	0.20000	0.20000	C
6=	0.20000	0.20000	0.20000	0.20000	0.20000	C
7=	0.20000	0.20000	0.20000	0.20000	0.20000	C
8=	0.20000	0.20000	0.20000	0.20000	0.20000	C
9=	0.20000	0.20000	0.20000	0.20000	0.20000	C
10=	0.20000	0.20000	0.20000	0.20000	0.20000	C
11=	0.20000	0.20000	0.20000	0.20000	0.20000	C
12=	0.20000	0.20000	0.20000	0.20000	0.20000	C
13=	0.20000	0.20000	0.20000	0.20000	0.20000	C
14=	C	C	C	C	C	C

SCENARIO 1
DATA FILE

NET RECHARGE (IN/YR)

	1	2	3	4	5	6	7	8	9
1=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
3=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
4=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
6=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
7=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
8=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
9=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
10=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
12=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
13=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
14=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

	10	11	12	13	14	15	16	17	18
1=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
3=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
4=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
6=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
7=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
8=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
9=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
10=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
12=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
13=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
14=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

	19	20	21	22	23	24
1=	10.00	10.00	10.00	10.00	10.00	10.00
2=	10.00	10.00	10.00	10.00	10.00	10.00
3=	10.00	10.00	10.00	10.00	10.00	10.00
4=	10.00	10.00	10.00	10.00	10.00	10.00
5=	10.00	10.00	10.00	10.00	10.00	10.00
6=	10.00	10.00	10.00	10.00	10.00	10.00
7=	10.00	10.00	10.00	10.00	10.00	10.00
8=	10.00	10.00	10.00	10.00	10.00	10.00
9=	10.00	10.00	10.00	10.00	10.00	10.00
10=	10.00	10.00	10.00	10.00	10.00	10.00
11=	10.00	10.00	10.00	10.00	10.00	10.00
12=	10.00	10.00	10.00	10.00	10.00	10.00
13=	10.00	10.00	10.00	10.00	10.00	10.00
14=	10.00	10.00	10.00	10.00	10.00	10.00

SCENARIO 1
DATA FILE

Pg 10 of 10

TIME SINCE PUMPING STARTED ,IN DAYS = 353.986

THIS TIME WAS ARRIVED AT IN 25 STEPS

ARTESIAN AQUIFER HEADS

	1	2	3	4	5	6	7	8	9
1=									
2=									
3=									
4=									
5=	-0.02	0.54	-2.19	-3.13					
6=	-0.06	0.26	-3.39	-4.70					
7=	-0.14	-0.25	-5.96	-8.25					
8=	-0.25	-0.94	-10.43	-15.24	-18.43	-19.98			
9=	-0.39	-1.67	-12.62	-18.94	-21.80	-23.43	-23.46	-21.84	-21.53
10=	-0.56	-2.55	-15.25	-24.69	-28.34	-30.55	-30.54	-25.64	-23.10
11=	-0.66	-2.98	-15.12	-24.27	-28.76	-32.15	-30.04	-25.65	-23.22
12=									
13=									
14=									

	10	11	12	13	14	15	16	17	18
1=									
2=									
3=									
4=									-7.69
5=						-15.74	-15.24	-13.59	-9.54
6=				-16.85	-17.17	-17.49	-16.88	-14.92	-10.51
7=		-14.16	-16.17	-20.47	-21.25	-21.48	-20.29	-16.66	-11.61
8=		-19.32	-21.26	-24.44	-25.26	-25.08	-23.08	-18.85	-12.98
9=	-21.83	-23.08	-25.73	-28.74	-29.73	-29.34	-25.59	-20.40	-13.82
10=	-22.83	-24.33	-29.04	-28.53	-29.16	-30.34	-27.65	-21.68	-12.74
11=	-22.83	-24.14	-27.17	-27.94	-28.59	-29.33	-26.96	-20.08	-12.20
12=									
13=									
14=									

	19	20	21	22	23	24
1=						
2=						
3=						
4=	-4.97	-1.65	0.45	1.53	1.82	0.97
5=	-5.64	-1.74	0.48	1.57	1.84	0.96
6=	-5.86	-1.65	0.57	1.63	1.88	0.93
7=	-6.10	-1.43	0.74	1.75	1.97	0.87
8=	-5.98	-0.92	1.13	2.01	2.15	0.74
9=	-5.98	-0.92	1.19	2.06	2.18	0.74
10=	-6.20	-0.92	1.22	2.09	2.19	0.74
11=						
12=						
13=						
14=						

SCENARIO 1
HEAD FILES

WATER TABLE HEADS

	1	2	3	4	5	6	7	8	9
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	3.68	3.83	3.82	3.79	3.72	3.60	3.50	3.25
3=	0.00	3.83	3.94	3.70	3.27	2.43	0.00	0.00	0.00
4=	0.00	3.67	3.48	2.38	0.00	0.00	2.38	3.11	3.31
5=	0.00	2.91	1.82	0.94	0.00	2.22	3.27	3.62	3.62
6=	0.00	2.63	0.99	0.00	1.59	2.64	3.29	3.49	3.25
7=	0.00	2.37	0.04	-0.00	0.84	1.41	2.39	2.71	2.18
8=	0.00	2.12	-0.82	-0.00	-3.01	-3.17	-0.15	0.66	0.22
9=	0.00	2.07	-0.00	-3.27	-4.79	-5.25	-4.55	-3.92	-3.95
10=	0.00	2.56	0.00	-1.72	-2.51	-2.87	-2.63	-2.08	-1.83
11=	0.00	2.78	0.00	-0.05	-0.38	-0.60	-0.43	-0.04	0.20
12=	0.00	2.80	0.00	2.38	2.64	2.67	2.73	2.83	2.90
13=	0.00	0.00	2.93	3.42	3.51	3.53	3.54	3.56	3.56
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	10	11	12	13	14	15	16	17	18
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	2.41	0.00	0.00	0.00	2.60	3.49	3.77	3.83	3.84
3=	0.00	2.53	3.35	3.62	3.83	3.93	3.96	3.98	3.93
4=	3.37	3.57	3.61	3.56	3.54	3.52	3.54	3.62	3.26
5=	3.32	2.74	2.20	1.59	1.46	1.36	1.63	2.28	2.82
6=	2.27	0.18	-1.19	-3.11	-2.80	-0.27	0.80	1.79	2.34
7=	-0.14	-7.06	-8.99	-6.90	-5.39	-1.56	0.08	1.38	1.80
8=	-2.32	-10.28	-12.18	-8.96	-6.99	-2.46	-0.51	0.93	1.39
9=	-4.94	-7.29	-8.54	-8.28	-7.08	-2.82	-0.99	0.27	1.06
10=	-2.12	-2.98	-3.72	-3.76	-3.35	-2.21	-1.26	-0.11	1.19
11=	0.10	-0.47	-0.92	-1.07	-1.02	-0.73	-0.27	0.66	1.81
12=	2.87	2.74	2.63	2.57	2.57	2.63	2.75	3.01	3.35
13=	3.56	3.55	3.53	3.53	3.53	3.53	3.54	3.57	3.62
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	19	20	21	22	23	24
1=	0.00	0.00	0.00	0.00	0.00	0.00
2=	3.84	3.84	3.84	3.84	3.73	0.00
3=	3.95	3.98	4.00	4.01	3.90	0.00
4=	3.43	3.68	3.84	3.92	3.84	0.00
5=	3.18	3.57	3.79	3.89	3.82	0.00
6=	2.80	3.39	3.70	3.84	3.78	0.00
7=	2.18	3.11	3.56	3.77	3.73	0.00
8=	1.12	2.65	3.34	3.64	3.62	0.00
9=	1.95	3.07	3.56	3.77	3.73	0.00
10=	2.51	3.36	3.71	3.85	3.79	0.00
11=	3.45	3.80	3.92	3.97	3.87	0.00
12=	3.83	3.93	3.96	3.97	3.86	0.00
13=	3.67	3.68	3.69	3.68	3.58	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00

SCENARIO 1
HEAD FILES

TIME SINCE PUMPING STARTED ,IN DAYS = 738.051

THIS TIME WAS ARRIVED AT IN 29 STEPS

ARTESIAN AQUIFER HEADS

	1	2	3	4	5	6	7	8	9
1=									
2=									
3=									
4=									
5=	0.22	1.91	-1.40	-2.65					
6=	0.17	1.55	-2.77	-4.39					
7=	0.09	0.93	-5.58	-8.15					
8=	-0.03	0.14	-10.34	-15.48	-18.89	-20.57			
9=	-0.15	-0.68	-12.62	-19.28	-22.33	-24.11	-24.31	-22.97	-22.94
10=	-0.29	-1.65	-15.32	-25.07	-28.87	-31.23	-31.35	-26.69	-24.40
11=	-0.38	-2.13	-15.17	-24.64	-29.32	-32.82	-30.81	-26.67	-24.46
12=									
13=									
14=									

	10	11	12	13	14	15	16	17	18
1=									
2=									
3=									
4=									-6.49
5=						-16.09	-15.39	-13.30	-8.62
6=				-18.21	-18.27	-18.15	-17.18	-14.74	-9.72
7=		-16.30	-18.29	-22.05	-22.52	-22.35	-20.79	-16.62	-10.96
8=		-21.38	-23.23	-26.03	-26.54	-25.99	-23.65	-18.95	-12.48
9=	-23.41	-24.83	-27.44	-30.26	-30.97	-30.22	-26.19	-20.59	-13.41
10=	-24.31	-25.95	-30.64	-29.93	-30.32	-31.19	-28.25	-21.93	-12.22
11=	-24.25	-25.67	-28.68	-29.30	-29.73	-30.18	-27.54	-20.21	-11.61
12=									
13=									
14=									

	19	20	21	22	23	24
1=						
2=						
3=						
4=	-3.37	0.51	2.97	4.14	4.12	2.18
5=	-4.17	0.38	2.99	4.18	4.14	2.15
6=	-4.44	0.48	3.10	4.27	4.21	2.07
7=	-4.75	0.71	3.31	4.43	4.33	1.94
8=	-4.68	1.28	3.78	4.79	4.62	1.63
9=	-4.66	1.29	3.86	4.86	4.65	1.62
10=	-4.89	1.30	3.90	4.90	4.66	1.62
11=						
12=						
13=						
14=						

SCENARIO 1
HEAD FILES

WATER TABLE HEADS

	1	2	3	4	5	6	7	8	9
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	7.00	7.49	7.40	7.25	6.99	6.60	6.18	5.39
3=	0.00	7.47	7.70	6.73	5.62	3.83	0.00	0.00	0.00
4=	0.00	6.91	6.32	3.75	0.00	0.00	3.59	5.03	5.52
5=	0.00	5.31	3.39	1.52	0.00	3.18	5.12	5.93	5.89
6=	0.00	4.70	1.94	0.00	1.94	3.67	4.95	5.38	4.79
7=	0.00	4.20	0.55	-0.00	0.87	1.76	3.14	3.53	2.44
8=	0.00	3.82	-0.62	-0.00	-3.62	-3.87	-0.69	0.11	-0.87
9=	0.00	3.76	-0.00	-3.95	-5.92	-6.57	-5.88	-5.33	-5.73
10=	0.00	4.39	0.00	-2.35	-3.46	-3.99	-3.77	-3.24	-3.20
11=	0.00	4.63	0.00	0.07	-0.30	-0.57	-0.37	0.04	0.18
12=	0.00	4.37	0.00	3.59	4.11	4.26	4.39	4.53	4.58
13=	0.00	0.00	4.64	5.82	6.11	6.23	6.29	6.33	6.34
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	10	11	12	13	14	15	16	17	18
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	3.65	0.00	0.00	0.00	4.25	6.25	7.15	7.51	7.58
3=	0.00	4.02	5.76	6.57	7.23	7.63	7.86	7.99	7.94
4=	5.68	6.03	6.18	6.19	6.28	6.43	6.64	6.95	6.60
5=	5.14	3.95	2.92	2.07	2.08	2.35	3.13	4.49	5.51
6=	2.92	-0.26	-2.37	-4.57	-3.93	-0.64	1.30	3.32	4.55
7=	-1.07	-9.17	-11.61	-9.83	-7.81	-3.03	-0.24	2.34	3.55
8=	-4.44	-13.08	-15.35	-12.57	-10.05	-4.55	-1.36	1.46	2.82
9=	-7.42	-10.45	-12.09	-11.82	-10.04	-4.91	-1.96	0.60	2.38
10=	-3.94	-5.32	-6.38	-6.36	-5.49	-3.60	-1.81	0.41	2.74
11=	-0.16	-1.05	-1.72	-1.85	-1.54	-0.80	0.19	1.88	3.91
12=	4.46	4.18	3.94	3.87	3.97	4.23	4.61	5.31	6.22
13=	6.32	6.28	6.24	6.22	6.23	6.28	6.36	6.50	6.70
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	19	20	21	22	23	24
1=	0.00	0.00	0.00	0.00	0.00	0.00
2=	7.60	7.61	7.61	7.59	7.18	0.00
3=	8.01	8.13	8.21	8.22	7.78	0.00
4=	6.98	7.54	7.90	8.05	7.65	0.00
5=	6.28	7.19	7.72	7.94	7.58	0.00
6=	5.52	6.80	7.51	7.82	7.48	0.00
7=	4.50	6.31	7.26	7.66	7.34	0.00
8=	3.17	5.70	6.94	7.44	7.13	0.00
9=	4.16	6.27	7.27	7.67	7.33	0.00
10=	5.12	6.81	7.56	7.84	7.47	0.00
11=	6.63	7.56	7.92	8.04	7.64	0.00
12=	7.38	7.80	7.94	7.97	7.55	0.00
13=	6.96	7.05	7.08	7.07	6.70	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00

SCENARIO 1
HEAD FILES

TIME SINCE PUMPING STARTED ,IN DAYS = 0
NUMBER OF ITERATIONS = 0
ERROR = 0

ARTESIAN AQUIFER HEADS

	1	2	3	4	5	6	7	8	9
1=									
2=									
3=									
4=									
5=	0.00	0.00	0.00	0.00	0.00				
6=	0.00	0.00	0.00	0.00	0.00				
7=	0.00	0.00	0.00	0.00	0.00				
8=	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=									
13=									
14=									

	10	11	12	13	14	15	16	17	18
1=									
2=									
3=									
4=									0.00
5=						0.00	0.00	0.00	0.00
6=				0.00	0.00	0.00	0.00	0.00	0.00
7=		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8=		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=									
13=									
14=									

	19	20	21	22	23	24
1=						
2=						
3=						
4=	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00
11=						
12=						
13=						
14=						

WATER TABLE HEADS

	1	2	3	4	5	6	7	8	9
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	10	11	12	13	14	15	16	17	18
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	19	20	21	22	23	24
1=	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	0.00	0.00	0.00	0.00	0.00
3=	0.00	0.00	0.00	0.00	0.00	0.00
4=	0.00	0.00	0.00	0.00	0.00	0.00
5=	0.00	0.00	0.00	0.00	0.00	0.00
6=	0.00	0.00	0.00	0.00	0.00	0.00
7=	0.00	0.00	0.00	0.00	0.00	0.00
8=	0.00	0.00	0.00	0.00	0.00	0.00
9=	0.00	0.00	0.00	0.00	0.00	0.00
10=	0.00	0.00	0.00	0.00	0.00	0.00
11=	0.00	0.00	0.00	0.00	0.00	0.00
12=	0.00	0.00	0.00	0.00	0.00	0.00
13=	0.00	0.00	0.00	0.00	0.00	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00

SCENARIO 2
DATA FILE

ARTESIAN AQUIFER Q (GPD)

	1	2	3	4	5	6	7	8	9
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	0	0	0	0	0	0
10=	0	0	0	1000000	1000000	1000000	1000000	0	0
11=	0	0	0	0	0	1000000	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	10	11	12	13	14	15	16	17	18
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	1500000
9=	0	0	0	0	0	1500000	0	0	0
10=	0	0	0	0	0	0	1500000	0	1500000
11=	0	0	0	0	0	0	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	19	20	21	22	23	24
1=	0	0	0	0	0	0
2=	0	0	0	0	0	0
3=	0	0	0	0	0	0
4=	0	0	0	0	0	0
5=	0	0	0	0	0	0
6=	1500000	0	0	0	0	0
7=	1500000	0	0	0	0	0
8=	0	0	0	0	0	0
9=	0	0	0	0	0	0
10=	0	0	0	0	0	0
11=	0	0	0	0	0	0
12=	0	0	0	0	0	0
13=	0	0	0	0	0	0
14=	0	0	0	0	0	0

SCENARIO 2
DATA FILE

WATER TABLE Q

	1	2	3	4	5	6	7	8	9
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	0	0	0	0	0	0
10=	0	0	0	0	0	0	0	0	0
11=	0	0	0	0	0	0	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	10	11	12	13	14	15	16	17	18
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	0	0	0	0	0	0	0	0	0
6=	0	0	0	0	0	0	0	0	0
7=	0	0	0	0	0	0	0	0	0
8=	0	0	0	0	0	0	0	0	0
9=	0	0	0	0	0	0	0	0	0
10=	0	0	0	0	0	0	0	0	0
11=	0	0	0	0	0	0	0	0	0
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	19	20	21	22	23	24
1=	0	0	0	0	0	0
2=	0	0	0	0	0	0
3=	0	0	0	0	0	0
4=	0	0	0	0	0	0
5=	0	0	0	0	0	0
6=	0	0	0	0	0	0
7=	0	0	0	0	0	0
8=	0	0	0	0	0	0
9=	0	0	0	0	0	0
10=	0	0	0	0	0	0
11=	0	0	0	0	0	0
12=	0	0	0	0	0	0
13=	0	0	0	0	0	0
14=	0	0	0	0	0	0

SCENARIO 2
DATA FILE

ARTESIAN AQUIFER TRANSMISSIVITY

	1	2	3	4	5	6	7	8	9
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	0
5=	43000	43000	43000	43000	0	0	0	0	0
6=	43000	43000	43000	43000	0	0	0	0	0
7=	43000	43000	43000	43000	0	0	0	0	0
8=	43000	43000	108000	108000	108000	108000	0	0	0
9=	43000	43000	108000	108000	108000	108000	43000	43000	108000
10=	43000	43000	190000	190000	190000	190000	108000	108000	108000
11=	43000	43000	43000	43000	108000	108000	43000	43000	43000
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	10	11	12	13	14	15	16	17	18
1=	0	0	0	0	0	0	0	0	0
2=	0	0	0	0	0	0	0	0	0
3=	0	0	0	0	0	0	0	0	0
4=	0	0	0	0	0	0	0	0	43000
5=	0	0	0	0	0	43000	43000	43000	108000
6=	0	0	0	43000	43000	43000	43000	108000	108000
7=	0	43000	43000	108000	108000	108000	108000	108000	108000
8=	0	108000	108000	190000	190000	190000	190000	190000	108000
9=	108000	190000	190000	190000	190000	248000	248000	190000	43000
10=	108000	108000	108000	190000	190000	248000	248000	43000	43000
11=	43000	43000	43000	43000	43000	43000	43000	43000	43000
12=	0	0	0	0	0	0	0	0	0
13=	0	0	0	0	0	0	0	0	0
14=	0	0	0	0	0	0	0	0	0

	19	20	21	22	23	24
1=	0	0	0	0	0	0
2=	0	0	0	0	0	0
3=	0	0	0	0	0	0
4=	43000	43000	43000	43000	43000	43000
5=	108000	108000	108000	108000	108000	108000
6=	108000	108000	108000	108000	108000	108000
7=	43000	43000	43000	43000	43000	43000
8=	43000	43000	43000	43000	43000	43000
9=	43000	43000	43000	43000	43000	43000
10=	43000	43000	43000	43000	43000	43000
11=	0	0	0	0	0	0
12=	0	0	0	0	0	0
13=	0	0	0	0	0	0
14=	0	0	0	0	0	0

SCENARIO 2
DATA FILE

WATER TABLE TRANSMISSIVITY

	1	2	3	4	5	6	7	8	9
1=	20000	20000	20000	20000	20000	20000	20000	20000	20000
2=	20000	20000	20000	20000	20000	20000	20000	20000	20000
3=	20000	20000	20000	20000	20000	20000	20000	20000	20000
4=	20000	20000	20000	20000	20000	20000	20000	20000	20000
5=	20000	20000	20000	20000	20000	20000	20000	20000	20000
6=	20000	20000	20000	20000	20000	20000	20000	20000	20000
7=	20000	20000	20000	20000	20000	20000	20000	20000	20000
8=	20000	20000	20000	20000	20000	20000	20000	20000	20000
9=	20000	20000	20000	20000	20000	20000	20000	20000	20000
10=	20000	20000	20000	20000	20000	20000	20000	20000	20000
11=	20000	20000	20000	20000	20000	20000	20000	20000	20000
12=	20000	20000	20000	20000	20000	20000	20000	20000	20000
13=	20000	20000	20000	20000	20000	20000	20000	20000	20000
14=	20000	20000	20000	20000	20000	20000	20000	20000	20000

	10	11	12	13	14	15	16	17	18
1=	20000	20000	20000	20000	20000	20000	20000	20000	20000
2=	20000	20000	20000	20000	20000	20000	20000	20000	20000
3=	20000	20000	20000	20000	20000	20000	20000	20000	20000
4=	20000	20000	20000	20000	20000	20000	20000	20000	20000
5=	20000	20000	20000	20000	20000	20000	20000	20000	20000
6=	20000	20000	20000	20000	20000	20000	20000	20000	20000
7=	20000	20000	20000	20000	20000	20000	20000	20000	20000
8=	20000	20000	20000	20000	20000	20000	20000	20000	20000
9=	20000	20000	20000	20000	20000	20000	20000	20000	20000
10=	20000	20000	20000	20000	20000	20000	20000	20000	20000
11=	20000	20000	20000	20000	20000	20000	20000	20000	20000
12=	20000	20000	20000	20000	20000	20000	20000	20000	20000
13=	20000	20000	20000	20000	20000	20000	20000	20000	20000
14=	20000	20000	20000	20000	20000	20000	20000	20000	20000

	19	20	21	22	23	24
1=	20000	20000	20000	20000	20000	20000
2=	20000	20000	20000	20000	20000	20000
3=	20000	20000	20000	20000	20000	20000
4=	20000	20000	20000	20000	20000	20000
5=	20000	20000	20000	20000	20000	20000
6=	20000	20000	20000	20000	20000	20000
7=	20000	20000	20000	20000	20000	20000
8=	20000	20000	20000	20000	20000	20000
9=	20000	20000	20000	20000	20000	20000
10=	20000	20000	20000	20000	20000	20000
11=	20000	20000	20000	20000	20000	20000
12=	20000	20000	20000	20000	20000	20000
13=	20000	20000	20000	20000	20000	20000
14=	20000	20000	20000	20000	20000	20000

SCENARIO 2
DATA FILE

CONFINING BED LEAKANCE

	1	2	3	4	5	6	7	8	9
1=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5=	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000	0.000000	0.000000
6=	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000	0.000000	0.000000
7=	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000	0.000000	0.000000
8=	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.000000	0.000000	0.000000
9=	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000
10=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
11=	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800
12=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	10	11	12	13	14	15	16	17	18
1=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000400
5=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000800	0.000800	0.000600	0.000400
6=	0.000000	0.000000	0.000000	0.003000	0.003000	0.000800	0.000800	0.000600	0.000600
7=	0.000000	0.010000	0.010000	0.003000	0.003000	0.000800	0.000800	0.000600	0.000800
8=	0.000000	0.010000	0.010000	0.003000	0.003000	0.000800	0.000800	0.000600	0.000800
9=	0.003000	0.003000	0.003000	0.003000	0.003000	0.000800	0.000800	0.000800	0.001000
10=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
11=	0.000800	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
12=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	19	20	21	22	23	24
1=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4=	0.000400	0.000400	0.000400	0.000400	0.000400	0.000400
5=	0.000400	0.000400	0.000400	0.000400	0.000400	0.000400
6=	0.000600	0.000600	0.000600	0.000600	0.000600	0.000600
7=	0.000800	0.000800	0.000800	0.000800	0.000800	0.000800
8=	0.003000	0.003000	0.003000	0.003000	0.003000	0.003000
9=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
10=	0.001000	0.001000	0.001000	0.001000	0.001000	0.001000
11=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
12=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14=	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ARTESIAN AQUIFER STORAGE COEFF.

	1	2	3	4	5	6	7	8	9
1=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
2=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
3=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
4=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
5=	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040	0.00040	0.00040
6=	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040	0.00040	0.00040
7=	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040	0.00040	0.00040
8=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00000	0.00040	0.00040
9=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
10=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
11=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
12=	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
14=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040

	10	11	12	13	14	15	16	17	18
1=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
2=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
3=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
4=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
5=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
6=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
7=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
8=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
9=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
10=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
11=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
12=	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
14=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040

	19	20	21	22	23	24
1=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
2=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
3=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
4=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
5=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
6=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
7=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
8=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
9=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
10=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
11=	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
13=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040
14=	0.00040	0.00040	0.00040	0.00040	0.00040	0.00040

SCENARIO 2
DATA FILE

WATER TABLE STORAGE FACTOR

	1	2	3	4	5	6	7	8	9
1=	C	C	C	C	C	C	C	C	C
2=	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
3=	C	0.20000	0.20000	0.20000	0.20000	0.20000	C	C	C
4=	C	0.20000	0.20000	0.20000	C	C	0.20000	0.20000	0.20000
5=	C	0.20000	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000
6=	C	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000
7=	C	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000
8=	C	0.20000	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000
9=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
10=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
11=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
12=	C	0.20000	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
13=	C	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
14=	C	C	C	C	C	C	C	C	C

	10	11	12	13	14	15	16	17	18
1=	C	C	C	C	C	C	C	C	C
2=	0.20000	C	C	C	0.20000	0.20000	0.20000	0.20000	0.20000
3=	C	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
4=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
5=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
6=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
7=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
8=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
9=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
10=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
11=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
12=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
13=	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
14=	C	C	C	C	C	C	C	C	C

	19	20	21	22	23	24
1=	C	C	C	C	C	C
2=	0.20000	0.20000	0.20000	0.20000	0.20000	C
3=	0.20000	0.20000	0.20000	0.20000	0.20000	C
4=	0.20000	0.20000	0.20000	0.20000	0.20000	C
5=	0.20000	0.20000	0.20000	0.20000	0.20000	C
6=	0.20000	0.20000	0.20000	0.20000	0.20000	C
7=	0.20000	0.20000	0.20000	0.20000	0.20000	C
8=	0.20000	0.20000	0.20000	0.20000	0.20000	C
9=	0.20000	0.20000	0.20000	0.20000	0.20000	C
10=	0.20000	0.20000	0.20000	0.20000	0.20000	C
11=	0.20000	0.20000	0.20000	0.20000	0.20000	C
12=	0.20000	0.20000	0.20000	0.20000	0.20000	C
13=	0.20000	0.20000	0.20000	0.20000	0.20000	C
14=	C	C	C	C	C	C

SCENARIO 2
DATA FILE

NET RECHARGE (IN/YR)

	1	2	3	4	5	6	7	8	9
1=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
3=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
4=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
6=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
7=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
8=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
9=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
10=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
12=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
13=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
14=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

	10	11	12	13	14	15	16	17	18
1=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
3=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
4=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
6=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
7=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
8=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
9=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
10=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
12=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
13=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
14=	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

	19	20	21	22	23	24
1=	10.00	10.00	10.00	10.00	10.00	10.00
2=	10.00	10.00	10.00	10.00	10.00	10.00
3=	10.00	10.00	10.00	10.00	10.00	10.00
4=	10.00	10.00	10.00	10.00	10.00	10.00
5=	10.00	10.00	10.00	10.00	10.00	10.00
6=	10.00	10.00	10.00	10.00	10.00	10.00
7=	10.00	10.00	10.00	10.00	10.00	10.00
8=	10.00	10.00	10.00	10.00	10.00	10.00
9=	10.00	10.00	10.00	10.00	10.00	10.00
10=	10.00	10.00	10.00	10.00	10.00	10.00
11=	10.00	10.00	10.00	10.00	10.00	10.00
12=	10.00	10.00	10.00	10.00	10.00	10.00
13=	10.00	10.00	10.00	10.00	10.00	10.00
14=	10.00	10.00	10.00	10.00	10.00	10.00

SCENARIO 2
DATA FILE

TIME SINCE PUMPING STARTED ,IN DAYS = 353.986

THIS TIME WAS ARRIVED AT IN 25 STEPS

ARTESIAN AQUIFER HEADS

	1	2	3	4	5	6	7	8	9
1=									
2=									
3=									
4=									
5=	0.01	0.67	-1.87	-2.76					
6=	-0.03	0.41	-2.99	-4.23					
7=	-0.10	-0.07	-5.38	-7.51					
8=	-0.20	-0.71	-9.55	-13.93	-16.76	-18.05			
9=	-0.33	-1.40	-11.61	-17.41	-19.90	-21.07	-20.42	-16.96	-14.14
10=	-0.48	-2.23	-14.09	-22.93	-26.13	-27.80	-27.03	-20.44	-15.90
11=	-0.57	-2.63	-13.97	-22.48	-26.44	-29.35	-26.58	-20.50	-16.12
12=									
13=									
14=									

	10	11	12	13	14	15	16	17	18
1=									
2=									
3=									
4=									-18.25
5=						-13.77	-14.79	-17.30	-20.07
6=				-10.29	-11.55	-13.88	-15.56	-18.50	-20.87
7=		-6.73	-8.18	-11.73	-13.48	-15.74	-17.36	-19.21	-22.10
8=		-9.48	-10.53	-13.00	-15.01	-17.57	-18.86	-20.27	-24.14
9=	-12.66	-11.61	-12.15	-13.72	-16.11	-20.17	-20.28	-20.63	-23.55
10=	-13.48	-12.28	-12.64	-14.34	-16.42	-19.36	-21.54	-20.77	-27.80
11=	-13.57	-12.36	-12.63	-14.15	-16.21	-18.92	-20.90	-20.08	-23.81
12=									
13=									
14=									

	19	20	21	22	23	24
1=						
2=						
3=						
4=	-17.91	-9.99	-4.16	-0.87	0.69	0.43
5=	-21.46	-10.51	-4.12	-0.79	0.75	0.44
6=	-24.14	-10.33	-3.87	-0.63	0.84	0.43
7=	-24.71	-9.60	-3.40	-0.36	0.99	0.42
8=	-18.83	-7.59	-2.31	0.27	1.35	0.38
9=	-16.83	-7.07	-2.05	0.42	1.42	0.41
10=	-16.52	-6.79	-1.90	0.50	1.46	0.42
11=						
12=						
13=						
14=						

SCENARIO 2
HEAD FILES

WATER TABLE HEADS

	1	2	3	4	5	6	7	8	9
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	3.68	3.83	3.82	3.79	3.72	3.60	3.50	3.25
3=	0.00	3.83	3.94	3.70	3.27	2.43	0.00	0.00	0.00
4=	0.00	3.68	3.50	2.39	0.00	0.00	2.38	3.12	3.33
5=	0.00	2.96	1.94	1.01	0.00	2.23	3.29	3.66	3.72
6=	0.00	2.70	1.14	0.00	1.63	2.69	3.35	3.60	3.53
7=	0.00	2.45	0.24	-0.00	0.97	1.60	2.58	3.00	2.84
8=	0.00	2.21	-0.61	-0.00	-2.55	-2.57	0.34	1.35	1.45
9=	0.00	2.16	-0.00	-2.87	-4.16	-4.42	-3.50	-2.36	-1.59
10=	0.00	2.62	0.00	-1.40	-2.05	-2.27	-1.84	-0.93	-0.19
11=	0.00	2.82	0.00	0.17	-0.07	-0.21	0.09	0.71	1.24
12=	0.00	2.81	0.00	2.44	2.72	2.79	2.88	3.05	3.19
13=	0.00	0.00	2.93	3.43	3.52	3.55	3.56	3.58	3.60
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	10	11	12	13	14	15	16	17	18
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	2.41	0.00	0.00	0.00	2.60	3.49	3.77	3.83	3.83
3=	0.00	2.54	3.36	3.63	3.84	3.93	3.96	3.95	3.83
4=	3.41	3.65	3.73	3.70	3.65	3.59	3.55	3.47	2.48
5=	3.57	3.25	2.90	2.40	2.15	1.78	1.73	1.88	1.77
6=	3.00	1.80	0.88	-0.63	-0.77	0.67	1.08	1.36	0.97
7=	1.60	-2.33	-3.60	-2.71	-2.23	-0.07	0.64	1.01	0.09
8=	0.26	-4.07	-5.13	-3.55	-2.89	-0.50	0.29	0.65	-0.55
9=	-1.56	-2.38	-2.83	-2.79	-2.60	-0.62	0.00	0.10	-0.98
10=	0.14	0.06	-0.11	-0.29	-0.41	-0.20	-0.18	-0.18	-1.04
11=	1.52	1.47	1.37	1.18	0.95	0.76	0.60	0.59	0.17
12=	3.27	3.28	3.25	3.19	3.12	3.05	3.00	2.98	2.90
13=	3.61	3.61	3.60	3.60	3.59	3.58	3.57	3.57	3.57
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	19	20	21	22	23	24
1=	0.00	0.00	0.00	0.00	0.00	0.00
2=	3.83	3.83	3.84	3.84	3.73	0.00
3=	3.81	3.89	3.95	3.98	3.89	0.00
4=	2.39	3.02	3.48	3.74	3.76	0.00
5=	1.58	2.66	3.32	3.66	3.72	0.00
6=	0.46	2.16	3.08	3.53	3.65	0.00
7=	-1.06	1.44	2.72	3.35	3.55	0.00
8=	-3.16	0.32	2.16	3.05	3.36	0.00
9=	-0.82	1.51	2.77	3.38	3.55	0.00
10=	0.65	2.32	3.18	3.59	3.67	0.00
11=	2.78	3.45	3.74	3.88	3.83	0.00
12=	3.65	3.85	3.92	3.95	3.85	0.00
13=	3.65	3.68	3.68	3.68	3.58	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00

SCENARIO 2
HEAD FILES

TIME SINCE PUMPING STARTED ,IN DAYS = 738.051

THIS TIME WAS ARRIVED AT IN 29 STEPS

ARTESIAN AQUIFER HEADS

	1	2	3	4	5	6	7	8	9
1=									
2=									
3=									
4=									
5=	0.26	2.12	-0.95	-2.16					
6=	0.22	1.78	-2.22	-3.77					
7=	0.15	1.20	-4.82	-7.20					
8=	0.05	0.46	-9.22	-13.83	-16.78	-18.12			
9=	-0.07	-0.30	-11.34	-17.35	-19.94	-21.17	-20.55	-17.10	-14.27
10=	-0.18	-1.22	-13.85	-22.86	-26.14	-27.86	-27.10	-20.52	-15.99
11=	-0.25	-1.67	-13.72	-22.41	-26.45	-29.39	-26.63	-20.56	-16.19
12=									
13=									
14=									

	10	11	12	13	14	15	16	17	18
1=									
2=									
3=									
4=									-17.37
5=						-13.40	-14.37	-16.78	-19.37
6=				-10.28	-11.46	-13.65	-15.22	-18.06	-20.25
7=		-6.96	-8.46	-11.85	-13.50	-15.63	-17.14	-18.84	-21.57
8=		-9.76	-10.80	-13.13	-15.05	-17.49	-18.68	-19.96	-23.70
9=	-12.81	-11.79	-12.32	-13.83	-16.13	-20.08	-20.10	-20.36	-23.15
10=	-13.59	-12.41	-12.76	-14.39	-16.40	-19.25	-21.36	-20.51	-27.39
11=	-13.65	-12.45	-12.70	-14.17	-16.17	-18.79	-20.71	-19.76	-23.35
12=									
13=									
14=									

	19	20	21	22	23	24
1=						
2=						
3=						
4=	-16.84	-8.43	-2.16	1.36	2.77	1.52
5=	-20.53	-9.04	-2.15	1.43	2.81	1.51
6=	-23.29	-8.88	-1.90	1.61	2.93	1.46
7=	-23.96	-8.18	-1.41	1.92	3.13	1.38
8=	-18.26	-6.21	-0.27	2.64	3.59	1.19
9=	-16.22	-5.66	0.02	2.82	3.67	1.21
10=	-15.87	-5.35	0.19	2.92	3.72	1.22
11=						
12=						
13=						
14=						

SCENARIO 2
HEAD FILES

WATER TABLE HEADS

	1	2	3	4	5	6	7	8	9
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	0.00	7.00	7.49	7.40	7.25	6.99	6.60	6.18	5.39
3=	0.00	7.48	7.71	6.74	5.62	3.83	0.00	0.00	0.00
4=	0.00	6.95	6.38	3.79	0.00	0.00	3.63	5.12	5.69
5=	0.00	5.43	3.61	1.62	0.00	3.26	5.29	6.24	6.46
6=	0.00	4.84	2.22	0.00	2.06	3.90	5.30	5.99	5.90
7=	0.00	4.37	0.89	0.00	1.19	2.28	3.83	4.61	4.36
8=	0.00	4.01	-0.29	-0.00	-2.83	-2.74	0.55	1.91	2.00
9=	0.00	3.94	-0.00	-3.29	-4.82	-5.10	-3.93	-2.50	-1.63
10=	0.00	4.52	0.00	-1.74	-2.55	-2.76	-2.11	-0.91	0.04
11=	0.00	4.72	0.00	0.52	0.35	0.30	0.79	1.66	2.40
12=	0.00	4.40	0.00	3.78	4.39	4.64	4.90	5.24	5.54
13=	0.00	0.00	4.64	5.86	6.17	6.31	6.41	6.49	6.55
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	10	11	12	13	14	15	16	17	18
1=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2=	3.65	0.00	0.00	0.00	4.26	6.25	7.15	7.50	7.55
3=	0.00	4.07	5.84	6.67	7.31	7.68	7.86	7.88	7.59
4=	5.97	6.47	6.72	6.76	6.77	6.74	6.72	6.58	5.12
5=	6.16	5.52	4.85	4.12	3.80	3.48	3.56	3.83	3.44
6=	4.94	3.08	1.65	-0.19	-0.31	1.41	2.13	2.63	1.95
7=	2.54	-2.20	-3.83	-3.20	-2.57	-0.03	1.10	1.76	0.46
8=	0.38	-4.42	-5.72	-4.41	-3.57	-0.82	0.42	1.04	-0.57
9=	-1.75	-2.85	-3.49	-3.50	-3.15	-0.87	0.09	0.37	-1.05
10=	0.39	0.19	-0.10	-0.31	-0.34	0.06	0.25	0.34	-0.72
11=	2.77	2.69	2.53	2.30	2.08	1.94	1.82	1.83	1.35
12=	5.71	5.72	5.67	5.57	5.46	5.37	5.31	5.27	5.20
13=	6.59	6.60	6.59	6.57	6.54	6.52	6.50	6.49	6.50
14=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	19	20	21	22	23	24
1=	0.00	0.00	0.00	0.00	0.00	0.00
2=	7.55	7.58	7.59	7.58	7.18	0.00
3=	7.53	7.80	8.02	8.12	7.73	0.00
4=	4.92	6.17	7.13	7.64	7.47	0.00
5=	3.07	5.21	6.65	7.39	7.33	0.00
6=	1.17	4.24	6.16	7.12	7.16	0.00
7=	-1.00	3.12	5.57	6.79	6.94	0.00
8=	-3.25	1.88	4.89	6.38	6.64	0.00
9=	-0.63	3.33	5.69	6.85	6.96	0.00
10=	1.69	4.72	6.43	7.26	7.21	0.00
11=	4.94	6.57	7.39	7.77	7.51	0.00
12=	6.69	7.41	7.74	7.87	7.51	0.00
13=	6.82	6.97	7.04	7.05	6.69	0.00
14=	0.00	0.00	0.00	0.00	0.00	0.00

SCENARIO 2
HEAD FILES