

EXECUTIVE SUMMARY
LP-4 (Panasoffkee Fire Station); Basin 19
19-020-034; S05 T20S,R22E

March 1, 1988

G. L. Henderson

- I. SITE LOCATION
- II. TYPE AND PURPOSE OF MONITORS
- III. GEOLOGY
- IV. HYDROGEOLOGY AND WATER QUALITY
- V. WELL DESIGN AND CONSTRUCTION
- VI. GEOPHYSICAL LOGS

I. SITE LOCATION

The LP-4 wellsite is located approximately one mile west of the body of water named Lake Panasoffkee, in Sumter County, Florida. The wellsite can be found by proceeding approximately two (2) miles northwest on C.R. 470 from Interstate 75 (Lake Panasoffkee Exit); then turning west onto the paved road going to Lake Panasoffkee Fire Station Building. The wellsite adjoins the south side of this paved road, approximately 1250 feet west of C.R. 470 and approximately 200 feet east of the Fire Station Building (See Site Location Map). The wellsite encompasses a 20' X 20' permanent easement. The LP-4 wellsite is located in the SW 1/4 of NW 1/4 of SE 1/4 of Section 5, Township 20 South, Range 22 East; at latitude 28⁰ 46' 28.42" North, longitude 82⁰ 07' 38.54" West.

II. TYPE AND PURPOSE OF MONITORS

At this wellsite, the existing six-inch well was modified into a Dual-Zone Floridan aquifer Monitor. The Deep Floridan Monitor was constructed in order to monitor the existing non-potable (high sulfates) water quality zone and to monitor any fluctuations in the potentiometric surface of the Floridan aquifer. The Shallow Floridan Monitor was constructed in order to monitor any possible contamination of the potable water quality zone and to monitor any fluctuations in the potentiometric surface of the Floridan aquifer. A shallow Surficial Monitor was also constructed in order to establish whether or not the Surficial aquifer existed at the LP-4 wellsite.

Comparison of the recorded water levels for the Dual-Zone Floridan Monitor and Lake Panasoffkee will provide long term information on the hydrologic characteristics exhibited by the groundwater (or surface water) system in the Lake Panasoffkee region. Correlation of LP-4 data with the other LP (Lake Panasoffkee) series wellsites might provide some groundwater flow patterns for the area around Lake Panasoffkee. The LP series wellsites were constructed only to provide regional background data for the Lake Panasoffkee Study being conducted by the Resource Evaluation Section.

III. GEOLOGY

The LP-4 wellsite is located in the Tsala Apopka Plain, a physiographic subprovince of the Coastal Highlands topographic province in peninsular Florida. The Tsala Apopka Plain (Figure 1) is bounded on the west by the southern outlier of the Brooksville Ridge and on the east by the Western Valley subprovince, as defined by W. A. White (1958, Bull. 41). The Tsala Apopka Plain's major drainage pattern is northerly in direction through the coast-parallel stream known as the Withlacoochee River.

The Withlacoochee River flows essentially parallel (NW-SE trend) with the strike of the limestone bedrock as determined by the flank of the Ocala Uplift, a structural feature believed to have occurred during the Tertiary time period (Figure 2). However, near Dunellon the Withlacoochee River abruptly veers left and flows westerly to the Gulf of Mexico. According to White (1958, Bull. 41), the Withlacoochee River owes its present escape route through the Brooksville Ridge to a newly formed gap (Dunellon Gap) produced by solution of limestone beneath that sand ridge.

White believed that a large freshwater lake once occupied that area today known as the Tsala Apopka Plain. At that time, the Withlacoochee River probably drained southeastward via the Hillsborough River to greater Tampa Bay, the largest estuary on the west coast of peninsular Florida. This ancestral lake, of which Lake Tsala Apopka and Lake Panasoffkee are remnants, would have assisted the passage of groundwater through permeable parts of the Brooksville Ridge from landward to seaward (NE-SW trend). This would eventually have opened a subterranean passage of sufficient crosssectional area to drain the ancestral lake and

facilitate the reversal of flow in the coast-parallel segment of the Withlacoochee River.

Vernon (1951, Bull. 33) showed a fault (NE-SW trend) passing through the Brooksville Ridge at this point which also could have facilitated the leakage of groundwater from the high northeastern side to the lower southwestern side. Solution would have been aided by the fact that water leaking through the ridge should have been mostly lake water which is usually more acidic than ordinary groundwater. White further substantiates the above-described suppositions with numerous subjective evidence (1958, Bull, 41) that will not be elaborated upon in this report.

The LP-4 wellsite is located on a thin veneer of quartz sands lying on the karstic limestones of the Ocala Group (1951, Bull. 33) at an elevation of approximately 52.6 feet above NGVD (of 1929). No lithologic samples were collected due to the existing six-inch well (270' total depth) at the LP-4 wellsite. The proposed stratigraphic sequence for the LP-4 wellsite that is shown below was derived through correlation of the geophysical logs for the LP-4 and LP-3 (Marsh Bend Park) wellsites.

<u>WELL DEPTH</u> (Ft. below LSD)	<u>STRATIGRAPHIC UNIT</u> (Age)
LSD - 16'	UNDIFFERENTIATED SURFICIAL DEPOSITS (Pleistocene/Miocene?)
16' - 50'	OCALA GROUP (Late Eocene)
50' - 270' (T.D.)	AVON PARK FORMATION (Middle Eocene)

IV. HYDROGEOLOGY AND WATER QUALITY

The hydrogeology of the Lake Panasoffkee region is variable due to the hydrogeologic properties of the unconsolidated deposits found above the limestones of the Floridan aquifer. In some areas, the Surficial aquifer is found to be confined by clays (or clayey sands) to the unconsolidated sand deposits lying above the limestones of the Floridan aquifer; thus the water table and the Floridan's potentiometric surface are disparate. In other areas, these unconsolidated sand deposits are hydraulically connected to the limestones of the Floridan aquifer; thus the water table and the Floridan's potentiometric surface are coincident.

At the LP-4 wellsite, the relatively thin veneer of unconsolidated sand deposits appeared to be hydraulically connected to the limestones of the Floridan aquifer; thus the water table and the Floridan's potentiometric surface should be coincident.

The preceding statement is substantiated through a comparison of measured water levels for the Shallow Floridan Monitor and the nearby Surficial Monitor. On July 17, 1986 the water levels recorded (by Jim Strong, Data Collection) for the Shallow Floridan Monitor and the Surficial Monitor were 41.83 feet and 41.85 feet above NGVD, respectively. The small difference between the recorded water levels could be attributed to measuring errors or well inefficiencies. The preceding statement is further substantiated through a comparison of measured water quality values collected from the above wells on August 26, 1986; as shown tabled below.

<u>WATER QUALITY PARAMETER</u>	<u>SURFICIAL MONITOR</u>	<u>SHALLOW FLORIDAN MONITOR</u>
Conductivity (umho/cm.)	400	450
Temperature (°C)	23.5	26.5
Chlorides (mg/l)	7	10
Sulfates (mg/l)	92	78
TDS (mg/l)	233	275

*NOTE: Conductivity/Temperature values measured by ROMP site hydrologist.
Chlorides/Sulfates/TDS values analyzed by SWFWMD laboratory.

As one can see, all of the water quality parameters shown above are fairly similar in their numerical values.

As no lithologic samples were collected at the LP-4 wellsite, the actual hydrologic extent of the Floridan aquifer can only be estimated by utilizing the proposed stratigraphic sequence outlined earlier in this report. The Floridan aquifer was only partially penetrated by the existing six inch well and probably extends from 16 feet below LSD (36.6 feet above NGVD) to 270 feet below LSD (217.4 feet below NGVD) at the LP-4 wellsite.

At this wellsite, a six inch water well (270' total depth) already existed. Geophysical log data was obtained from this well utilizing the SWFWMD and the NFWFMD geophysical logging equipment. Water samples were obtained with the SWFWMD logger and analyzed by the SWFWMD lab. The water quality results are summarized below.

<u>WELL DEPTH</u>	<u>CONDUCTIVITY</u>	<u>TEMPERATURE</u>	<u>CHLORIDES</u>	<u>SULFATES</u>
40'	390 umho/cm.	25 ⁰ C	8.5 mg/l	82.7 mg/l
155'	1200 umho/cm.	24.5 ⁰ C	11 mg/l	676 mg/l
265'	2300 umho/cm.	25 ⁰ C	15.5 mg/l	1429 mg/l

On the basis of water quality data and fluid conductivity log data, the well's water quality began showing non-potable water characteristics at the approximate depth of 140 feet below LSD. Water quality was shown to further deteriorate with increasing depth in the well. As indicated by the water quality data summarized above, sulfates (rather than chlorides) were the debilitating factor for the poor water quality in this well.

The occurrence of this non-potable water zone is commonly known to the residents of Lake Panasoffkee. Another existing well located about 500 feet south of the LP-4 wellsite was logged by the SWFWMD logger on January 16, 1984. This abandoned well (12" diameter) had 65 feet of steel surface casing and was open to 485 feet below LSD. Water samples were obtained with the SWFWMD logger and the water quality results are summarized below.

<u>WELL DEPTH</u>	<u>CONDUCTIVITY</u>	<u>TEMPERATURE</u>	<u>CHLORIDES</u>	<u>SULFATES</u>
160'	450 umho/cm	23 ⁰ C	11 mg/l	118.5 mg/l
220'	2400 umho/cm	23.5 ⁰ C	190 mg/l	1609 mg/l
480'	2400 umho/cm	23.5 ⁰ C	110 mg/l	1655 mg/l

On the basis of water quality data and the fluid conductivity log data, this well's water quality began showing non-potable water characteristics at the approximate depth of 200 feet below LSD. As at the LP-4 wellsite, water quality deteriorated with increasing depth and sulfates were the debilitating factor for the poor water quality in this well.

After the existing well at the LP-4 wellsite was modified, water samples were taken (8/26/86) from the Shallow Floridan Monitor and the Deep Floridan Monitor. The water quality results are summarized below.

<u>WATER QUALITY PARAMETER</u>	<u>SHALLOW FLORIDAN MONITOR</u>	<u>DEEP FLORIDAN MONITOR</u>
Conductivity (umho/cm)	450	1825
Temperature (⁰ C)	26.5	23.5
Chlorides (mg/l)	10	14
Sulfates (mg/l)	78	934
TDS (mg/l)	275	1442

As one can see, the Shallow Floridan Monitor is monitoring the potable water zone existing at the LP-4 wellsite. The Deep Floridan Monitor is monitoring the non-potable water zone existing at the LP-4 wellsite.

V. WELL DESIGN AND CONSTRUCTION

At this wellsite, the existing six-inch well (270' T.D.) was modified into a Dual-Zone Floridan Monitor. The driller initiated modification of the existing well on June 5, 1985.

The driller proceeded to insert 200 feet of 1 1/4 inch PVC casing coupled to 40 feet of 1 1/4 inch PVC wellscreen into the existing borehole. The driller then proceeded to sandpack the 195'-270' interval of the well's annulus. The driller finally cement-grouted the 125'-195' interval of the well's annulus. This completed well will serve as the Deep Floridan Monitor at this wellsite (See AS-BUILT WELL DIAGRAM).

The driller next proceeded to sandpack the 120'-125' interval of the well's annulus. The driller then proceeded to insert 100 feet of 2 inch PVC casing coupled to 20 feet of 2 inch PVC wellscreen into the existing borehole. Unlike the sandpacked screened interval for the Deep Floridan Monitor, the annular space for the Shallow Floridan Monitor's screened interval shall remain open to LSD (land surface datum). This was done in order to facilitate any further modifications to the Shallow Floridan Monitor that might be necessary to properly monitor any changes of the potable water zone at the LP-4 wellsite. This completed well will serve as the Shallow Floridan Monitor at this wellsite (See AS-BUILT WELL DIAGRAM).

A shallow Surficial Monitor was also constructed in order to establish the existence of the Surficial aquifer. The driller proceeded to drill on mud rotary a 6 inch nominal borehole to 30 feet below LSD. The driller then proceeded to insert 15 feet of 2 inch PVC casing coupled to 15 feet of 2 inch PVC wellscreen into the borehole. The driller next proceeded to sandpack the 5'-30' interval of the well's annulus and to cement-grout the LSD-5' interval of the well's annulus.

The Shallow Floridan Monitor and the Deep Floridan Monitor were thoroughly developed utilizing compressed air and a PVC tremie pipe until the water from each well was clear.

The Surficial Monitor was thoroughly developed utilizing compressed air, a PVC tremie pipe, and Barafoss to break down the bentonite drilling fluid until the water from the well was clear.

VI. GEOPHYSICAL LOGS

The existing six-inch well at this wellsite was geophysically logged by the NFWFMD and SWFWMD loggers before its modification into the Dual-Zone Floridan Monitor. The types of geophysical logs performed and their respective logging depth intervals are outlined below.

SWFWMD LOGGER

SEPTEMBER 8, 1983

Geophysical Log Type	Borehole Interval
Caliper	LSD-270'
Electric	LSD-270'
Natural Gamma	LSD-270'
Fluid Conductivity	10'-270'

NFWFMD LOGGER

NOVEMBER 8, 1983

Geophysical Log Type	Borehole Interval
16" Electric	76'-266'
Neutron	13'-266'
Natural Gamma	50'-262'
Gamma-Gamma	60'-266'

REFERENCES

Fretwell, J. D.; 1983; Groundwater Resources of Coastal Citrus, Hernando, and Southwestern Levy Counties, Florida; U. S. Geological Survey, Water Resources Investigations Report #83-4079.

Gilboy, A. E.; March, 1985; Hydrogeology of the Southwest Florida Water Management District; Regional Analysis/SWFWMD, Technical Report #85-01.

Lewelling, B. R.; 1987; Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, September 1987; U. S. Geological Survey, Open-File Report #87-683.

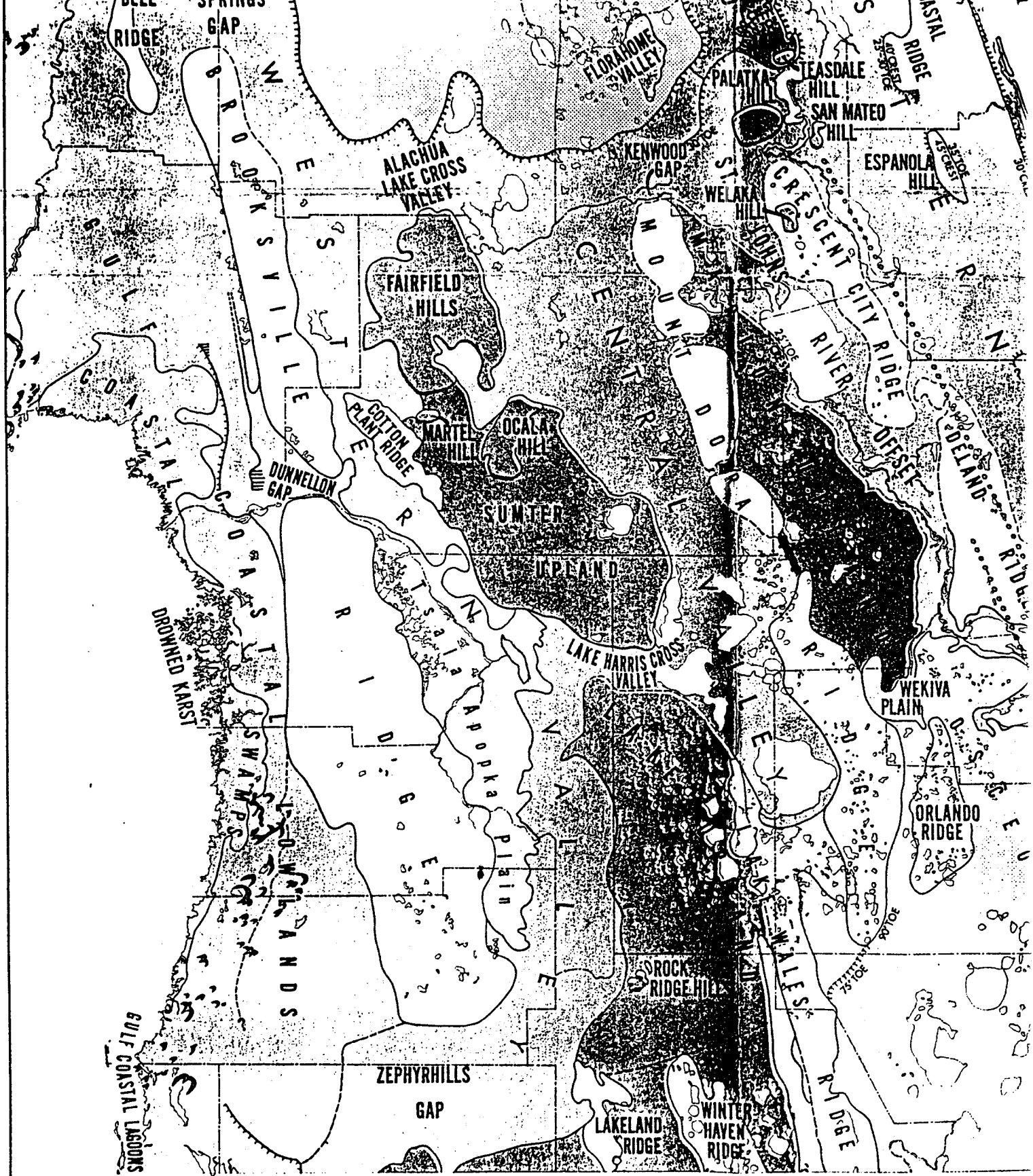
Lindquist, R.; 1986; The Well Log Data System, Sumter County File; Geologic Information Systems, F.B.G. Wells #11471, #11564, #30007, #30008, and #30009 (Note: PC Software Program).

Puri, H. S.; November, 1957; Stratigraphy and Zonation of the Ocala Group; Florida Geological Survey, Geological Bulletin #38.

Vernon, R. O.; 1951; Geology of Citrus and Levy Counties, Florida; Florida Geological Survey, Geological Bulletin #33.

White, W. A.; August, 1958; Some Geomorphic Features of Central Peninsular Florida; Florida Bureau of Geology, Geological Bulletin #44.

White, W. A.; 1970, The Geomorphology of the Florida Peninsula; Florida Bureau of Geology, Geological Bulletin #51.



(FIGURE 1) PHYSIOGRAPHIC MAP OF LAKE PANASOFFKEE REGION (White, 1970)

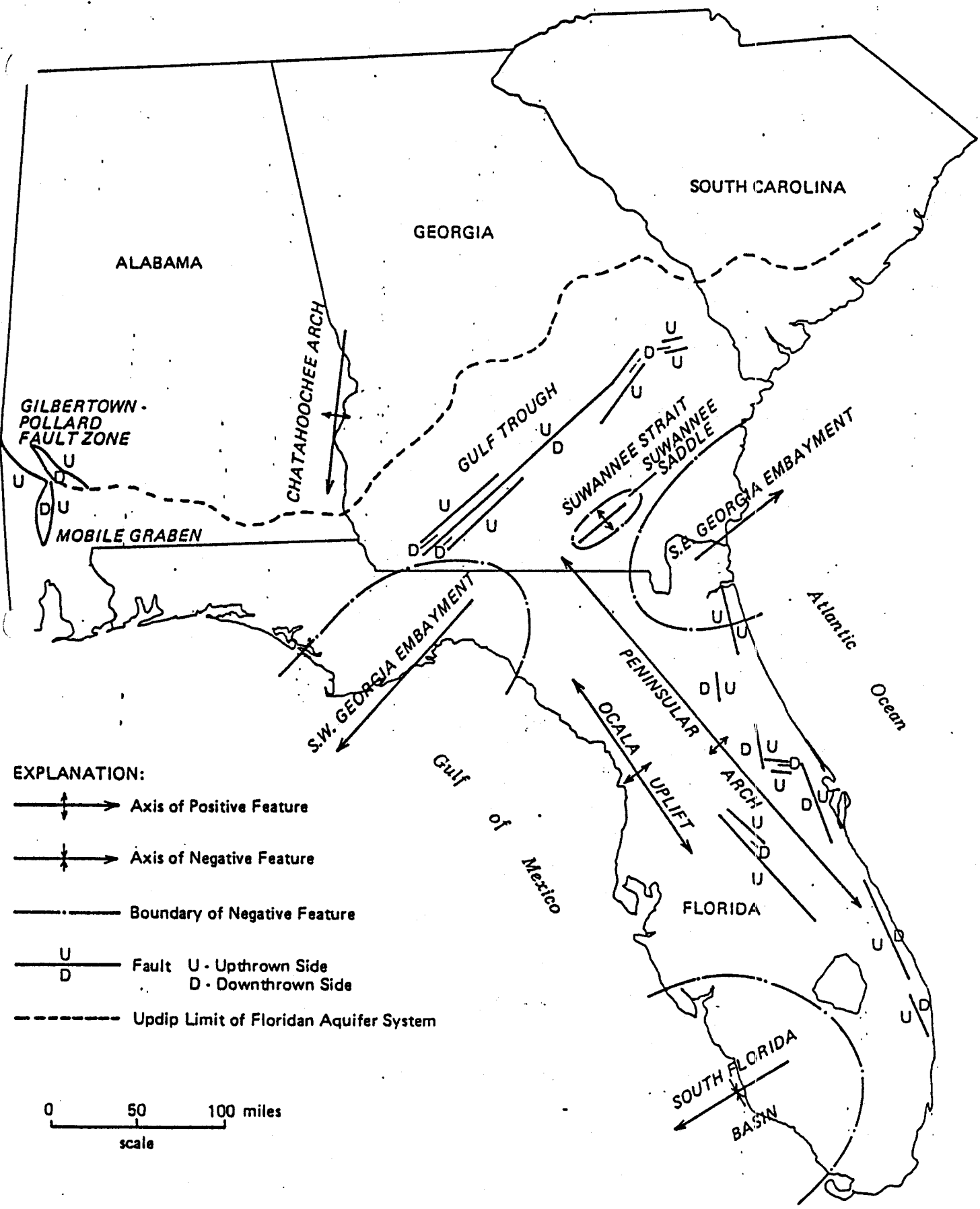
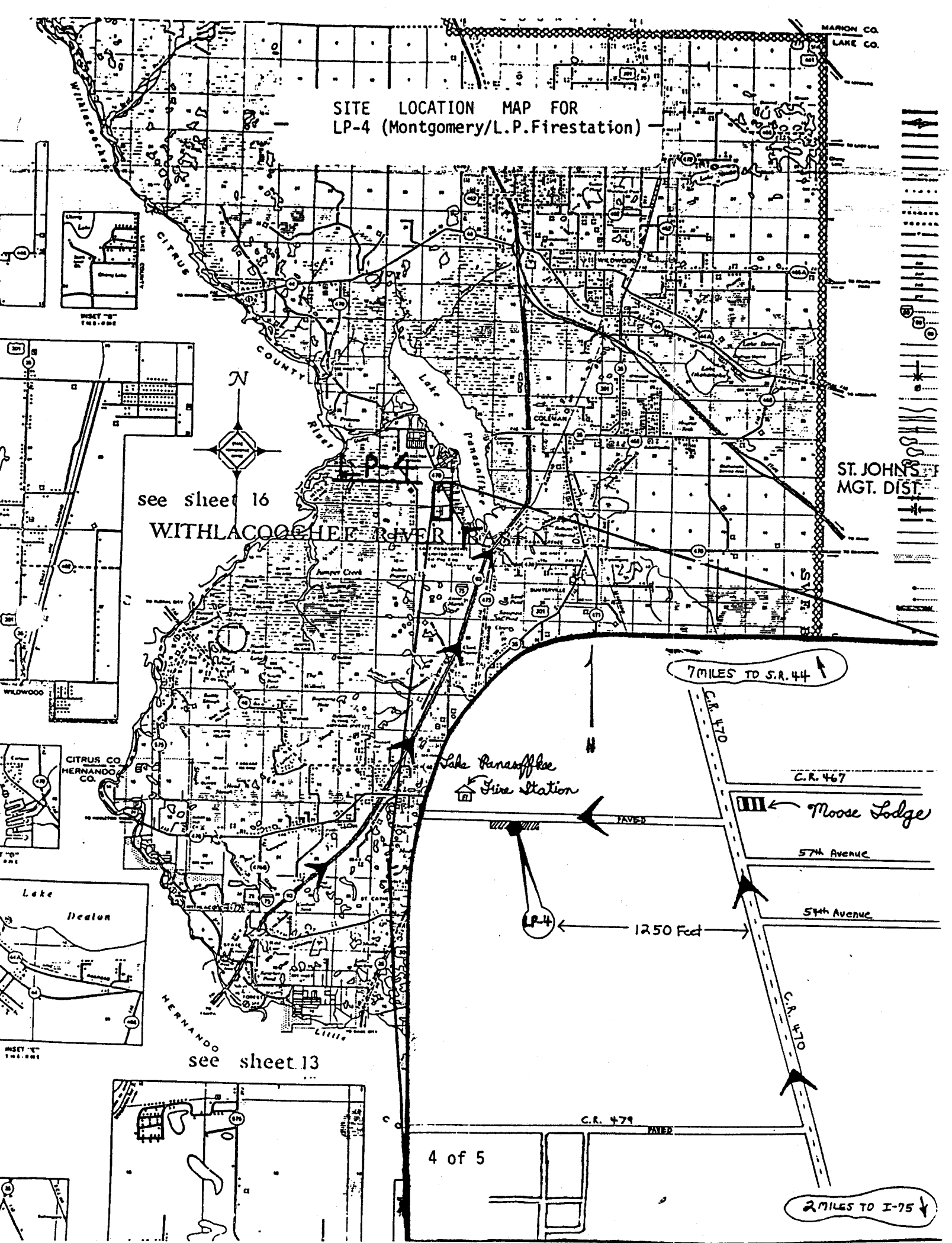


Figure 2. Structural Features that affect the Floridan Aquifer system (adapted from Miller, 1984)

SITE LOCATION MAP FOR
LP-4 (Montgomery/L.P. Firestation)



see sheet 16

WITHLACOOCHIEE RIVER

Lake Panasofflee
Fire Station

7 MILES TO S.R. 44

1250 Feet

C.R. 467

Moose Lodge

57th Avenue

54th Avenue

C.R. 479

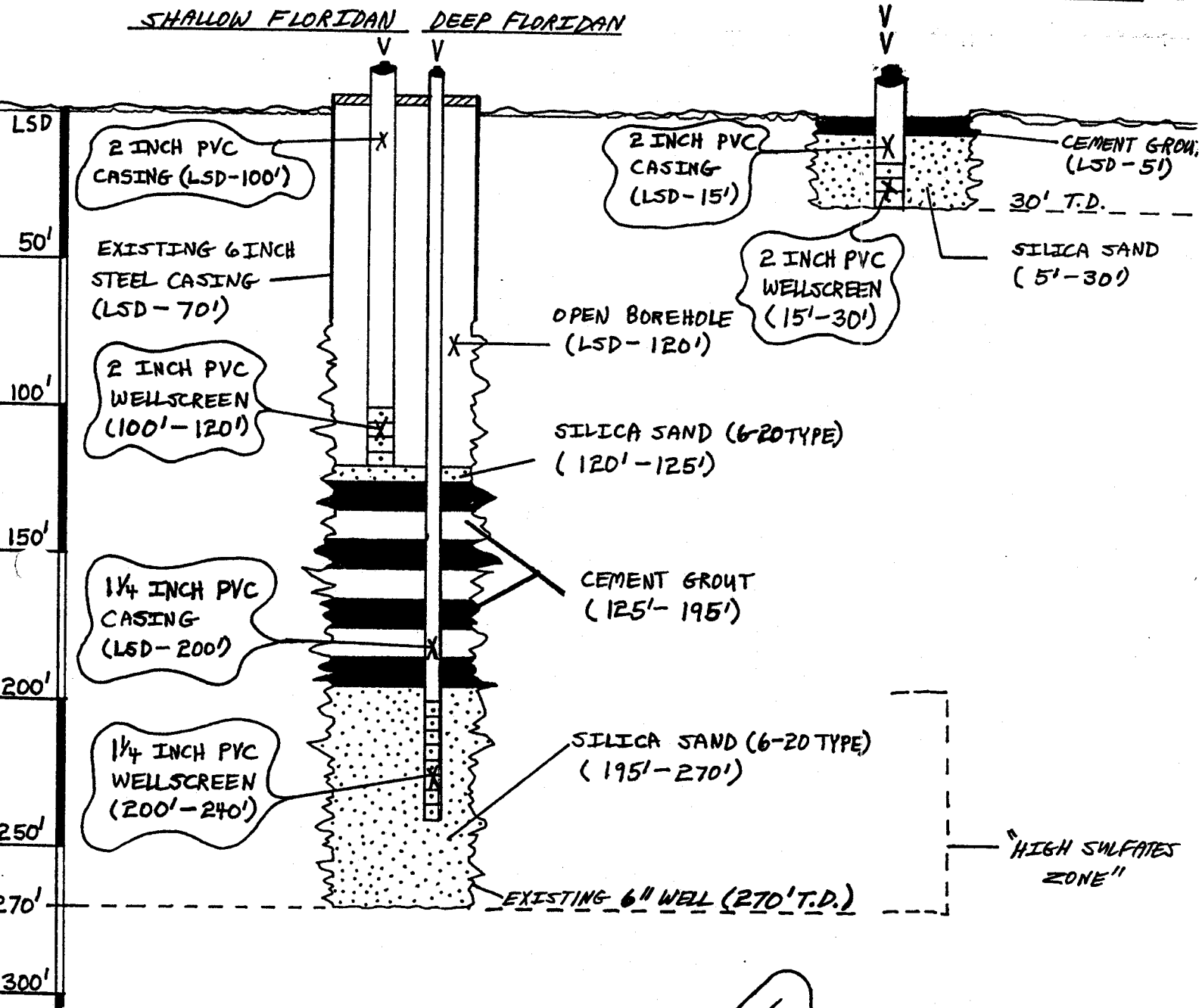
2 MILES TO I-75

LP-4 (Lake Panasoffkee Fire Station) AS-BUILT WELL DIAGRAM

DUAL ZONE FLORIDAN MONITOR

WATER TABLE MONITOR

SHALLOW FLORIDAN DEEP FLORIDAN



8/06/85
AS-BUILT
GH