

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

**HYDROGEOLOGIC DATA  
FROM TEST DRILLING  
NEAR Verna, Florida, 1978**

**OPEN-FILE REPORT 81-634**

**Prepared in cooperation with the  
CITY OF SARASOTA, FLORIDA**



## ABBREVIATIONS AND CONVERSION FACTORS

Factors for converting inch-pound units to International System (SI) units  
and abbreviations of units

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
gallon (gal)	3.785	liter (L)
	0.003785	cubic meter (m <sup>3</sup> )
gallon per minute (gal/min)	0.6308	liter per second (L/s)

\* \* \* \* \*

National Geodetic Vertical Datum of 1929 (NGVD of 1929).--A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "mean sea level."

81-0222

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

HYDROGEOLOGIC DATA FROM TEST DRILLING NEAR

VERNA BEACH, FLORIDA, 1978

By Michael Barker, Geronia Bowman, and H. Sutcliffe, Jr.

---

Open-File Report 81-634

PROPERTY OF  
ST. JOHNS RIVER WATER  
MANAGEMENT DISTRICT  
WITHDRAWN  
SJRWMD  
Library

SEP 25 2006

Prepared in cooperation with the

CITY OF SARASOTA, FLORIDA

Tallahassee, Florida

1981



UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES E. WATT, Secretary

GEOLOGICAL SURVEY

Doyle G. Frederick, Acting Director

---

For additional information write to:

U.S. Geological Survey  
325 John Knox Road, Suite F-240  
Tallahassee, FL 32303

## CONTENTS

	Page
Abstract -----	1
Introduction -----	1
Purpose -----	4
Scope of the test well program -----	4
Drilling and water sample collecting methods -----	4
Summary -----	11
Selected references -----	11

## ILLUSTRATIONS

	Page
Figure 1. Map showing location of the study area -----	2
2. Map of Verna area showing location of test wells -----	3
3. Schematic diagram of airlift water sampling -----	6
4. Composite log for test well 0-1 -----	7
5. Composite log for test well 0-2 -----	8
6. Composite log for test well 0-3 -----	9
7. Composite log for test well 0-4 -----	10

## TABLES

	Page
Table 1. Drillers' logs of test wells -----	12
2. Chemical analyses of water from test wells -----	24
3. Data from test pumping of test wells -----	25



# HYDROGEOLOGIC DATA FROM TEST DRILLING NEAR VERNA, FLORIDA, 1978

By Michael Barker, Geronia Bowman, and H. Sutcliffe, Jr.

## ABSTRACT

Four test wells were drilled in the vicinity of the city of Sarasota well field near Verna, Florida, to provide hydrologic and geologic information. An expedient and economical method of air lifting water samples from isolated water-producing zones while drilling was utilized. Lithologic logs of drill cuttings and geophysical logs, including point resistance and spontaneous potential electric logs, gamma-ray logs, and caliper logs, were made. Chemical quality of water was determined for principal producing zones at each well. Dissolved solids from composite water samples ranged from 313 milligrams per liter in test well 0-1 north of the well field to 728 milligrams per liter in test well 0-3 within the well field.

Each test well was pumped to determine maximum discharge, water-level drawdown, and recovery time. A leaking pump column on test well 0-1 prevented accurate measurement of drawdown on the well. Test well 0-2, located east of the well field, had a pumping rate of 376 gallons per minute and 13.11 feet of drawdown after 3 hours and 50 minutes; test well 0-3 had a maximum yield of 320 gallons per minute, a drawdown of 31.91 feet after 2 hours and 35 minutes of pumping, and a recovery time of 20 minutes; and test well 0-4, south of the well field, had a pumping rate of 200 gallons per minute with 63.34 feet of drawdown after 2 hours and 35 minutes.

## INTRODUCTION

The city of Sarasota has operated a well field near Verna in the northeast corner of Sarasota County (fig. 1) since September 1966. Withdrawal of ground water has steadily increased since that time, and additional data were needed by the city of Sarasota to describe areal water-level declines in the aquifer.

Three test wells were drilled outside the well field and one inside the well field during December 1977 and January 1978 by the city of Sarasota. These sites were selected because of expected minimum pumping interference and ease of access for work and maintenance. Locations of the test wells, labeled 0-1, 0-2, 0-3, and 0-4, are shown in figure 2. Test wells were not drilled west of the well field because the U.S. Geological Survey has maintained observation wells in this area since June 1963.

Water-level recorders on the test wells and existing observation wells will provide water-level information from all sides of the well field. This information will be used for water-resources management and future planning. Data are also used by the U.S. Geological Survey to prepare semiannual potentiometric water-level maps for the Southwest Florida Water Management District (Wolansky and others, 1978a; 1978b).

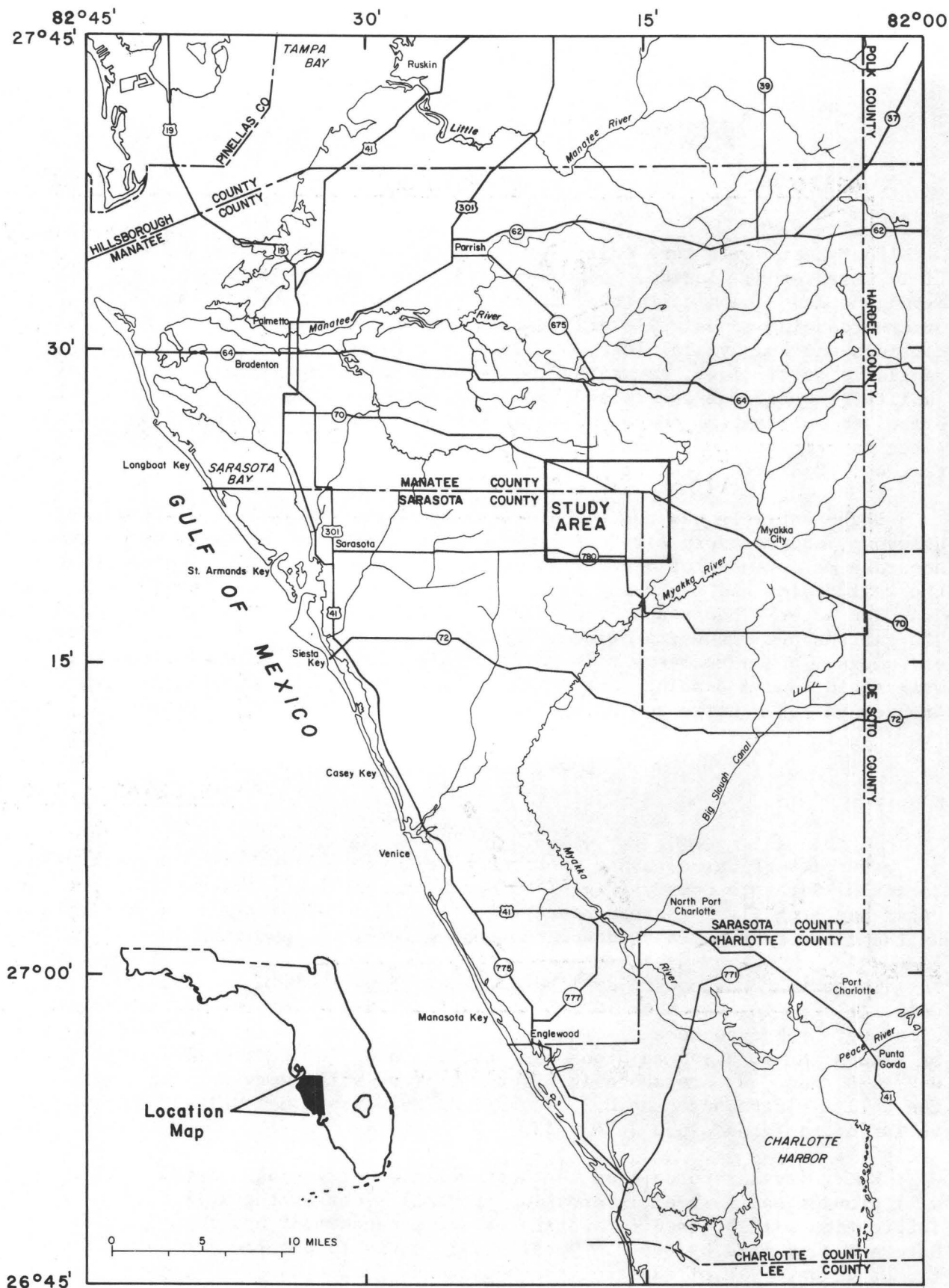


Figure 1.--Location of the study area.



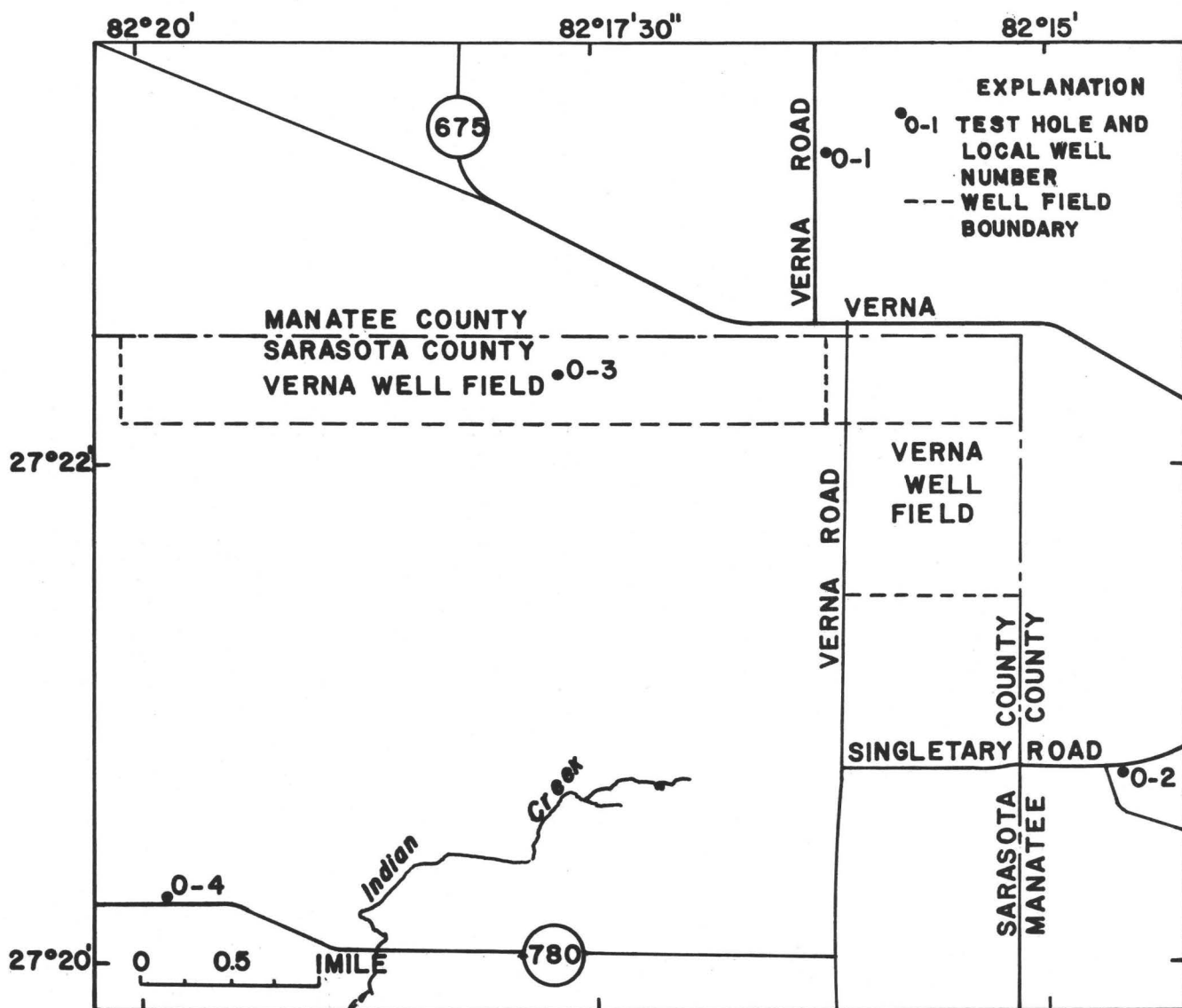


Figure 2.--Location of test wells.

## Purpose

The purposes of this report are: (1) to describe methods employed during well construction and procedures used for collecting water samples; and (2) to present data obtained during the test drilling program.

## Scope of the Test Well Program

The four test wells were drilled using the hydraulic rotary method. Hydrologic and geologic data collected during the drilling include:

1. Chemical quality of water from each water-bearing zone and a composite water sample from each completed well.
2. Cuttings of geologic material penetrated during drilling.
3. Yield of each well and recovery time to static water levels after pumping.
4. Geophysical logs for each well.

Construction of the test wells was patterned after the Verna well field production wells. The objective was to effectively monitor the principal water-bearing zones, isolating the shallow aquifers with grouted casing.

The test wells are used as observation wells for recording water-level fluctuations and for collecting water samples. Continuous water-level recorders have been installed on the wells to supplement information obtained at the well field.

## DRILLING AND WATER SAMPLE COLLECTING METHODS

A hydraulic rotary drilling rig was used to set 140 feet of 6-inch PVC casing in each well. The casing was grouted to the surface with neat cement. The cement plug was drilled out while still "elastic" to minimize fracturing of the grout and maintain a watertight seal around the casing.

To obtain formation samples of "cuttings" without contamination from shallower depths, drilling was stopped every 10 feet and the cuttings were circulated out of the hole using a thin mixture of bentonite drilling mud and water. After casing the well, clear water was used for circulating. This procedure was followed on all wells except test well 0-3 where circulation was lost to the formation at 330 feet and no more cuttings could be raised. Table 1 presents the drillers' log of each test well.

When a water-producing zone was encountered, drilling was stopped. The drill bit and stem were left at the bottom of the hole and the well was cleared of cuttings and drilling mud using compressed air lift. One hundred and ten

feet of 1/2-inch air line was submerged inside the drill stem and sealed at the top except for the discharge opening, as shown in figure 3. The static water level in the well was measured and the volume of water in the submerged drill stem was calculated. The inside diameter of the drill pipe was 2.9 inches, giving it a volume of 0.34 gallons per foot of submergence. The volume of water displaced by the air line was figured to be 1 gallon. This was subtracted from the total, leaving the amount of water that must be pumped from the drill stem before a sample could be collected.

For example, a sample depth of 180 feet below land surface with a static water level of 20 feet below land surface would have a submergence of 160 feet. This figure multiplied by 0.34 gallons per foot = 54.4 gallons - 1.0 gallon for airline = 53.4 gallons to be displaced before sample collection.

Using compressed air pumped down the 1/2-inch air line, water in the stem was lifted out. When the volume of water in the drill stem had been pumped out, a 5-gallon sample was collected. This sample represented water from the bottom of the hole.

Water-quality data obtained during the test drilling are given in table 2. Composite samples for the wells showed dissolved solids were 313 mg/L (milligrams per liter) in test well 0-1, 395 mg/L in 0-2, 583 mg/L in 0-4, and 728 mg/L in 0-3.

Water samples for analysis of radium-226 were also collected from each water-bearing zone. These samples all had radium-226 levels below the U.S. Environmental Protection Agency (1976) recommended maximum contaminant levels of 5.0 pCi/L (picocuries per liter), except on test well 0-1 where 5.9 pCi/L was recorded at a depth of 340 feet and on test well 0-2 where 7.4 pCi/L was recorded at 180 feet.

After the wells were completed, they were developed using air lift for an hour or more. Following development, geophysical logs were run (figs. 4-7). The logs included point-resistance and spontaneous-potential electric logs, gamma-ray, and caliper logs. A temperature log was also run on test well 0-1.

Each well was pumped using an engine-driven, 4-inch turbine pump to obtain discharge, drawdown, and recovery time as shown in table 3. Discharge measurements were made using a 4-inch orifice plate. A steel tape was used to measure water levels during drawdown and recovery.

The pumping tests indicate that test well 0-2 has a yield in excess of 376 gal/min. This yield was the maximum limit of the pumping equipment used. The drawdown of the well was 13.11 feet below the static water level after 3 hours and 50 minutes of pumping. Recovery time was 20 minutes. Test well 0-3, located in the well field, had a maximum yield of 320 gal/min, a drawdown of 31.91 feet after 2 hours and 35 minutes of pumping, and a recovery time of 20 minutes. Test wells 0-1 and 0-4 had drawdowns in excess of the intake setting of the pump (110 feet below land surface) when pumped at rates of 100 and 315 gal/min, respectively. Test well 0-4 had a drawdown of 63.34 feet when pumped at a rate of 200 gal/min for 2 hours and 35 minutes. A leaking pump column on test well 0-1 prevented accurate measurement of drawdown on the well.

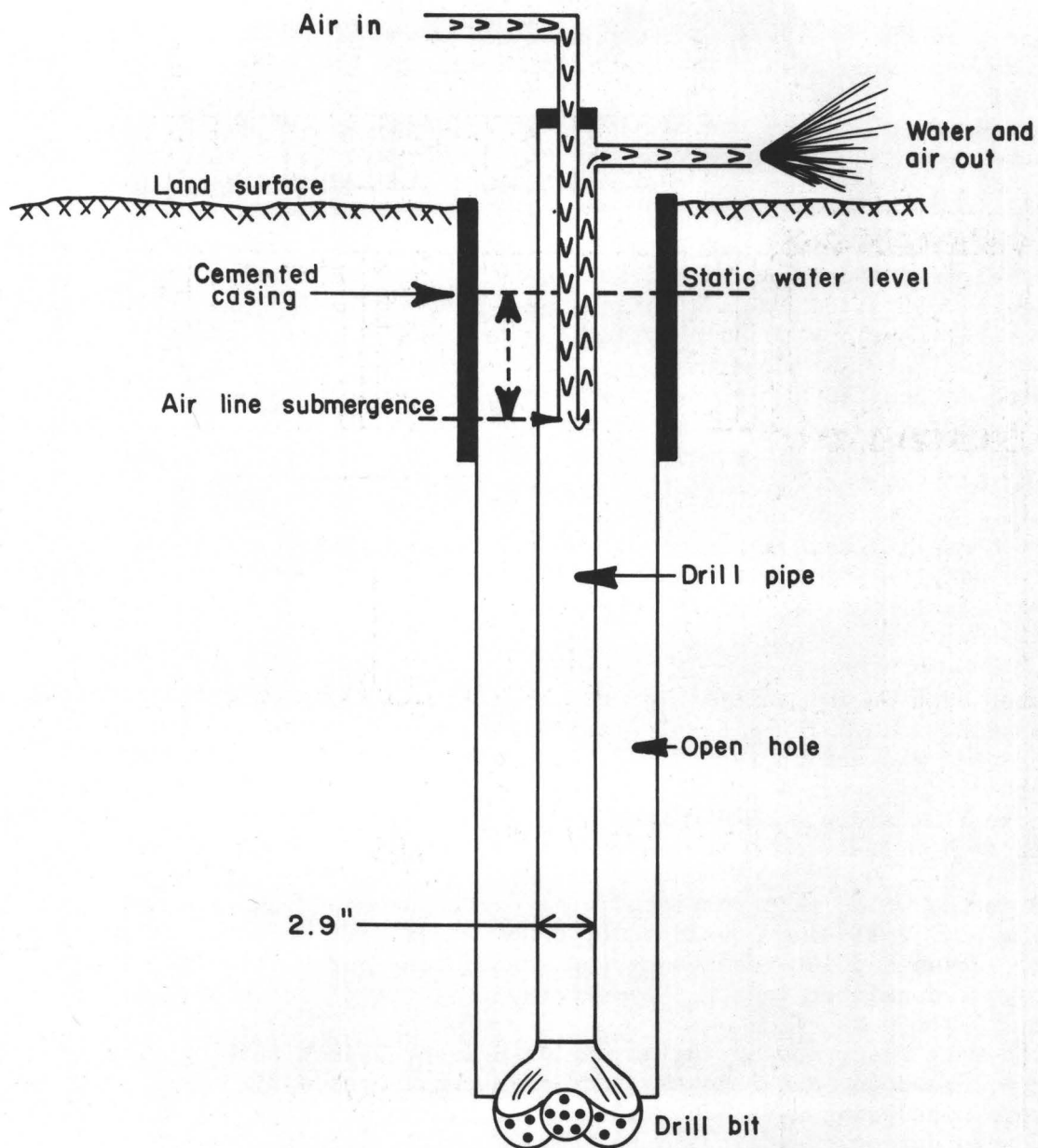


Figure 3.--Schematic diagram of airlift water sampling.

CITY OF SARASOTA 0-1  
(2724040821617.01)

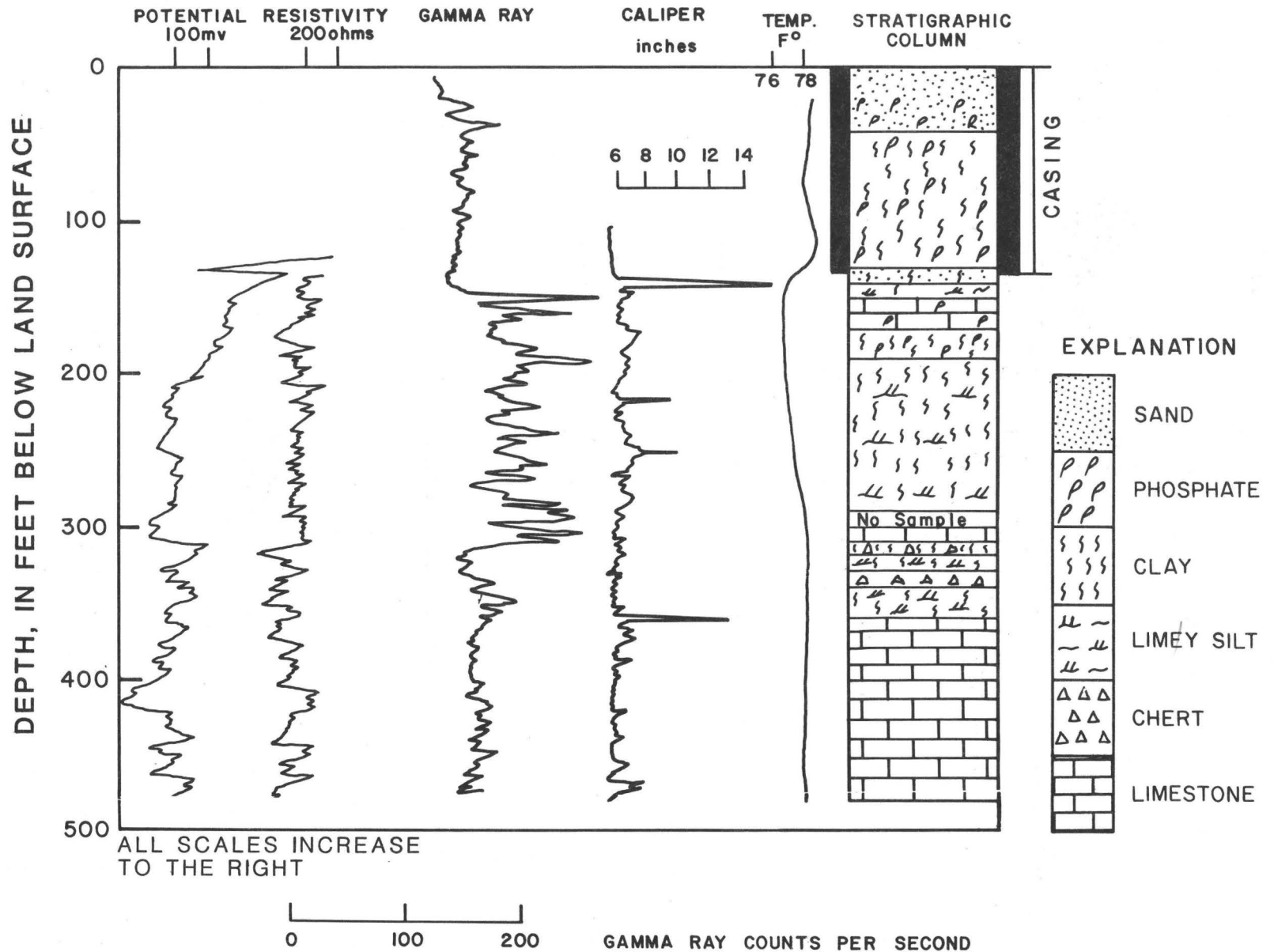


Figure 4.--Composite log for test well 0-1.

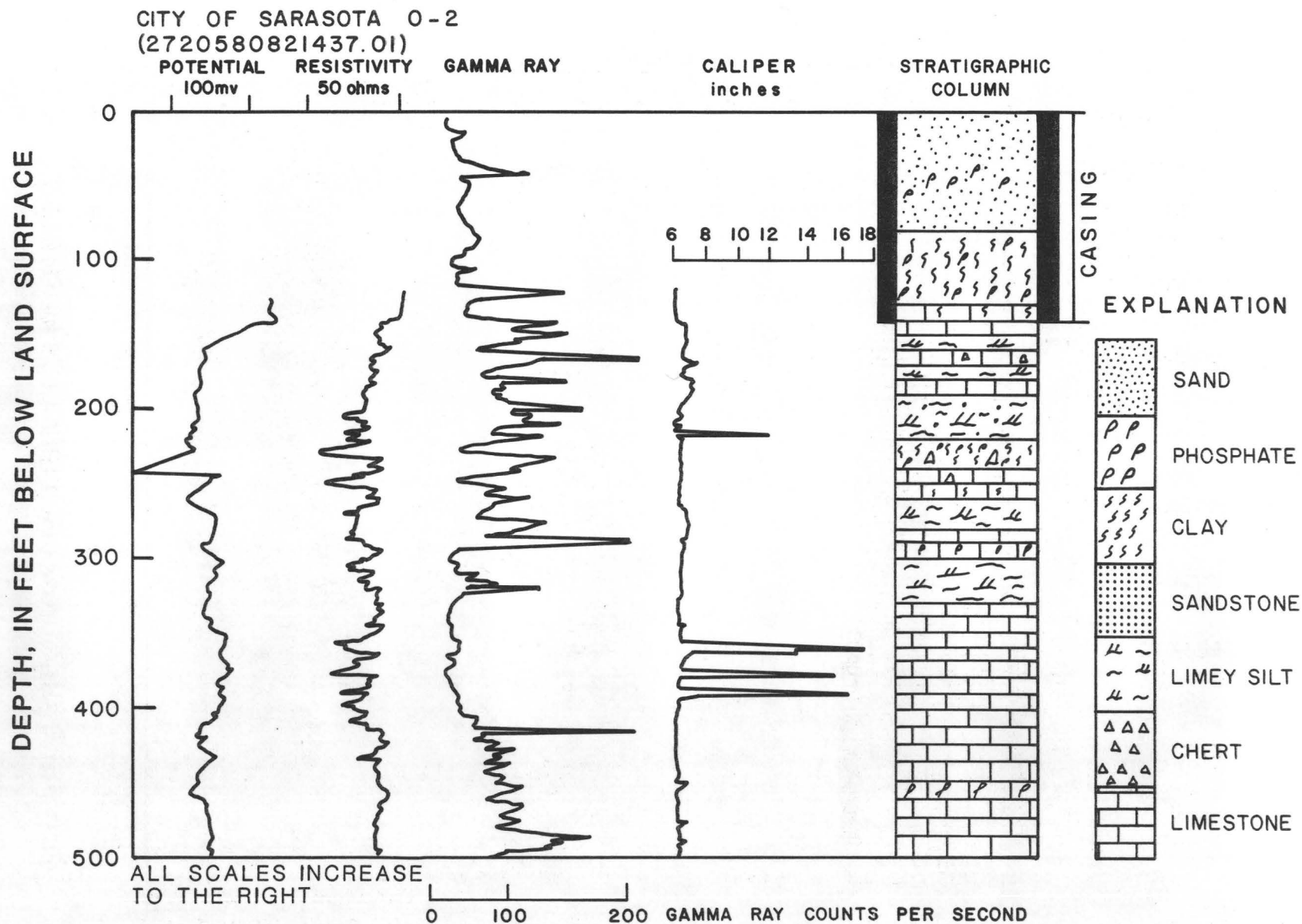


Figure 5.--Composite log for test well 0-2.

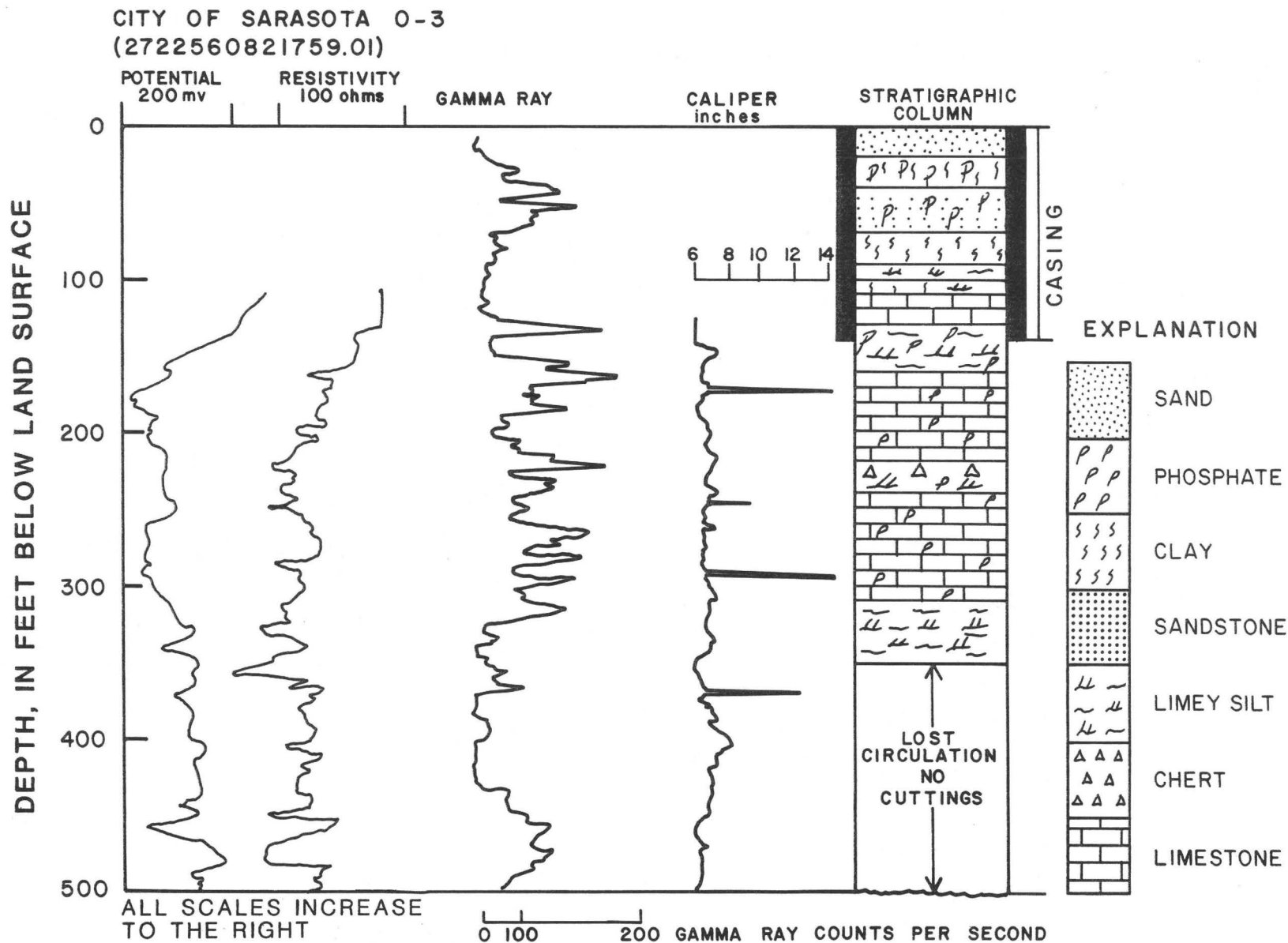
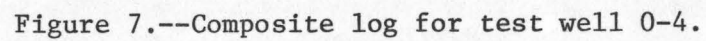


Figure 6.--Composite log for test well 0-3.







## SUMMARY

The hydraulic rotary method of well drilling makes it difficult to collect water samples from individual water-bearing zones without utilizing costly or time-consuming procedures. The airlift water sampling method proved to be economical, expedient, and accurate. Water samples were collected from each water-bearing zone encountered during drilling and a composite sample collected from each completed well. These samples represented water from producing zones of the city well field at Verna.

Dissolved solids in a composite water sample from each well ranged from 313 mg/L for test well 0-1 to 728 mg/L for test well 0-3. Test well 0-4 had dissolved solids of 583 mg/L and test well 0-2 had a total of 395 mg/L.

Test well 0-2 had a yield of 376 gal/min with 13.11 feet of drawdown after 3 hours and 50 minutes of pumping and a recovery time of 20 minutes; test well 0-3 yielded 320 gal/min with 31.91 feet of drawdown after 2 hours and 35 minutes of pumping and a recovery time of 20 minutes; and test well 0-4 had a yield of 200 gal/min with a drawdown of 63.91 feet after 2 hours and 35 minutes of pumping and a recovery time of 25 minutes.

Daily drillers' and lithologic logs were made for each well. Geophysical logs consisting of point resistance, potential electric, gamma-ray, and caliper were also run. Continuous water-level recorders on these test wells will provide information on water levels in and adjacent to the well field. The wells will provide a means for collecting water-quality samples in the future.

## SELECTED REFERENCES

- Joyner, B. F., and Sutcliffe, Horace, Jr., 1976, Water resources of the Myakka River basin area, southwest Florida: U.S. Geological Survey Water-Resources Investigations 76-58, 87 p.
- Sutcliffe, Horace, Jr., and Joyner, B. F., 1968, Test well exploration in the Myakka River basin area, Florida: Florida Bureau of Geology Information Circular 56, 61 p., 15 figs.
- U.S. Environmental Protection Agency, 1976, Interim primary drinking water regulations--promulgation of regulations on radionuclides: Federal Register, v. 41, no. 133, Friday, July 9, 1976, part II, pp. 28402-29409.
- Wolansky, R. M., Mills, L. R., and Woodham, W. M., 1978a, Water table in the surficial aquifer and potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, May 1978: U.S. Geological Survey Open-File Report 78-939.
- \_\_\_\_\_, 1978b, Water table in the surficial aquifer and potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, September 1978: U.S. Geological Survey Open-File Report 78-1045.

Table 1.--Drillers' logs of test wells

NAME: City of Sarasota 0-1  
 LOCATION: Bethany Road, Sarasota  
 COUNTY: Manatee  
 WELL NO: 272404 0821617.01  
 DAILY LOG: Robert Putnam, Driller

12-07-77 On site 9:10 a.m., clear and cold; started drilling at  
 10:10 a.m., 12-inch roller bit.

DEPTH  
(in feet)

0 - 12	Sand
12 - 14	Hardpan
14 - 16	Clay, light tan
16 - 25	Sand
25 - 36	Clay, tan and sand
36 - 47	Sand and sandstone
47 - 66	Clay, gray, slight shell with sand streak
66 - 67	Lime
67 - 77	Clay
77 - 105	Clay, gray to blue gray with sand and sandstone
105 - 111	Lime and clay
111 - 119	Clay, gray
119 - 121	Lime
121 - 128	Clay
128 - 140	Lime with clay

1:15 p.m. Circulating and lighten mud

2:10 p.m. Start logging

3:10 p.m. Complete logging

Set 140 feet of 6-inch PVC and grouted back to the sur-  
 face with 77 bags of cement.

5:30 p.m. Shut down

12-08-77 On site, clear and cold; started drilling at 9:00 a.m.,  
 6-inch roller bit, 10:10 a.m. top cement at 100 feet  
 drilled out to 140 feet.

140 - 142	Lime
142 - 151	Lime and clay

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-1  
PAGE: 2

DEPTH  
(in feet)

151 - 153	Clay, light tan
153 - 157	Lime, hard
157 - 165	Lime and clay, gray streaks, dark gray
165 - 168	Lime, hard gray
168 - 172	Clay, gray with lime
172 - 175	Lime and clay, gray
175 - 185	Clay, tan to blue gray
185 - 188	Lime, gray
188 - 190	Clay, gray
190 - 200	Lime, light gray and clay
200 - 210	Lime and clay streaks, gray
210 - 214	Lime, hard cherty
214 - 224	Clay, with lime streaks
224 - 264	Lime clay, gray
264 - 273	Lime, light gray
273 - 275	Clay

Stopped at 275 feet.

12-09-77

8:45 a.m. On site, static water level 43.10 below LSD.

275 - 280	Lime and clay
280 - 287	Clay, gray with lime
287 - 295	Lime with clay streaks
295 - 300	Lime, light gray

12-12-77

8:45 a.m. On site, static water level 41.50 below LSD.

9:15 a.m. Water sample collected from 300 feet by air lift. Drilling started at 9:55 a.m.

300 - 304	Lime, light gray to hard gray
304 - 309	Lime, gray with clay

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-1  
PAGE: 3

DEPTH  
(in feet)

309 - 317 Lime, gray with hard cherty streaks  
317 - 321 Clay, bright blue gray  
321 - 327 Clay, gray  
327 - 332 Lime, gray to brown cherty  
332 - 340 Clay, white with lime

12:20 p.m. Water sample collected from 340 feet by air lift.

340 - 356 Clay, gray with lime  
356 - 360 Lime, gray  
360 - 378 Lime, tan to gray, phosphate with white clay streaks  
378 - 394 Lime, tan to gray  
394 - 400 Lime, tan with gray and white clay

12-13-77

8:40 a.m. On site, partly cloudy, warm; water level 40.22 below LSD.

9:30 a.m. Water sample collected at 400 feet by air lift.

400 - 409 Lime, light brown with white phosphate  
409 - 418 Lime, hard  
418 - 432 Lime, light brown with white clay  
432 - 443 Lime, light brown with gray lime  
443 - 452 Lime, firm brown with white clay  
452 - 460 Lime, soft light brown to tan  
460 - 468 Lime, firm  
468 - 480 Lime, soft

4:00 p.m. Water sample collected at 480 feet by air lift. Water level 58.72 below LSD.

Finished, pulled drill pipe.

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-2  
 LOCATION: Singletary Road  
 COUNTY: Manatee  
 WELL NO: 272058 0821437.01  
 DAILY LOG: Robert Putnam, Driller

12-15-77 On site 8:40 a.m., humid, overcast; started drilling at  
 9:15 a.m., 11-inch roller bit.

DEPTH  
 (in feet)

0 - 6	Sand
6 - 8	Hardpan
8 - 18	Sand and sandstone streaks
18 - 30	Sand
30 - 48	Sand and gray slight shell
48 - 80	Gray shell, clay and sand
80 - 91	Clay, blue gray
91 - 97	Lime and clay, light gray
97 - 117	Clay, blue gray
117 - 120	Lime and clay
120 - 125	Lime, light gray
125 - 130	Lime and clay
130 - 139	Clay
139 - 140	Lime and clay, light tan

1:25 p.m. Started logging; bottom of hole logged at 140 feet,  
 140 feet of casing set and grouted at 5:20 p.m.

12-16-77

10:15 a.m. On site, began drilling using 6-inch roller bit. Humid  
 and overcast.

140 - 143	Lime and clay, light tan
143 - 146	Lime, light tan, phosphate, sandy
146 - 152	Lime, light brown and tan slight
152 - 160	Lime, gray with phosphate and clay
160 - 173	Lime, gray to tan phosphate
173 - 175	Lime with clay, light tan
175 - 181	Clay and lime, gray

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-2  
PAGE: 2

11:20 a.m. Water sample collected at 180 feet by air lift.

DEPTH  
(in feet)

181 - 187	Lime, gray, phosphate streaks
187 - 197	Clay, gray
197 - 204	Lime and clay streaks
204 - 207	Lime, hard gray, cherty
207 - 217	Lime, hard gray and clay, gray streaks
217 - 226	Lime, tan and clay streaks
226 - 233	Clay, blue gray
233 - 235	Clay
235 - 255	Lime, clay gray
255 - 295	Lime, clay, gray
295 - 300	Lime, light brown with clay

2:45 p.m. Water sample collected at 300 feet by air lift.

12-19-77

9:05 a.m. On site, clear and cold; water level 42.35 feet below LSD.  
No apparent caving of hole over the weekend.

300 - 320	Lime and clay, gray
320 - 325	Lime
325 - 331	Lime and clay streaks, gray
331 - 345	Lime, light brown with gray lime
345 - 349	Lime, firm, light brown with clay
349 - 376	Lime, sandy, soft brown with clay
376 - 400	Lime, light sandy brown with gray lime

1:10 p.m. Water sample taken at 400 feet, water level 74.00 feet below LSD.

400 - 408	Lime, light tan and gray
408 - 428	Lime, light tan, firm
428 - 460	Lime, soft
460 - 470	Lime, soft, creamy

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-2  
PAGE: 3

12-20-77

9:05 a.m. On site, cold and clear; water level 42.46 feet below LSD.

DEPTH  
(in feet)

470 - 489 Lime, soft, creamy

489 - 500 Lime, light tan, soft

11:00 a.m. Water sample collected at 500 feet by air lift.

500 - 530 Lime, light tan, soft

12-20-77

2:00 p.m. Stopped drilling, blew hole, blowing 300+ gal/min at 180  
pounds air pressure.

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-3  
 LOCATION: Verna Well Field  
 COUNTY: Sarasota  
 WELL NO: 272256 0821759.01  
 DAILY LOG: Robert Putnam, Driller

12-26-77

8:30 a.m. On site, partly cloudy, cold; started drilling at 9:15 a.m., 11-inch roller bit.

DEPTH  
(in feet)

0 - 24	Sand
24 - 48	Sandy clay, sandy, gray
48 - 53	Clay, blue gray
53 - 78	Clay, gray
78 - 88	Lime and clay, gray
88 - 103	Clay, gray green
103 - 108	Lime and clay, gray
108 - 112	Clay
112 - 133	Lime, gray to light tan
133 - 140	Lime and clay, light gray

11:50 a.m. Finished, logged to 141 feet by Southwest Florida Water Management District. Set and grouted 140 feet, 6-inch casing.

12-27-77 Cold, heavy frost, 6-inch roller bit.

140 - 143	Clay, gray
143 - 148	Clay, tan
148 - 151	Clay, blue gray
151 - 160	Lime and clay, streaks, gray
160 - 164	Lime, tan, some phosphate
164 - 171	Lime, gray, phosphate
171 - 186	Lime and clay, gray
186 - 193	Clay, gray with lime
193 - 205	Lime, with clay streaks; tried blowing water at 200 feet - none
205 - 215	Clay, gray with phosphate and lime
215 - 226	Lime and clay streaks, gray



Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-3  
PAGE: 2

DEPTH  
(in feet)

226 - 230 Lime, blue gray with lime gray chert  
230 - 246 Clay, clay with lime and phosphate  
246 - 256 Lime and clay streaks, light gray  
256 - 258 Lime and clay streaks, gray  
258 - 266 Lime  
266 - 273 Lime and clay streaks

1:30 p.m. Water sample collected at 270 feet, not much water, blowing approximately 50 gal/min, sample no. 366.

273 - 283 Lime, gray  
283 - 316 Lime and clay  
316 - 320 Clay, dark gray  
320 - 330 Clay

12-28-77

8:30 a.m. On site, water level 74.06 feet below LSD.

330 - 340 Clay  
No return on samples (samples no good).  
340 - 350 Lime with clay  
350 - 360 Lime, hard with clay streaks  
360 - 362 Lime, soft, light brown with hard streaks  
362 - 400 Cannot get enough water to bring cuttings to surface. No cuttings from 362 to 400 feet.

1:00 p.m. Collected water sample no. 367; 80 minutes to pump 75 gallons, bit plugged, no cuttings return at 400 feet.

400 - 439 Lime, hard, and soft streaks, phosphate  
439 - 455 Lime, with clay  
Stopped, blew hole.

12-29-77

9:00 a.m. On site, very hard, drilled 3 feet, broke 2 drill bits.  
Water level 73.78 feet below LSD.

1-03-78

1:30 p.m. Started drilling at 456 feet, tungsten carbide button bit.  
Water level 74.78 feet below LSD.

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-3  
PAGE: 3

DEPTH  
(in feet)

455 - 457	Lime, hard
457 - 463	Hard, cherty lime Came out of hard material at 463 feet.
463 - 475	Lime, firm
475 - 490	Lime, soft
490 - 493	Lime, hard
493 - 500	Lime, soft and hard streaks Bottom of hole 500 feet at 4:00 p.m.

1-04-78

9:50 a.m. On site, blew hole, collected water sample.

Table 1.--Drillers' logs of test wells---Continued

NAME: City of Sarasota 0-4  
 LOCATION: Myakka Ranch  
 COUNTY: Sarasota  
 WELL NO: 272020 0821948.01  
 DAILY LOG: Robert Putnam, Driller

1-09-78 On site 8:40 a.m., partly cloudy, cold and **very windy**;  
 started drilling with 12-inch roller bit at 10:20 a.m.

DEPTH  
(in feet)

0 -	3	Sand
3 -	8	Hardpan, green clay
8 -	14	Clay, gray
14 -	18	Sand
18 -	20	Clay

Shut down, awaited clearance on right-of-way.

1-10-78

8:20 a.m. On site, clear, very cold; started drilling at 9:00 a.m.

20 -	37	Clay, gray with sand streaks
37 -	42	Lime, light gray to brown
42 -	44	Clay, gray
44 -	47	Lime, gray
47 -	49	Clay, gray
49 -	51	Lime
51 -	61	Clay, blue gray
61 -	62	Lime, with clay
62 -	66	Clay, blue gray
66 -	69	Lime, light gray
69 -	71	Clay
71 -	75	Lime and clay
75 -	79	Lime, light gray
79 -	84	Lime and clay, light gray
84 -	95	Lime, light gray
95 -	100	Lime, hard
100 -	107	Lime and clay
107 -	111	Lime, hard
111 -	140	Lime and clay

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-4  
PAGE: 2

12:25 p.m. Finished, set, and grouted 140 feet of 6-inch PVC casing at 5:40 p.m.

1-13-78

8:40 a.m. On site, clear, cold; drilled out 5 feet of cement; started drilling at 10:15 a.m.

DEPTH  
(in feet)

140 - 143	Lime and clay
143 - 152	Clay with lime streaks, gray
152 - 155	Lime
155 - 165	Clay with lime, gray
165 - 185	Lime and clay, gray
185 - 192	Lime with clay streaks, light gray
192 - 203	Clay with lime, gray
203 - 223	Lime and clay streaks
223 - 242	Lime and clay, tan
242 - 248	Lime, cherty gray
248 - 258	Lime and clay streaks
258 - 268	Clay, blue gray
268 - 270	Lime, hard gray cherty
270 - 279	Lime and clay
279 - 282	Lime, hard gray
282 - 294	Lime and clay
294 - 299	Lime, hard with clay streaks
299 - 300	Lime, brown

2:30 p.m. Water sample collected at 300 feet by air lift.

300 - 320	Lime, brown and gray sandstone, phosphate
-----------	---

1-12-78

9:00 a.m. On site, cold, clear; water level 18.88 feet below LSD.

320 - 335	Lime, tan and gray sandstone
335 - 346	Lime, tan and gray sandstone, clay, white
346 - 366	Lime, brown with white clay

Table 1.--Drillers' logs of test wells--Continued

NAME: City of Sarasota 0-4  
PAGE: 3

DEPTH  
(in feet)

366 - 374 Lime, light brown with white clay  
374 - 378 Lime, hard, light tan, dense  
378 - 391 Lime, soft brown with white clay  
391 - 400 Lime, brown

11:45 a.m. Water sample collected at 400 feet by air lift; sample lab  
no. 09; water level 72.2 feet below LSD.

400 - 415 Lime, brown with gray  
415 - 437 Lime, brown and light gray and tan clay  
437 - 442 Lime, brown  
442 - 447 Clay, tan  
447 - 448 Lime, hard, brown cherty  
448 - 453 Clay, tan  
453 - 457 Lime, hard, dense, cherty  
457 - 462 Lime, hard, dense with soft streaks, cherty; drilled 55 minutes  
to drill 10 feet  
462 - 468 Lime, light brown  
468 - 478 Clay, light, gray with lime  
478 - 480 Lime, brown

4:10 p.m. Stopped.

1-13-78

8:30 a.m. On site, wind, rain; water level 20.0 feet below LSD.  
Started drilling at 10:55 a.m.

480 - 485 Lime, brown  
485 - 490 Lime, light tan  
490 - 495 Lime, light brown  
495 - 500 Lime, very light tan

12:45 p.m. Blew hole for 1 hour at 500 feet. Collected water  
sample by air lift.

Table 2.--Chemical analyses of water from test wells

Station number	Date of sample	Time	Sampling depth (ft)	Color (platinum-cobalt units)	Alkalinity (mg/L as CaCO <sub>3</sub> )	Bicarbonate (mg/L as HCO <sub>3</sub> )	Carbonate (mg/L as CO <sub>3</sub> )	Hardness (mg/L as CaCO <sub>3</sub> )	Hardness, noncarbonate (mg/L as CaCO <sub>3</sub> )	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO <sub>4</sub> )	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO <sub>2</sub> )	Strontium, dissolved (ug/L as Sr)	Radium 226, dissolved, radon method (pCi/L)	Solids, residue at 180°C, dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)
272404082161701 No. 0-1	77-12-12	0900	300	10	190	230	0	210	21	52	19	26	2.7	27	37	1.6	48	1,300	2.5	341	328
	77-12-12	1220	340	12	190	230	0	380	190	88	39	31	3.0	48	170	1.9	47	310	5.9	571	542
	77-12-13	0930	400	12	110	130	0	730	620	170	70	40	4.0	81	560	1.3	39	13,000	4.1	1,120	1,040
	77-12-13	1600	480	18	140	170	0	460	320	98	48	18	2.8	27	310	1.2	33	16,000	2.8	686	638
	*78-02-01	1330	480	10	230	280	0	230	0	54	22	20	2.1	17	14	1.5	48	2,300	---	313	319
272058082143701 No. 0-2	77-12-16	1120	180	7	130	160	0	200	70	55	15	22	2.4	21	82	1.3	40	1,800	7.4	282	319
	77-12-16	1445	300	3	170	210	0	180	3	34	21	19	2.5	10	21	2.0	50	3,100	4.7	278	266
	77-12-19	1310	400	4	190	230	0	200	14	37	25	19	2.8	12	29	2.2	42	6,800	1.0	308	289
	77-12-20	1100	500	4	170	210	0	320	150	66	34	15	2.5	18	140	1.4	30	12,000	1.2	453	422
	*78-02-02	1550	530	10	160	200	0	280	120	59	30	14	2.3	14	120	1.2	32	11,000	---	395	382
272256082175901 No. 0-3	77-12-27	1330	270	10	130	160	0	560	430	130	54	24	3.3	34	400	1.8	39	12,000	4.8	826	777
	78-01-04	0950	500	10	170	210	0	480	300	97	51	17	3.6	20	290	2.0	28	20,000	3.0	670	632
	*78-02-03	1550	500	10	160	200	0	510	340	100	57	17	3.3	19	340	1.9	30	21,000	---	728	688
272020082194801 No. 0-4	78-01-11	1430	300	14	180	220	0	180	4	33	23	32	5.9	37	16	3.1	40	6,800	.2	297	305
	78-01-12	1145	400	4	190	230	0	210	18	40	23	28	4.2	23	39	2.1	26	11,000	1.2	301	310
	78-01-13	1245	500	6	140	170	0	740	600	140	88	16	3.6	19	520	1.4	24	28,000	3.2	925	924
	*78-02-06	1650	500	10	160	200	0	380	220	78	41	24	3.8	22	240	1.9	29	18,000	---	583	556

\*Composite sample from completed well.

Table 3.--Data from test pumping of test wells

Well number	Depth (ft)	Date	Time	Pumping rate (gal/min)	Water level (ft below measuring point)	Drawdown (ft)	Remarks
0-2	530	2-02-78	1200		39.69		Static water level.
			1210	100	41.96	2.27	
			1220	100	41.80	2.11	
			1230	100	41.85	2.16	
			1235	100	42.26	2.57	
			1245	100	42.43	2.74	
			1255	100	42.88	3.19	
			1300	100	42.90	3.21	
			1310	100	42.73	3.04	
			1325	100	42.80	3.11	
			1330	100	42.80	3.11	
			1340	100	42.80	3.11	
			1345	200	46.20	6.51	
			1350	200	45.92	6.23	
			1355	200	45.80	6.11	
			1400	200	46.12	6.43	
			1405	200	45.77	6.08	
			1410	200	45.92	6.23	
			1415	200	45.85	6.16	
			1425	200	46.46	6.77	
			1430	200	46.07	6.38	
			1435	200	46.06	6.37	
			1450	200	46.06	6.37	
			1455	200	46.08	6.39	
			1515	346	52.40	12.71	
			1535	376	52.70	13.01	
			1550	376	52.80	13.11	
			1550	recovery			Pump shut down.
			1555		41.64	1.95	
			1605		40.53	.84	
			1610		39.68	-.01	
0-3	500	2-03-78	1320		66.69		Static water level.
			1345	100	75.49	8.80	
			1400	100	73.75	6.06	
			1405	100	73.65	6.96	
			1410	100	73.75	7.06	
			1420	100	74.00	7.31	
			1425	100	74.25	7.56	
			1435	100	74.00	7.31	
			1445	100	74.05	7.36	
			1450	150	79.00	12.31	
			1500	150	79.45	12.76	

Table 3.--Data from test pumping of test wells--Continued

Well number	Depth (ft)	Date	Time	Pumping rate (gal/min)	Water level (ft below measuring point)	Drawdown (ft)	Remarks
0-3	500	2-03-78	1510	150	79.60	12.91	Pump shut down.
			1520	150	80.05	13.56	
			1530	150	80.25	13.56	
			1540	150	80.23	13.54	
			1550	150	80.25	13.56	
			1555	320	98.60	31.91	
			recovery				
			1605		69.28	2.59	
			1615		68.55	1.86	
0-4	500	2-06-78	1415		18.61		Static water level.
			1425	150	53.34	34.73	
			1430	150	54.81	36.20	
			1450	100	46.45	27.84	
			1455	100	47.00	28.39	
			1500	100	47.35	28.74	
			1505	100	47.54	28.93	
			1510	100	47.68	29.07	
			1515	100	48.00	29.39	
			1520	100	48.23	29.62	
			1525	100	48.42	29.81	
			1530	100	48.22	29.61	
			1535	100	48.39	29.78	
			1540	100	48.14	29.80	
			1550	200	68.54	49.93	
			1600	200	79.59	60.98	
			1605	200	80.40	61.79	
			1615	200	80.90	62.29	
			1620	200	80.87	62.26	
			1625	200	80.94	62.33	
			1635	200	82.00	63.39	
			1645	200	82.00	63.39	
			1650	200	81.95	63.34	
			recovery				Pump shut down.
			1705		26.27	7.66	
			1708		22.60	3.99	
			1713		23.54	4.93	
			1718		23.57	4.96	
			1720		22.00	3.39	
			1721		21.95	3.34	
			1725		20.23	1.62	
			1730		22.17	3.56	