UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1977 WATER YEAR

OPEN-FILE REPORT 80-345

Prepared in cooperation with
PINELLAS COUNTY, FLORIDA

CONVERSION FACTORS

For readers who may prefer to use SI (metric) units rather than inch-pound units, conversion factors for terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain SI (metric) unit
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
Million gallons per day (Mgal/d)	0.0438	cubic meter per second (m^3/s)

* * * * * * * * * * * *

mean sea level (msl)	---	National Geodetic Vertical Datum of 1929 (NGVD of 1929)

Abbreviations

mg/L = milligrams per liter

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1977 WATER YEAR

By B. F. Joyner and J. M. Gerhart

Open-File Report 80-345

Prepared in cooperation with

PINELLAS COUNTY, FLORIDA

Tallahassee, Florida

1980

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, Secretary

GEOLOGICAL SURVEY

H. William Menard, Director

For additional information write to:

U.S. Geological Survey
Water Resources Division
325 John Knox Road, Suite F-240
Tallahassee, Florida 32303

CONTENTS

Page

Abstract ---------- 1
Introduction ---------- 2
Observation-well network ---------- 2
Surficial aquifer monitor wells ---------- 6
Floridan aquifer monitor wells ---------- 6
Production zone ---------- 6
Freshwater-saltwater interface ---------- 6
Hydrologic conditions ---------- 6
Rainfall ---------- 6
Ground-water levels ---------- 10
Surficial aquifer ---------- 10
Floridan aquifer ---------- 10
Water quality ---------- 20
Water use ---------- 28
Summary ---------- 31
Modifications in observation-well network, 1977 ---------- 31
Proposed modifications ---------- 32
Selected references ---------- 33

ILLUSTRATIONS

Page

Figure 1. Map showing locations of observation wells in and near Eldridge-Wilde and East Lake Road well fields ---------- 3

2. Generalized cross sections showing well depths, casing depths, and open-hole intervals of observation wells in and near Eldridge-Wilde and East Lake Road well fields ---------- 4

3. Hydrogeologic cross section through East Lake Road and Eldridge-Wilde well fields ---------- 5

4. Graph showing monthly rainfall at Eldridge-Wilde well field near Odessa, 1974-77 water years ---------- 11

5-12. Maps showing--

5. Water-level contours in surficial aquifer, May 1976 ---------- 12

6. Water-level contours in surficial aquifer, September 1976 ---------- 13

7. Water-level contours in surficial aquifer, May 1977 ---------- 14

8. Water-level contours in surficial aquifer, September 1977 ---------- 15

9. Potentiometric-surface contours in Floridan aquifer, May 1976 ---------- 16

10. Potentiometric-surface contours in Floridan aquifer, September 1976 ---------- 17

Page

11. Potentiometric-surface contours in Floridan aquifer, May 1977 ---------- 18
12. Potentiometric-surface contours in Floridan aquifer, September 1977 ---------- 19

13-18. Graphs showing--
13. Monthly means of daily maximum water levels in observation well 2S deep, 1975-77 water years ---------- 21
14. Monthly means of daily maximum water levels in observation well 113A, 1975-77 water years ---------- 22
15. Monthly means of daily maximum water levels in observation well N-2, 1975-77 water years ---------- 23
16. Monthly means of daily maximum water levels in observation well 139G, 1975-77 water years ---------- 24
17. Chloride concentrations in water from observation well North Lake Tarpon, 1977 water year ---------- 25
18. Chloride concentrations in water from 730-foot depth in observation well S.W. deep, 1977 water year ---------- 26

19. Cross section showing approximate location of 250 milligram per liter chloride line in the Floridan aquifer, September 1977 ---------- 29
20. Graph showing monthly pumpages from Cypress Creek, East Lake Road, and Eldridge-Wilde well fields, 1975-77 water years -- 30

TABLES

Page

Table 1. Observation wells that tap the surficial aquifer ---------- 7
2. Observation wells that tap the Floridan aquifer ---------- 8
3. Observation wells that penetrate the freshwater-saltwater interface ---------- 9
4. Chloride concentrations in water from selected observation wells ---------- 27

HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1977 WATER YEAR

By B. F. Joyner and J. M. Gerhart

ABSTRACT

The report evaluates the observation-well network used to monitor water levels and water quality in the vicinity of the two well fields. The well fields are part of the water-supply system that serves several municipalities and unincorporated areas in Pinellas County, Florida. Network modifications to improve the monitoring of the hydrologic system are proposed.

The Southwest Florida Water Management District has established regulatory water-level and water-quality limits in several observation wells. Water levels did not drop below regulatory limits during the 1977 water year. Water from two deep wells west of Eldridge-Wilde well field exceeded the regulatory limits for chloride concentrations. The position of the 250 milligram per liter chloride line is shown in cross section in the vicinity of Eldridge-Wilde well field in September 1977.

INTRODUCTION

The Eldridge-Wilde and East Lake Road well fields are located northeast and east of Lake Tarpon in northeast Pinellas County (fig. 1). Part of the Eldridge-Wilde well field extends into the northwest part of Hillsborough County. The well fields, operated by Pinellas County, supply water to several municipalities and unincorporated areas of Pinellas County.

The Southwest Florida Water Management District has established restrictions on the withdrawal of water from the Eldridge-Wilde and East Lake Road well fields to prevent deterioration of water quality by lateral or upward movement of saltwater. The restrictions on pumpage are based on minimum water levels and water-quality standards. To insure that any violation of these restrictions is detectable, an evaluation of the observation-well network in this area is needed.

The purpose of this report is to describe and evaluate the observation-well network in the vicinity of the Eldridge-Wilde and East Lake Road well fields. Water-level and water-quality data obtained during the 1977 water year (October 1, 1976-September 30, 1977) are presented. Selected data from previous years are included to provide an indication of trends.

The observation-well network in the Eldridge-Wilde and East Lake Road well-field area consists of 15 surficial aquifer wells (10 to 31 feet deep) and 38 Floridan aquifer wells (29 production-zone wells, 90 to 608 feet deep, and 9 saltwater-monitoring wells, 310 to 1,200 feet deep). In addition, the production wells in both fields are sampled monthly for chemical analysis. The observation-well network is maintained by the Pinellas County Water System and the U.S. Geological Survey.

The authors appreciate the assistance of Richard Sweet of Black, Crow and Eidsness, Inc., for furnishing information on some of the wells cited in the report. Acknowledgment is also given to Pickens C. Talley, II, Director, succeeded by Terry W. Knepper, Acting Director of the Pinellas County Water System, for supplying records of wells that were monitored by that agency.

OBSERVATION-WELL NETWORK

The observation wells in the network at the Eldridge-Wilde and East Lake Road well fields are finished in the surficial aquifer and the Floridan aquifer; some of the wells, mostly those of greater depth, penetrate the freshwater-saltwater interface. Figure 1 shows the locations of the observation wells. Figure 2 shows the depths, casing depths, and open intervals (where known) of the observation wells in a diagrammatic west-east cross section. A generalized section (A-A') from Brooker Creek shallow well to northeast of Lake Dan is shown in figure 3; the line of section, A-A', is shown in figure 1.

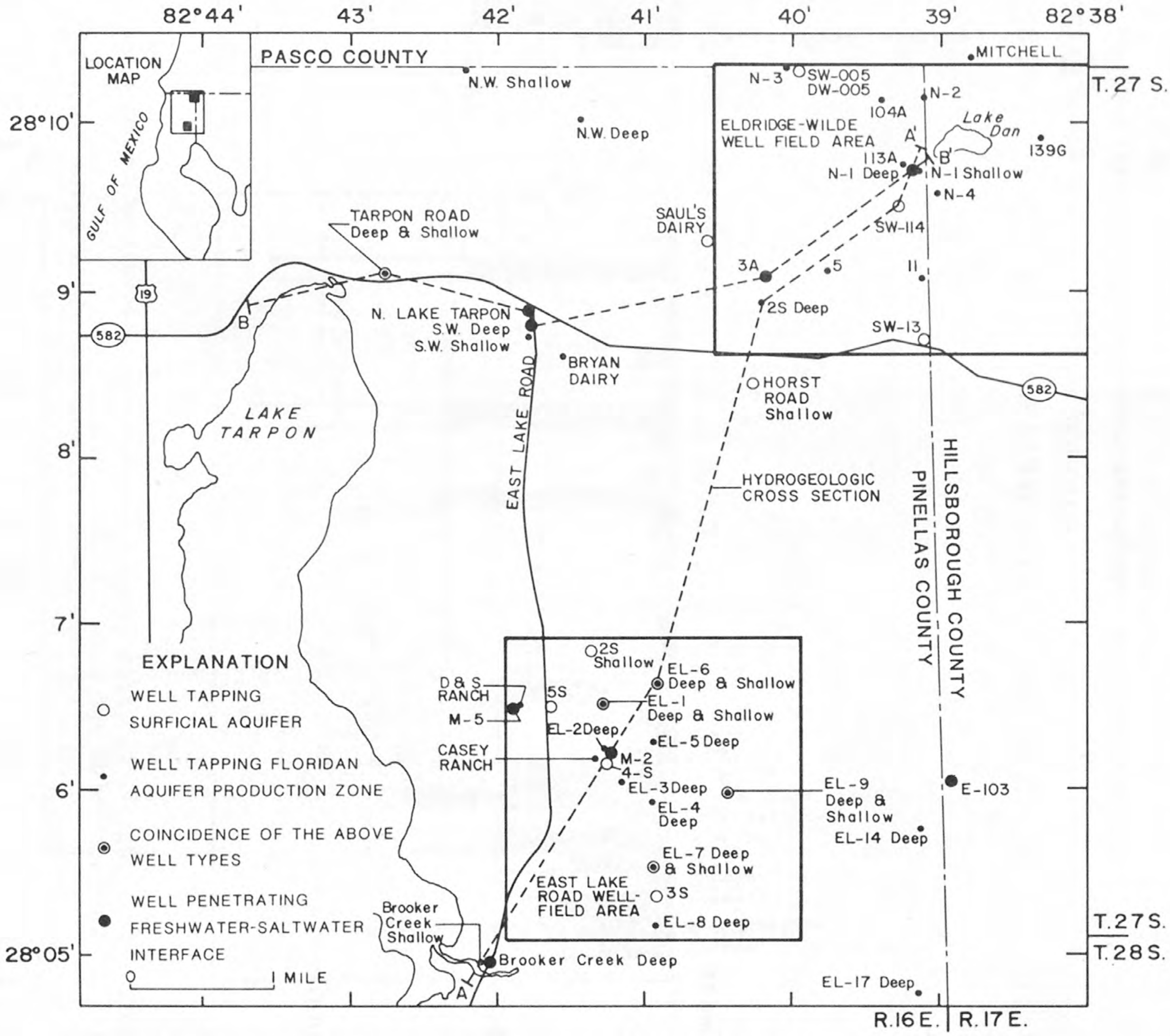

Figure 1.--Locations of observation wells in and near Eldridge-Wilde and East Lake Road well fields.

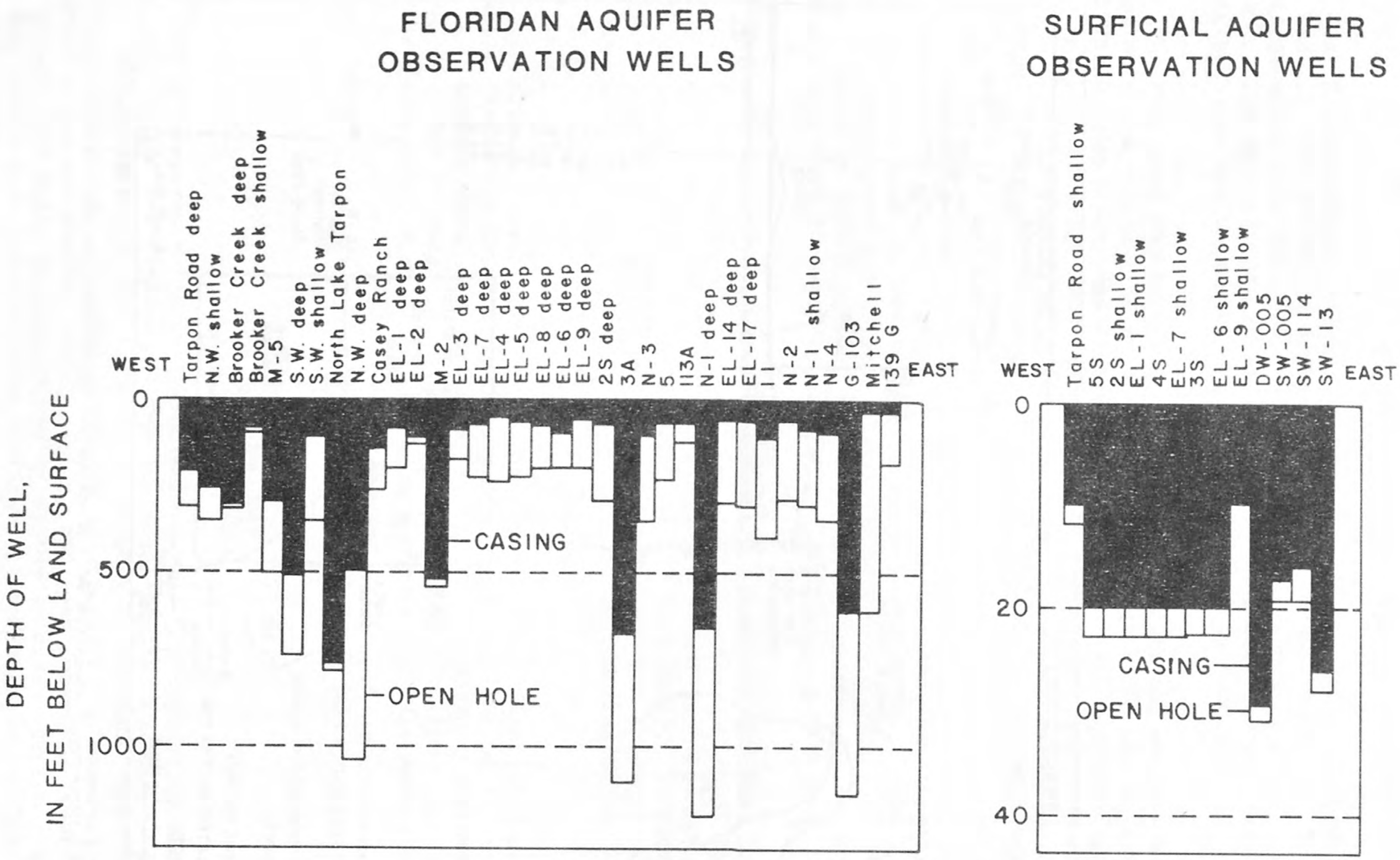

Figure 2.--Well depths, casing depths, and open-hole intervals of observation wells in and near Eldridge-Wilde and East Lake Road well fields.

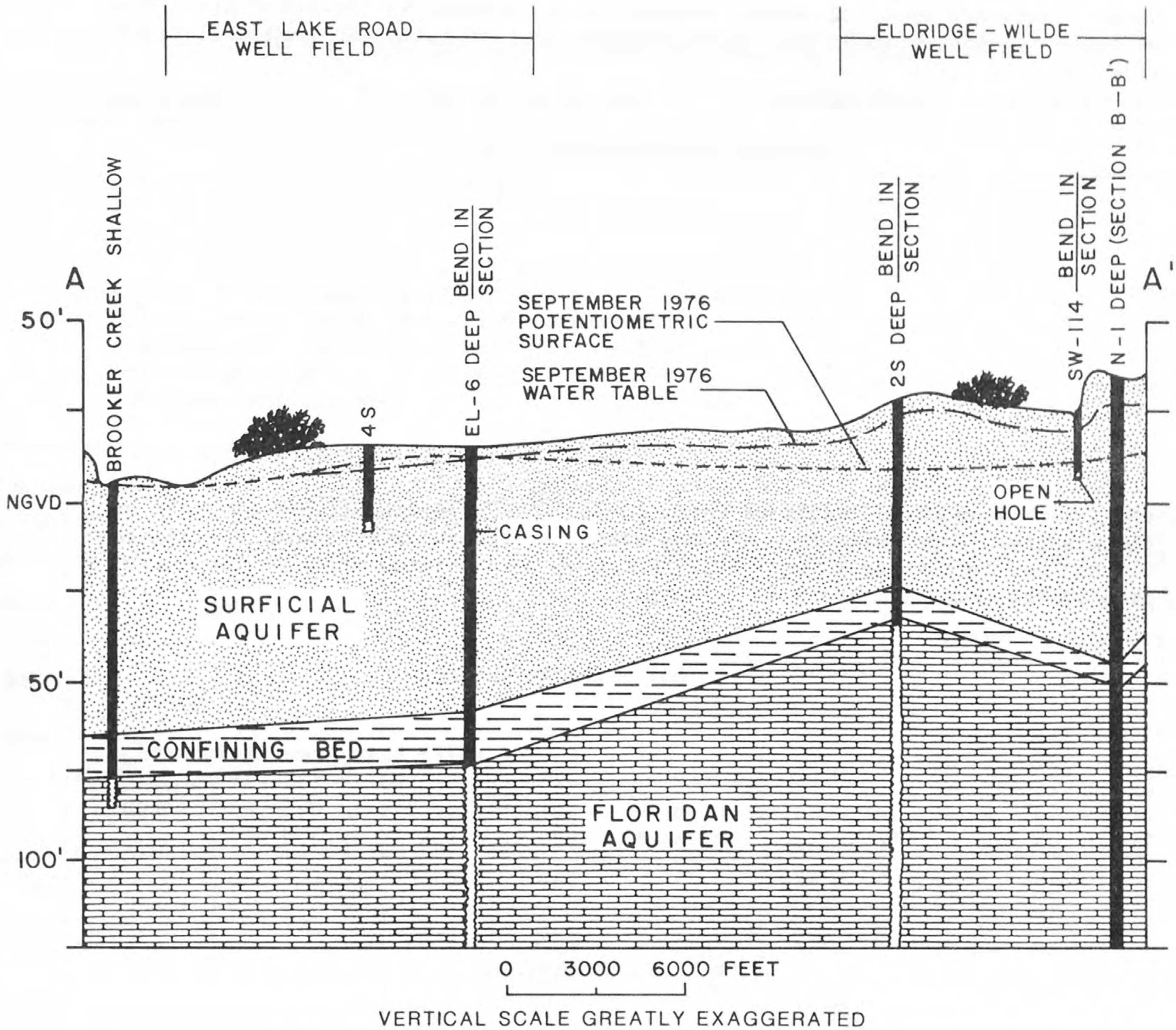

Figure 3.--Hydrogeologic cross section through East Lake Road and Eldridge-Wilde well fields (location of section shown in figure 1).

Surficial Aquifer Monitor Wells

The observation-well network includes 15 wells that tap the surficial aquifer (table 1). Of these 15 wells, 7 have been designated by the Southwest Florida Water Management District as water-level regulatory wells. As of the 1977 water year, regulatory levels had not been established for these wells. Water levels are measured weekly in well 4S and monthly in the other six. Most of these regulatory wells are in the western part of East Lake Road well field (fig. 1).

Floridan Aquifer Monitor Wells

Production Zone

Table 2 lists 29 observation wells that tap the production zone in the Eldridge-Wilde and East Lake Road well fields. Wells EL-1 deep through EL-8 deep are also the production wells in East Lake Road well field. The others are used only for observation. The 58 production wells in the Eldridge-Wilde well field, not listed in the table, are sampled monthly for chemical analysis.

Seventeen of the wells listed in table 2 have been designated regulatory wells by the Southwest Florida Water Management District. As of the 1977 water year, limits on water levels or water quality had been established on eight of these wells. Four wells have minimum water-level regulatory limits ranging from 4.0 to 16.0 feet above NGVD of 1929, and four have maximum chloride concentration limits ranging from 50 to 1,200 mg/L.

Freshwater-Saltwater Interface

Table 3 lists nine observation wells, six of which have been designated as regulatory wells, used to monitor the freshwater-saltwater interface. As of the 1977 water year, maximum chloride concentration limits have been established on four of the wells. The limits range from 150 to 10,500 mg/L.

HYDROLOGIC CONDITIONS

Rainfall

Several rain-gage stations are operated in the two well fields and adjacent areas. U.S. National Weather Service (formerly U.S. Weather Bureau) records are available for Clearwater, 17 years; Tarpon Springs, 89 years; and Tampa, 87 years. The U.S. Geological Survey has collected daily rainfall data from a recording station in the Eldridge-Wilde well field since April 1973. The monthly rainfall at this station for the 1974, 1975, 1976, and 1977 water

Table 1.--Observation wells that tap the surficial aquifer

Monitoring agency: USGS, U.S. Geological Survey; PCWS, Pinellas County Water System.
Parameter monitored and frequency: Sb, stage-bimonthly; Sm, stage-monthly, Sw, stage-weekly; Sr, stage-recorder.

Well	Depth (ft)	Casing depth (ft)	Diameter (in.)	Monitoring agency	Parameter monitored and frequency	Regulatory limits		Monitoring purpose
						Water level (ft above NGVD of 1929)	Chloride (mg/L)	
Tarpon Road shallow	12	10	1-1/4	USGS	Sb	None	None	Data
2S shallow	23	20	2	PCWS	Sm	None	None	Regulatory
EL-6 shallow	23	20	2	PCWS	Sm	None	None	Regulatory
EL-1 shallow	23	20	2	PCWS	Sm	None	None	Regulatory
5S	23	20	2	PCWS	Sm	None	None	Regulatory
4S	23	20	2	PCWS	Sw	None	None	Regulatory
EL-7 shallow	23	20	2	PCWS	Sm	None	None	Regulatory
3S	23	20	2	PCWS	Sm	None	None	Regulatory
Saul's Dairy Farm	--	--	1-1/4	USGS	Sm	None	None	Data
Horst Road shallow	--	--	1-1/4	USGS	Sm	None	None	Data
SW-005	19	17	2	USGS	Sm	None	None	Data
DW-005	31	29	2	USGS	Sm	None	None	Data
SW-13	28	26	2	USGS	Sm	None	None	Data
SW-14	19	16	1-1/4	USGS	Sm	None	None	Data
EL-9 shallow	10	10	4	USGS	Sr	None	None	Data

Table 2.--Observation wells that tap the Floridan aquifer

Monitoring agency: USGS, U.S. Geological Survey; PCWS, Pinellas County Water System.
Parameters monitored and frequency: Sm, stage-monthly; Cb, chloride-bimonthly; C, chloride; K, specific conductance; DS, dissolved solids; SO_4, sulfate; m, monthly; Cm, chloride-monthly; Sr, stage-recorder; Sw, stage-weekly.

Well	Depth (ft)	Casing depth (ft)	Diameter (in.)	Monitoring agency	Parameters monitored and frequency	Sampling method or depth sampled (ft)	Regulatory limits		Monitoring purpose
							Water level (ft above NGVD of 1929)	Chloride (mg/L)	
Brooker Creek shallow	90	82	6	USGS	Sm, Cb	Pumped	None	1,200	Regulatory
N.W. shallow	350	250	4	PCWS	Sm, (C, K, DS, SO_4), m	320	None	None	Data
D&S Ranch	110	---	4	PCWS	Cm	Pumped	None	100	Regulatory
S.W. shallow	350	103	6	PCWS	Cm	350	None	None	Data
Bryan Dairy	405	---	6	PCWS	Cm	Pumped	None	50	Regulatory
Casey Ranch	261	135	6	PCWS	Cm	Pumped	None	250	Regulatory
EL-1 deep	200	80	6	PCWS	Cm	Pumped	None	None	Regulatory
EL-2 deep	125	100	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-3 deep	169	76	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-4 deep	235	44	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-5 deep	220	62	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-6 deep	200	88	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-7 deep	220	65	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-8 deep	200	73	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-9 deep	200	55	12	PCWS	Sr	Not sampled	None	None	Regulatory
2S deep	290	61	12	USGS	Sr	Not sampled	4.0	None	Regulatory
113A	114	58	12	USGS	Sr	Not sampled	5.0	None	Regulatory
11	400	110	12	USGS	Sr	Not sampled	None	None	Data
N-2	292	62	8	USGS	Sr	Not sampled	9.0	None	Regulatory
N-3	350	100	6	USGS	Sr	Not sampled	None	None	Data
N-4	350	100	6	USGS	Sr	Not sampled	None	None	Data
104A	---	---	12	USGS	Sm	Not sampled	None	None	Data
Tarpon Road deep	305	205	6	USGS	Sr, Cm	Pumped	None	None	Data
N-1 shallow	300	82	12	PCWS	Sw	Not sampled	None	None	Data
5	229	58	4	USGS	Sr	Not sampled	None	None	Data
EL-14 deep	300	57	12	USGS	Sb	Not sampled	None	None	Data
EL-17 deep	305	57	12	USGS	Sb	Not sampled	None	None	Data
139G	195	44	--	USGS	Sr	Not sampled	16.0	None	Regulatory
Mitchell	608	42	--	USGS	Sr	Not sampled	None	None	Data

Table 3.--Observation wells that penetrate the freshwater-saltwater interface

Monitoring agency: USGS, U.S. Geological Survey; PCWS, Pinellas County Water System.
Parameters monitored and frequency: Sr, stage-recorder; Cb, chloride-bimonthly; K, specific conductance; DS, dissolved solids; C, chloride; SO_4, sulfate; S, stage; a, annual; Sm, stage-monthly; Cm, chloride-monthly; Cq, chloride-quarterly; b, bimonthly.

Well	Depth (ft)	Casing depth (ft)	Diameter (in.)	Monitoring agency	Parameters monitored and frequency	Sampling method or depth sampled (ft)	Regulatory limits		Monitoring purpose
							Water level (ft above NGVD of 1929)	Chloride (mg/L)	
Brooker Creek deep	310	300	6	USGS	Sr, Cb	Pumped	None	1,500	Regulatory
M-5	500	288	6	USGS/ PCWS	(K, DS, C, SO_4, S), a	320 350 410 490	None None None None	None None None None	Regulatory
North Lake Tarpon	780	758	8	USGS	Sm, Cm	Pumped	None	10,500	Regulatory
S.W. deep	741	500	6	USGS/ PCWS	(K, DS, C, SO_4, S), a	560 620 730	None None None	150 550 6,000	Regulatory
3A	1,100	670	8	USGS/ PCWS	(K, DS, C, SO_4, S), a	700 1,000 1,100	None None None	None None None	Data
N-1 deep	1,200	653	8	USGS/ PCWS	(K, DS, C, SO_4, S), a	700 1,100 1,800	None None None	None None None	Data
E-103	1,138	605	6	USGS/ PCWS	Sr, Cq	600 650 700 750 800	None None None None None	750 850 900 1,000 1,500	Regulatory
M-2	538	507	6	USGS/ PCWS	(K, DS, C, SO_4, S), a	510 535	None None	None None	Regulatory
N.W. deep	1,040	488	4	USGS	(C, DS, SO_4), b	760 850	None None	None None	Data

years is shown in figure 4. At this station, for the 1977 water year, rainfall was 14 inches below average annual rainfall (52 inches for the period of record) and was also 14 inches below the long-term average annual rainfall for the U.S. National Weather Service stations at Clearwater, Tarpon Springs, and Tampa. Annual rainfall in the three previous water years was above average.

Ground-Water Levels

The observation-well network is jointly operated by the Pinellas County Water System and the U.S. Geological Survey. The Pinellas County agency maintains two recorders--one in well EL-9 deep and the other in well E-103--for continuous measurement of the potentiometric surface of the Floridan aquifer. The county also measures water levels weekly or monthly in many of the surficial aquifer observation wells and production-zone observation wells. The U.S. Geological Survey maintains recorders on 12 wells for continuous measurement of water levels and also measures water levels monthly or bimonthly in other surficial aquifer and Floridan aquifer observation wells. In addition, mass water-level measurements are made in May (when water levels are lowest) and in September (when water levels are highest) for preparation of water-level contour maps released twice annually.

Surficial Aquifer

Figures 5-8 show water-table contours for the surficial aquifer in 1976 and 1977. These maps were prepared by Mills and Hutchinson (1976) and Ryder and Mills (1977a, 1977b, 1978). Withdrawals from the wells in the Eldridge-Wilde well field caused the water table to decline to 12 feet above NGVD of 1929 in May 1976 and May 1977. The water table recovered to 18 feet above the datum in September 1976 and 16 feet above the datum in September 1977. The amount of recovery in 1977 was less due to below normal rainfall that year. The water-table mound just west of the pumping cone of depression was also affected by the below normal rainfall in 1977. The water table in that area recovered from 24 to 28 feet above NGVD of 1929 from May to September 1976, but recovered from 24 to only 26 feet above the datum from May to September 1977.

The water table in the surficial aquifer in the East Lake Road well field is not noticeably affected by pumping of water from the Floridan aquifer. Instead, the water table is influenced by changes in stage of Brooker Creek, especially in May (figs. 5-8) when water levels are low. A water-level fluctuation of about 2 feet occurred in the water table from May to September in 1976 and 1977 in the East Lake Road well-field area. The below normal rainfall in 1977 did not greatly affect the water table in this area.

Floridan Aquifer

The potentiometric surface of the Floridan aquifer in May and September in 1976 and 1977 is shown in figures 9-12 (Mills and Hutchinson, 1976, and Ryder and Mills, 1977a, 1977b, 1978).

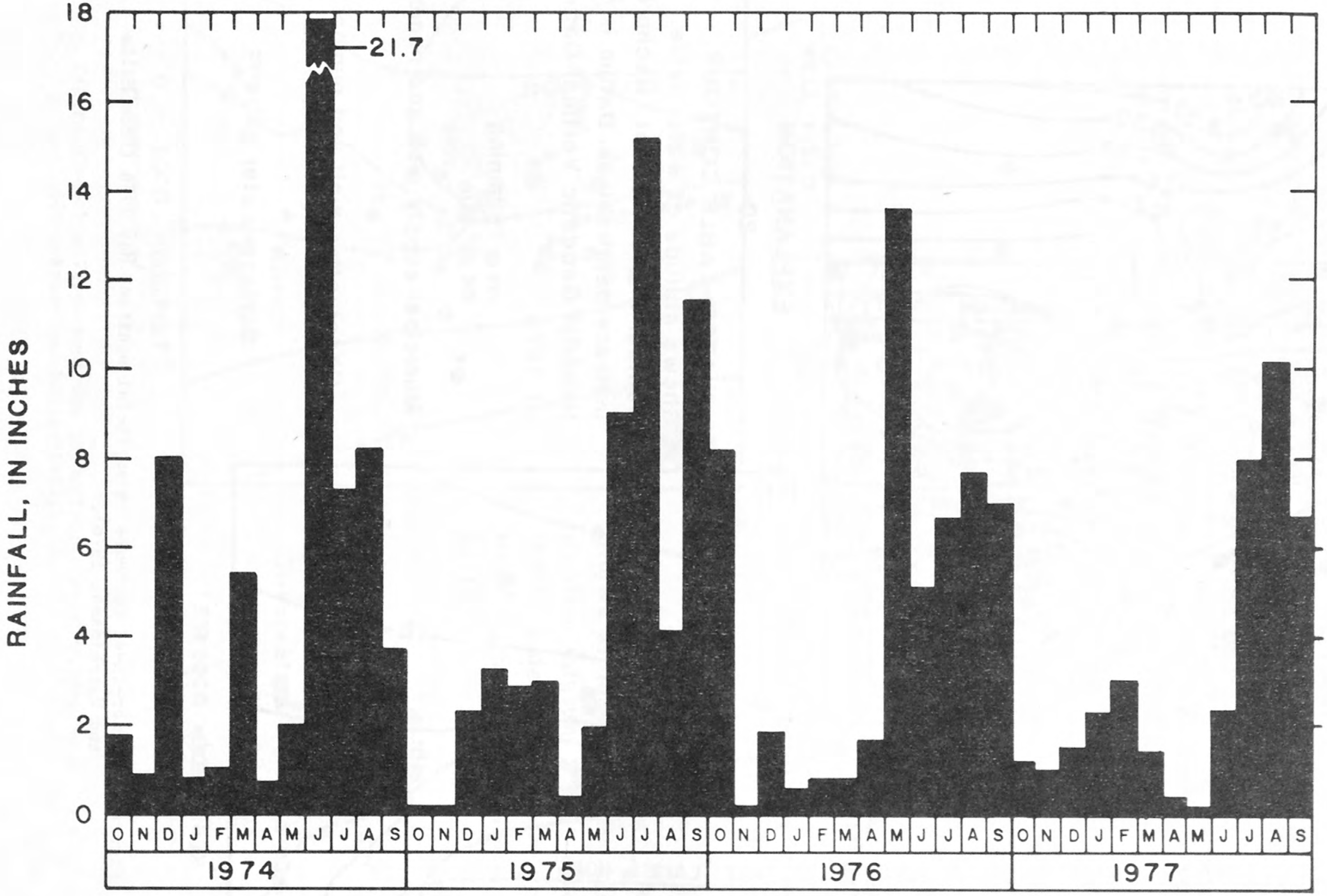

Figure 4.--Monthly rainfall at Eldridge-Wilde well field near Odessa, 1974-77 water years.

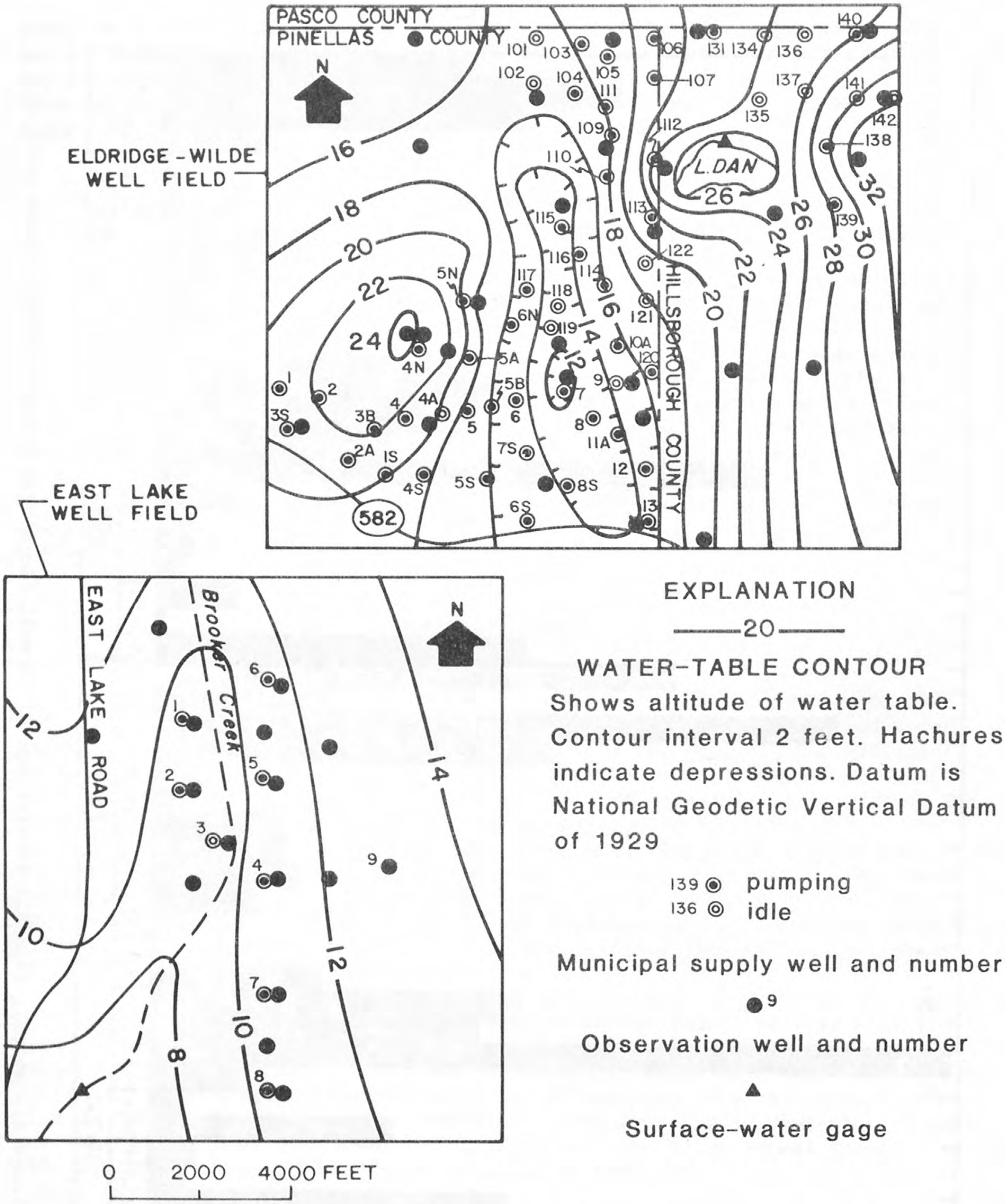

Figure 5.--Water-level contours in surficial aquifer, May 1976 (from Mills and Hutchinson, 1976).

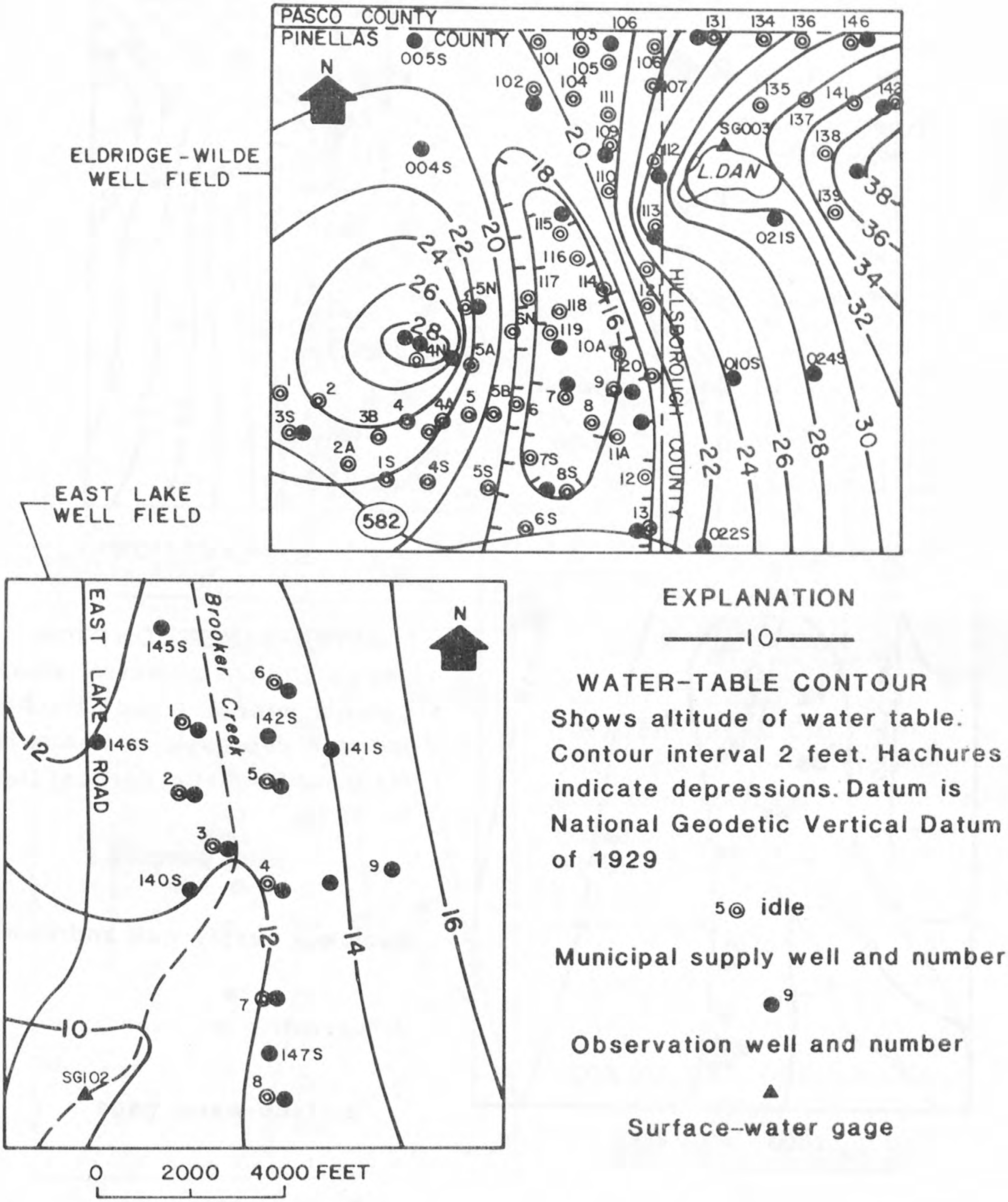

Figure 6.--Water-level contours in surficial aquifer, September 1976 (from Ryder and Mills, 1977a).

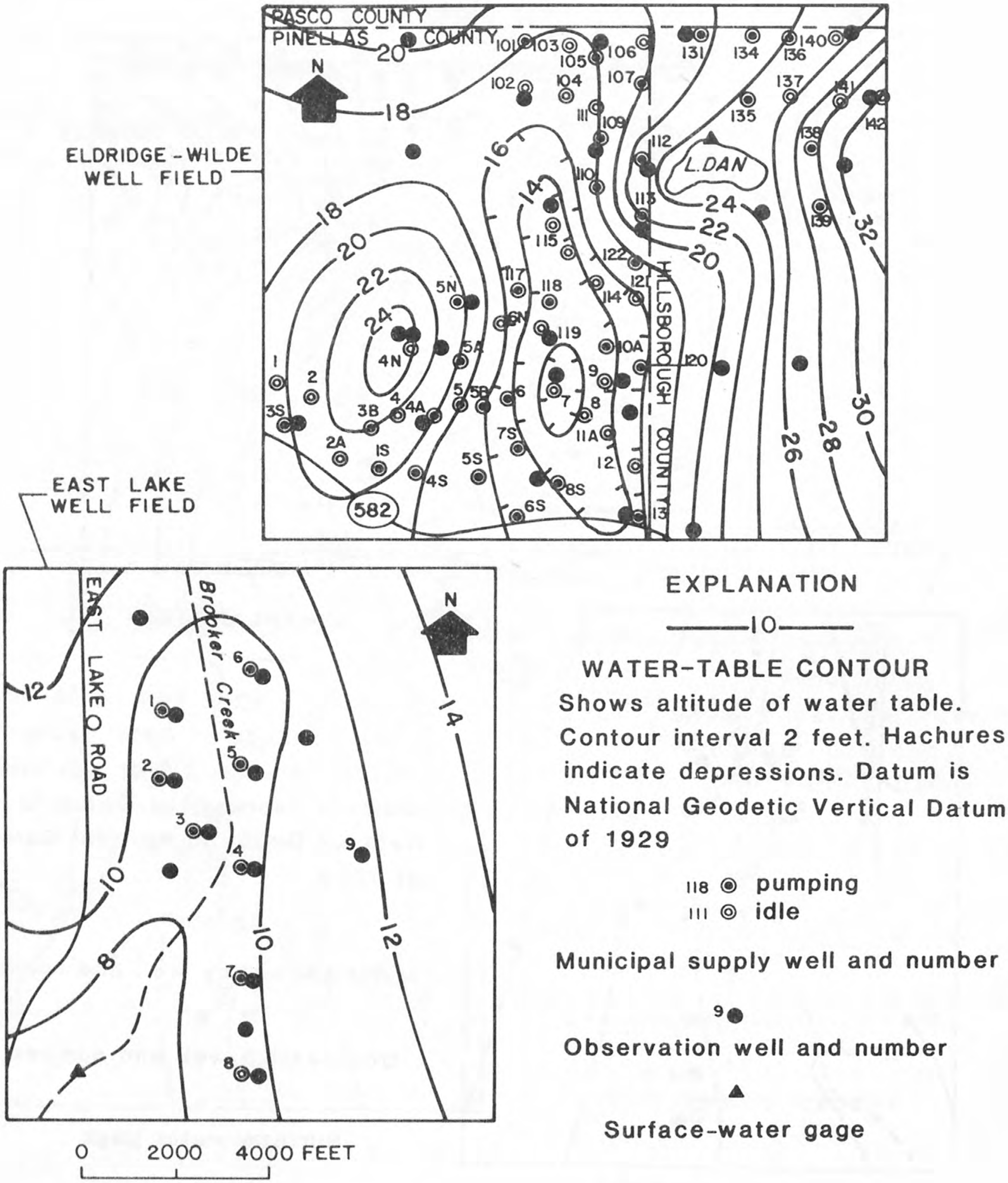

Figure 7.--Water-level contours in surficial aquifer, May 1977 (from Ryder and Mills, 1977b).

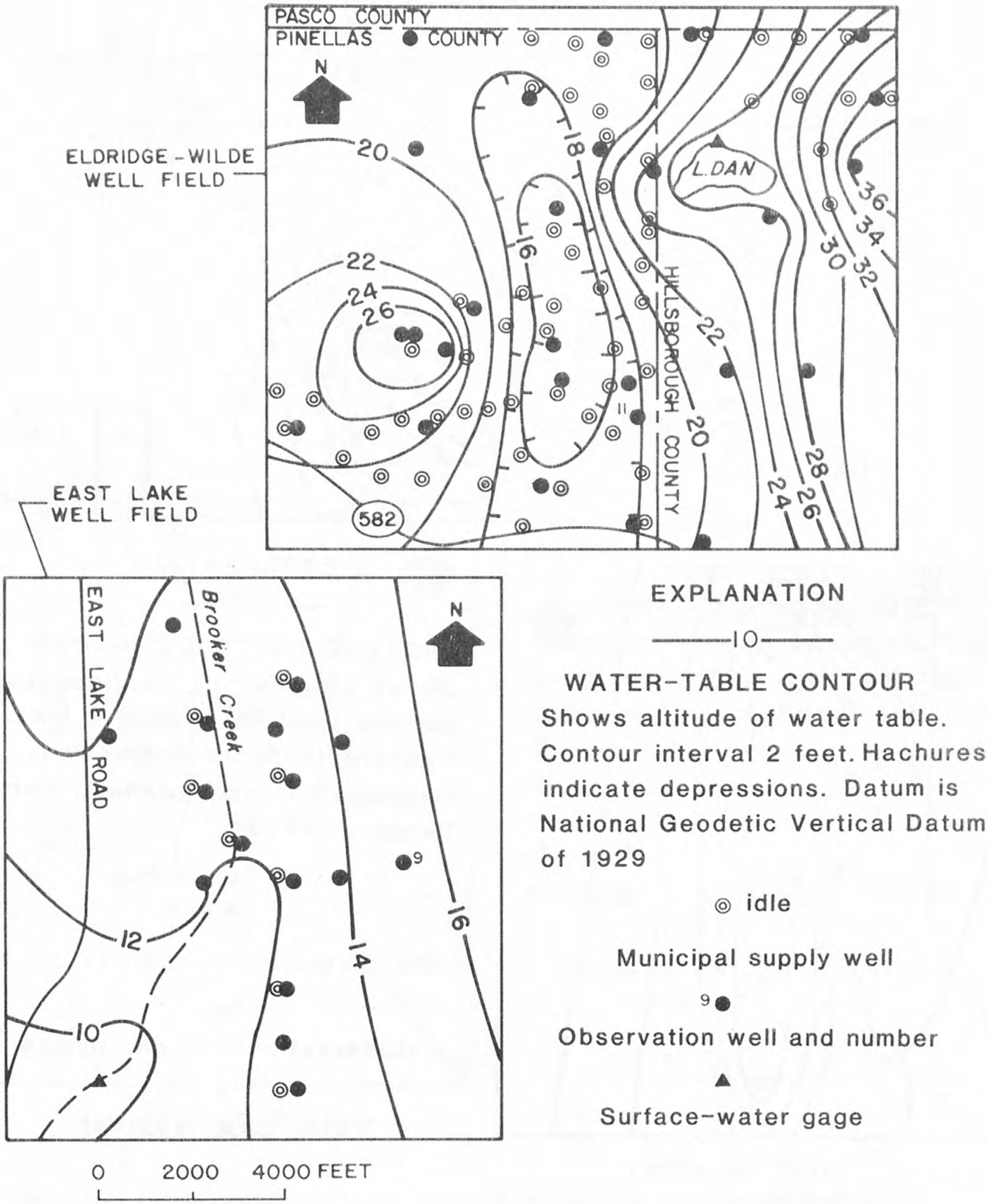

Figure 8.--Water-level contours in surficial aquifer, September 1977 (from Ryder and Mills, 1978).

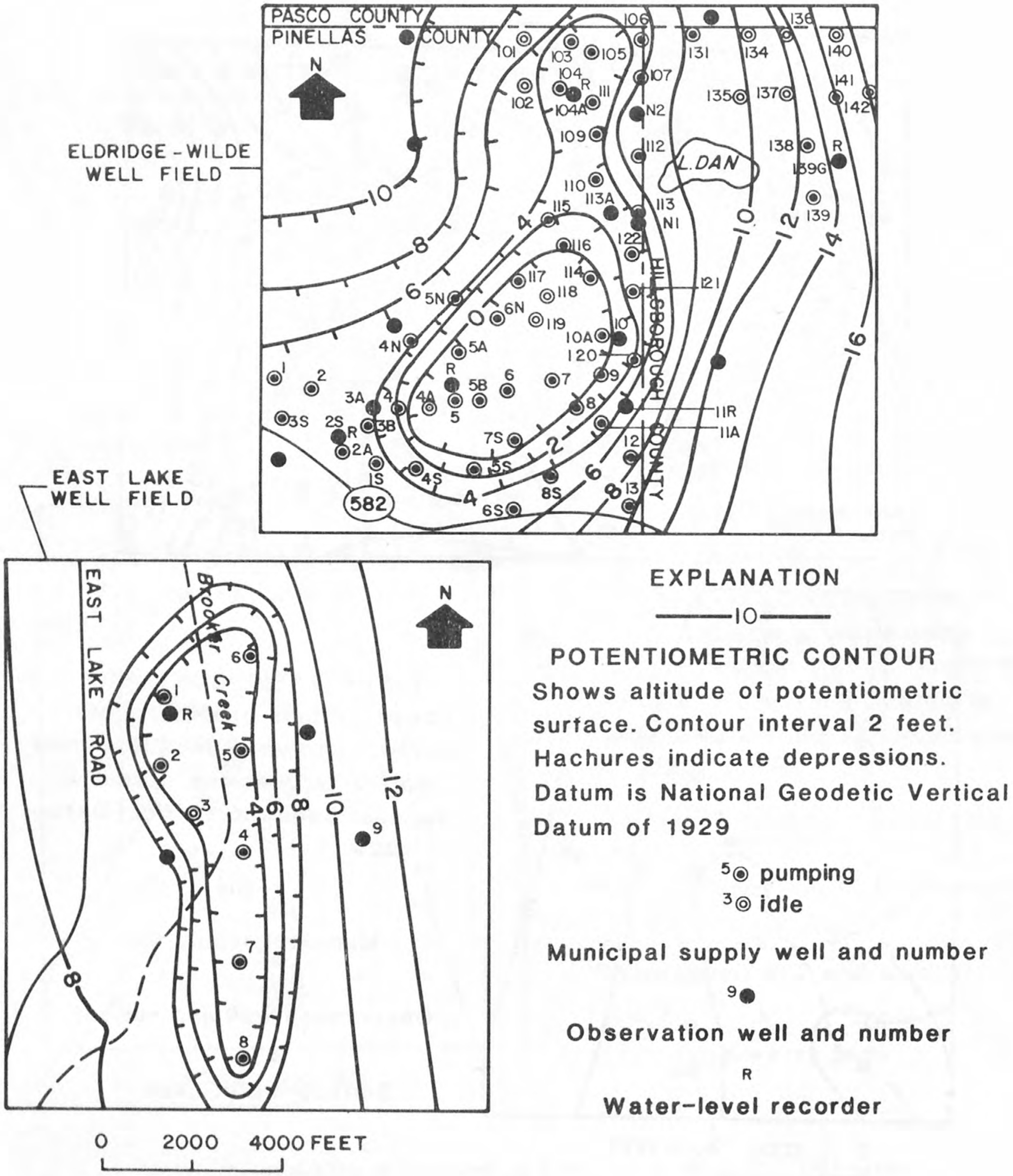

Figure 9.--Potentiometric-surface contours in Floridan aquifer, May 1976 (from Mills and Hutchinson, 1976).

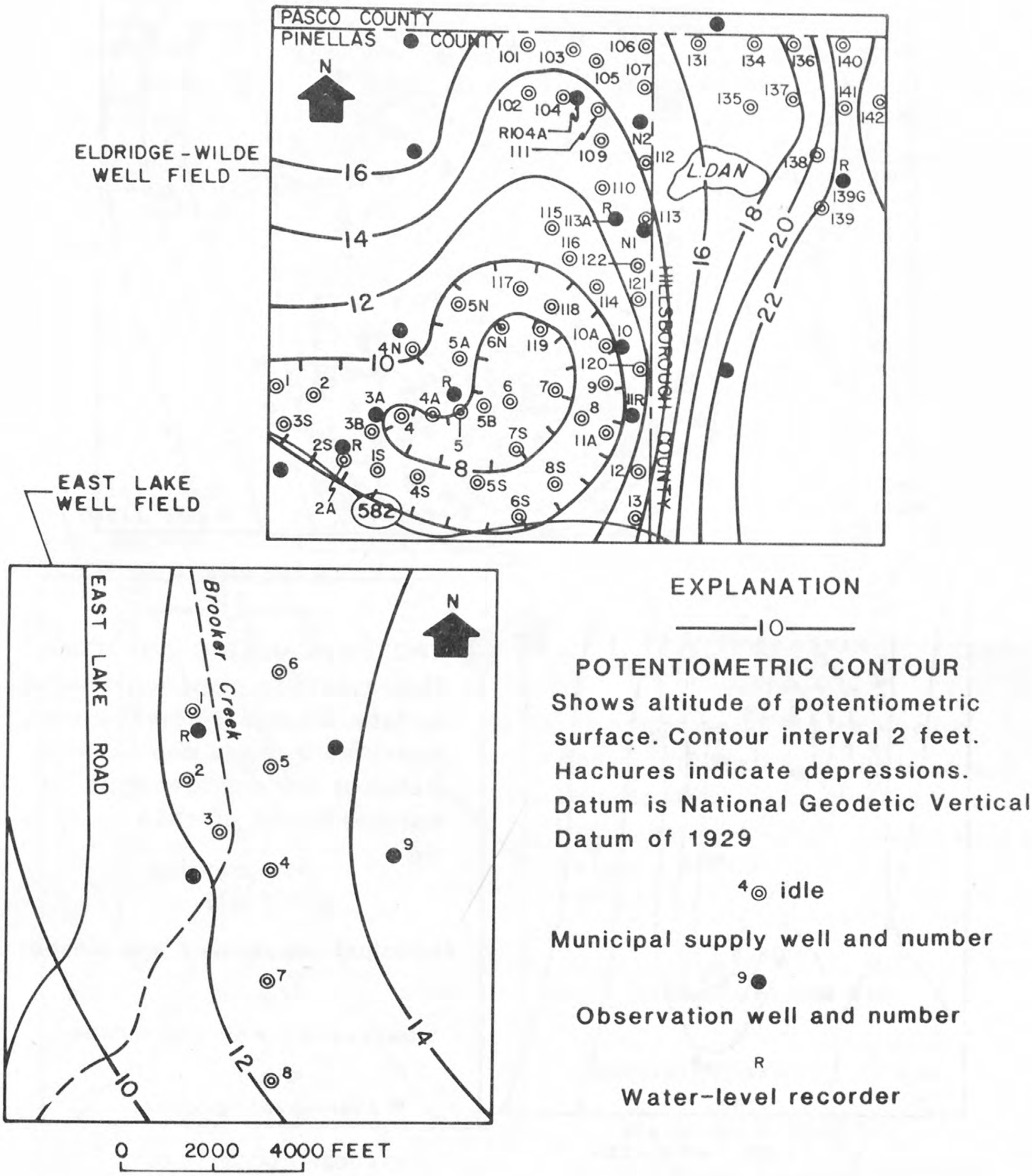

Figure 10.--Potentiometric-surface contours in Floridan aquifer, September 1976 (from Ryder and Mills, 1977a).

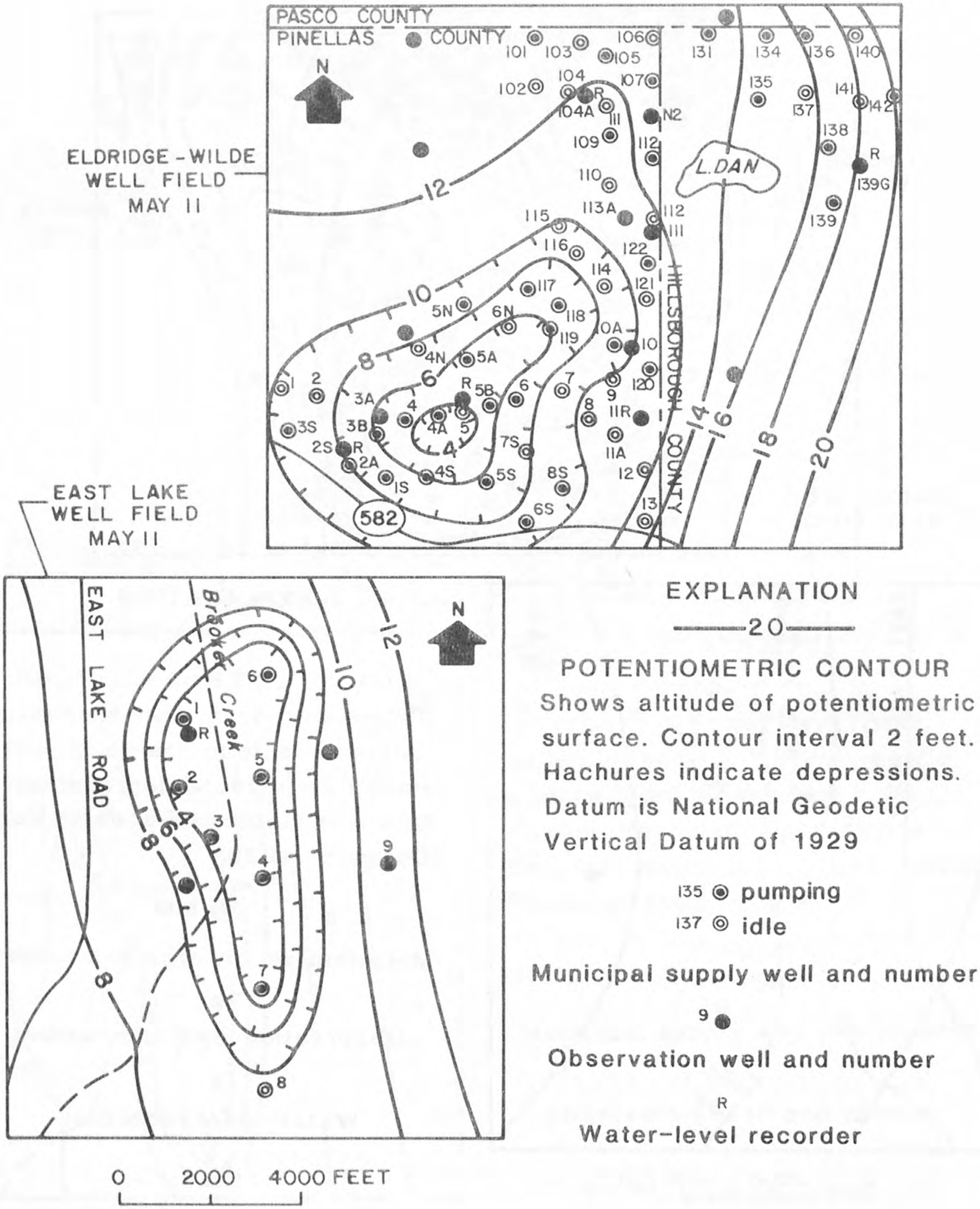

Figure 11.--Potentiometric-surface contours in Floridan aquifer, May 1977 (from Ryder and Mills, 1977b).

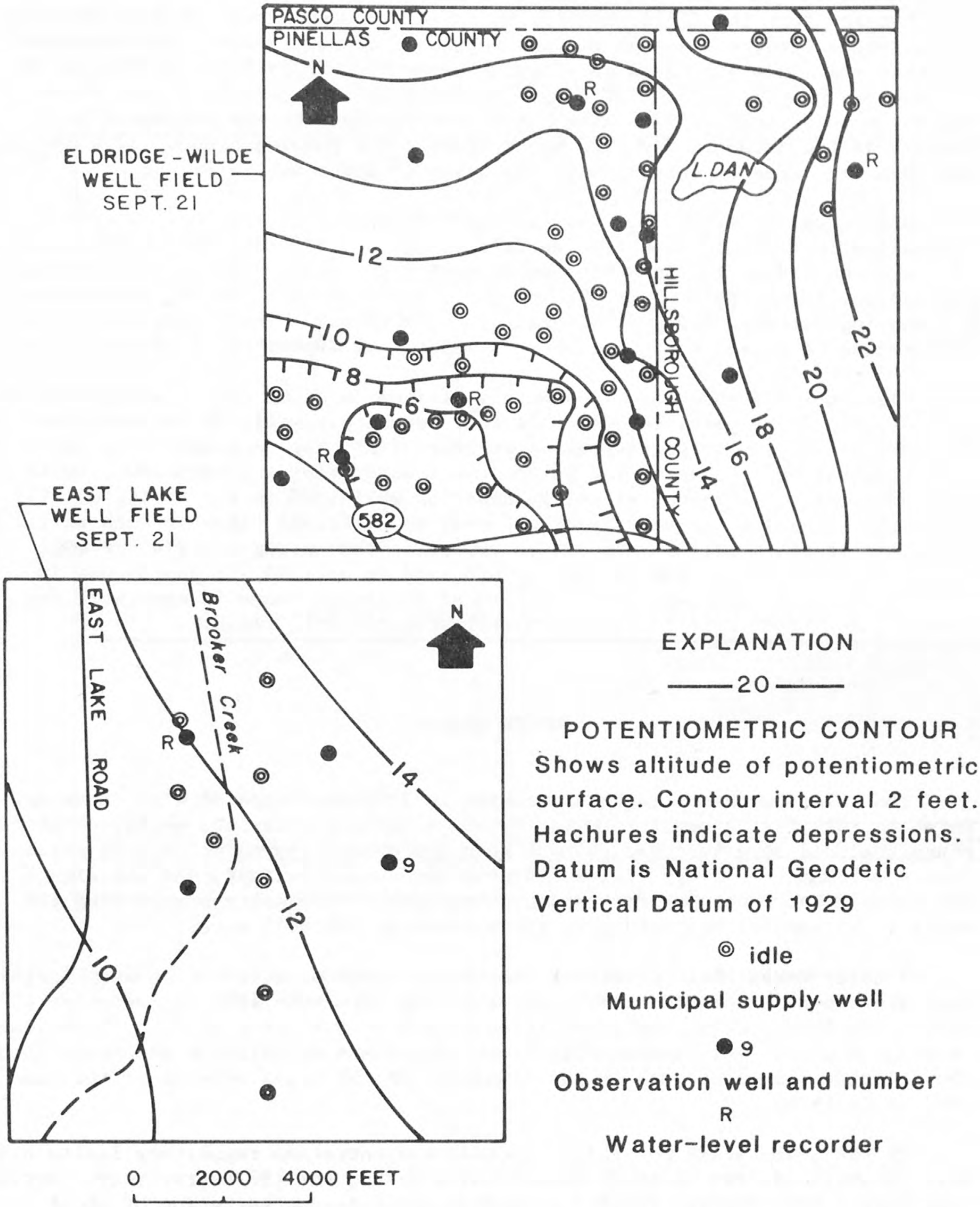

Figure 12.--Potentiometric-surface contours in Floridan aquifer, September 1977 (from Ryder and Mills, 1978).

Pumpage from the Eldridge-Wilde well field caused a cone of depression in the potentiometric surface in May and September of both years. The potentiometric surface was depressed to slightly below NGVD of 1929 in May 1976 at an average May pumping rate of 27.2 Mgal/d, and then recovered to 8 feet above the datum in September 1976. The potentiometric surface was depressed to 4 feet above the datum in May 1977 at an average May pumping rate of 32.6 Mgal/d, and then recovered to 6 feet above the datum in September 1977.

Withdrawal of water from the East Lake Road well field caused a cone of depression in the potentiometric surface in May of 1976 and 1977, but caused little or no depression in September of both years. The potentiometric surface was depressed to 4 feet above NGVD of 1929 in May of 1976 and 1977 at average May pumping rates of 3.9 and 4.2 Mgal/d, respectively. The potentiometric surface recovered to about 12 feet above the datum in September of 1976 and 1977.

Figures 13-16 show the mean monthly maximum (mean of daily maximums for a month) water-level elevations for the four regulatory wells in the Eldridge-Wilde well field. The regulatory water-level limit for each well is shown on the illustrations. None of the water levels were below the regulatory level for the water years shown, except perhaps for well 139G in the spring of 1975 (fig. 16). The lowest water level occurred at different times in each well. The water level in well 2S was at its lowest in the spring of 1976; in well 113A, it was lowest in the spring of 1976; and in well N2, it was lowest in the spring of 1977. Lowest water levels at different times in each well was probably due to changes in pumpage patterns in the well field.

WATER QUALITY

The chloride concentrations measured in 1976 are compared with those measured in 1977 for 13 monitor wells listed in table 4. In five wells, chloride concentrations were measured at more than one depth. Seven wells have established maximum regulatory limits for chloride concentrations, and the eighth has a limit based on specific conductance, either in samples pumped from the wells or in samples obtained at a given depth in the well bore.

Brooker Creek shallow well and the upper level of well M-2 showed significant decreases in chloride concentrations from September 1976 to September 1977. North Lake Tarpon well, the lower three levels of S.W. deep well, and the lowest level of N-1 deep well showed significant increases in chloride concentrations. The chloride concentrations in the remainder of the wells were about the same in 1977 as in 1976.

Of the seven wells for which chloride-concentration regulatory limits had been established, two exceeded their limits during the 1977 water year. North Lake Tarpon well samples reached a maximum chloride concentration of about 12,000 mg/L in July of 1977 and remained at about that level until the end of the water year (fig. 17). This concentration is 1,500 mg/L higher than the regulatory limit. The regulatory limit for chloride concentration in water from the lowest level (730 feet) in the S.W. deep well is 6,000 mg/L. In January 1977, the concentration reached a maximum of 8,250 mg/L (fig. 18).

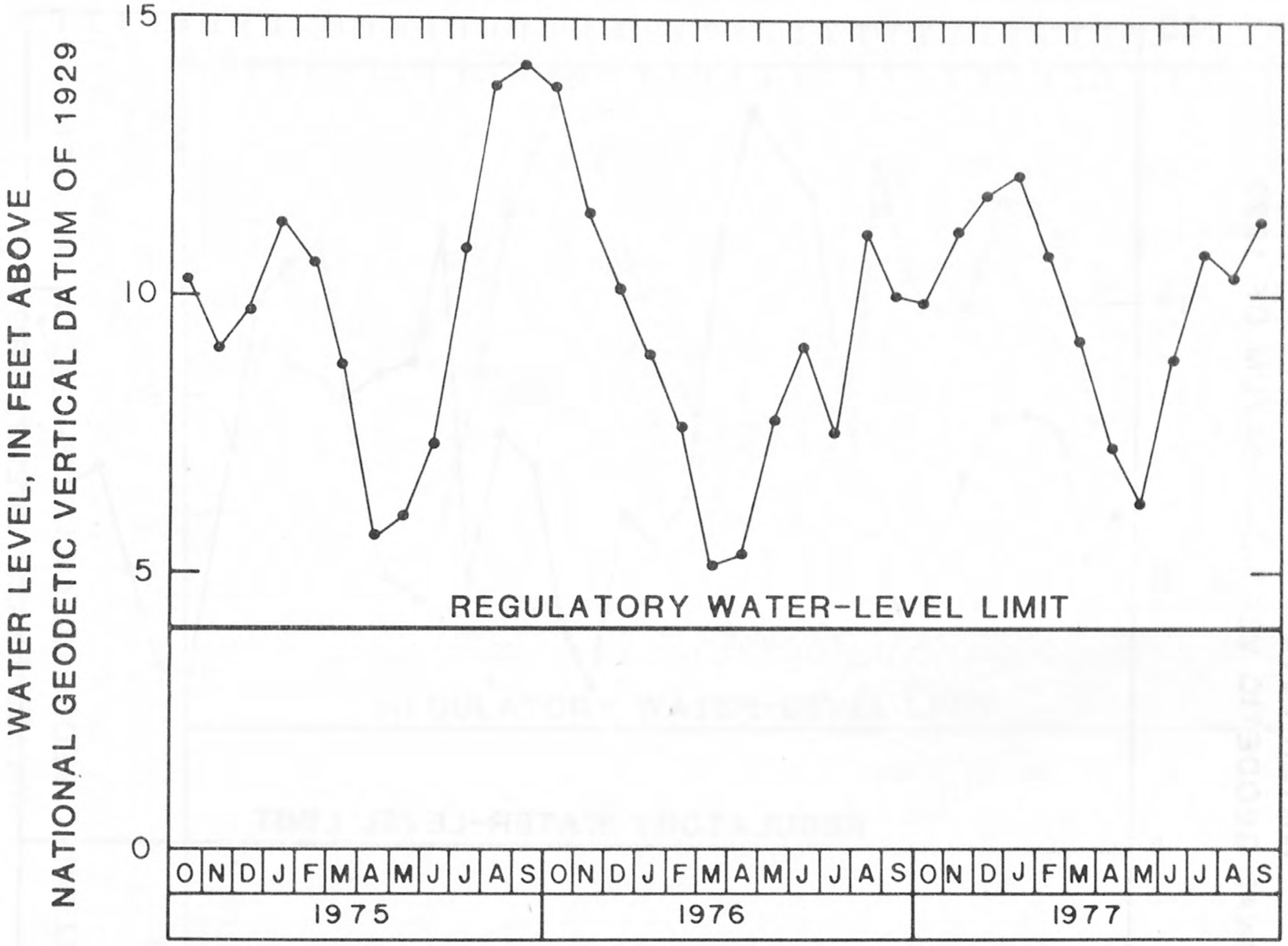

Figure 13.--Monthly means of daily maximum water levels in observation well 2S deep, 1975-77 water years.

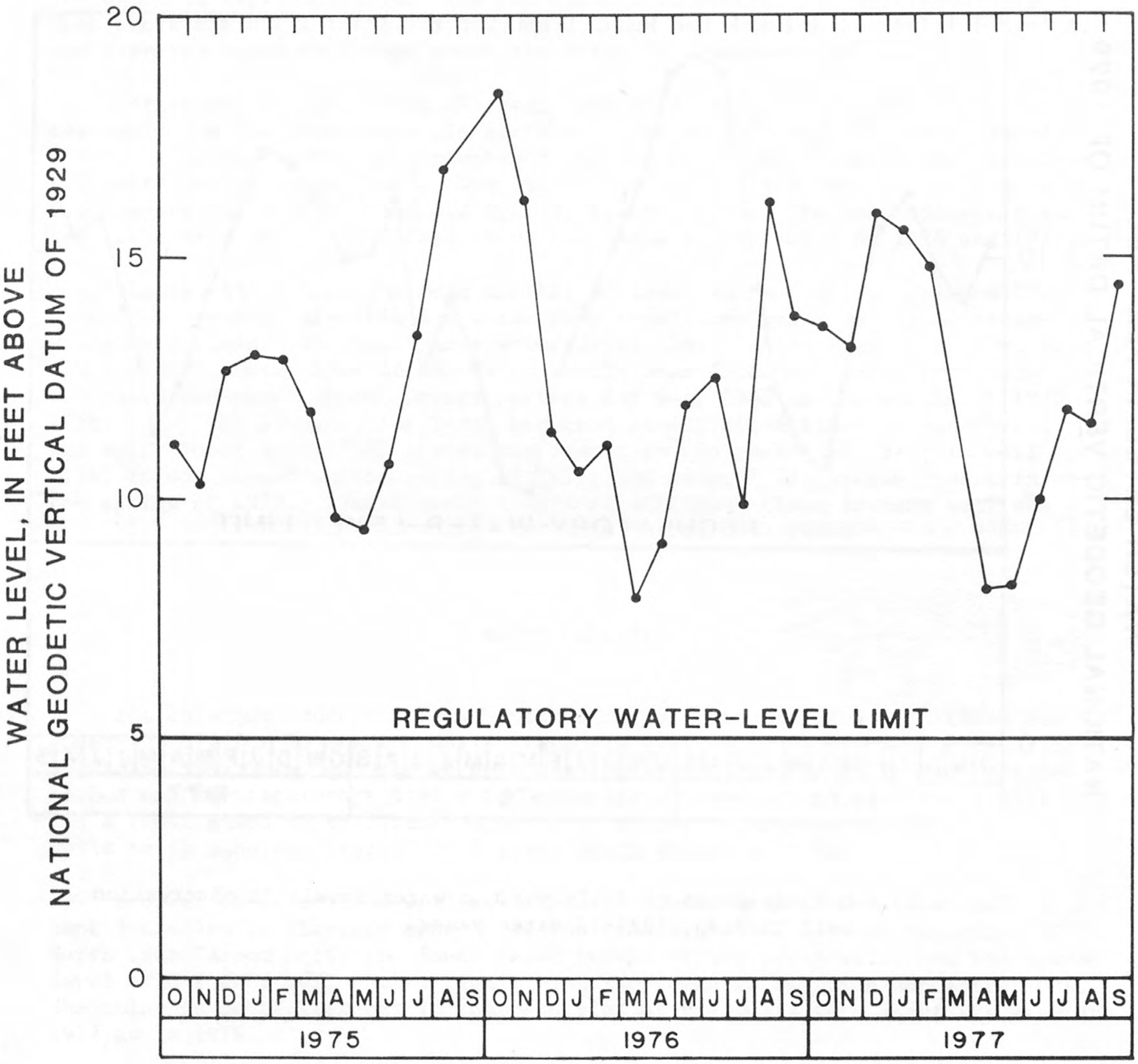

Figure 14.--Monthly means of daily maximum water levels in observation well 113A, 1975-77 water years.

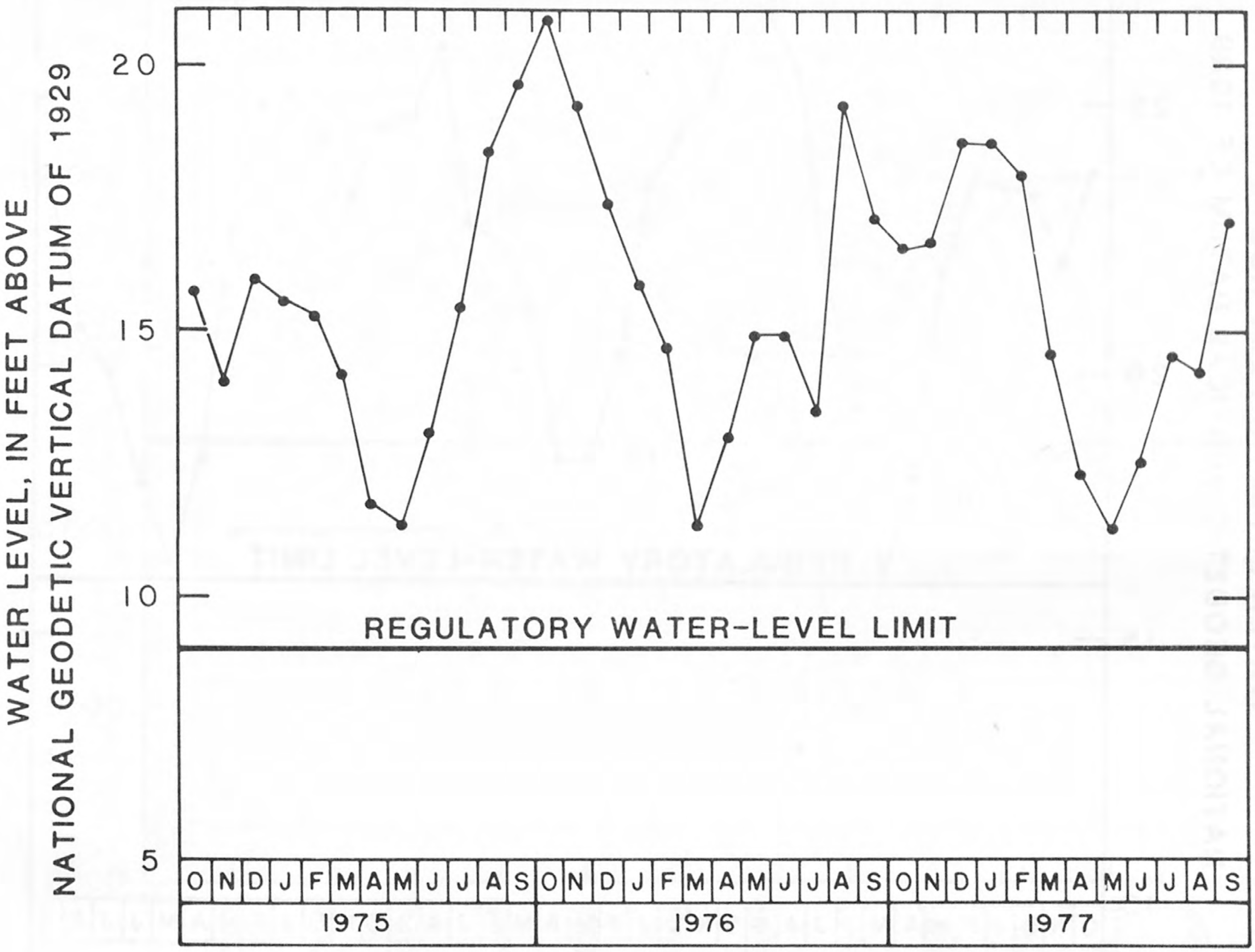

Figure 15.--Monthly means of daily maximum water levels in observation well N-2, 1975-77 water years.

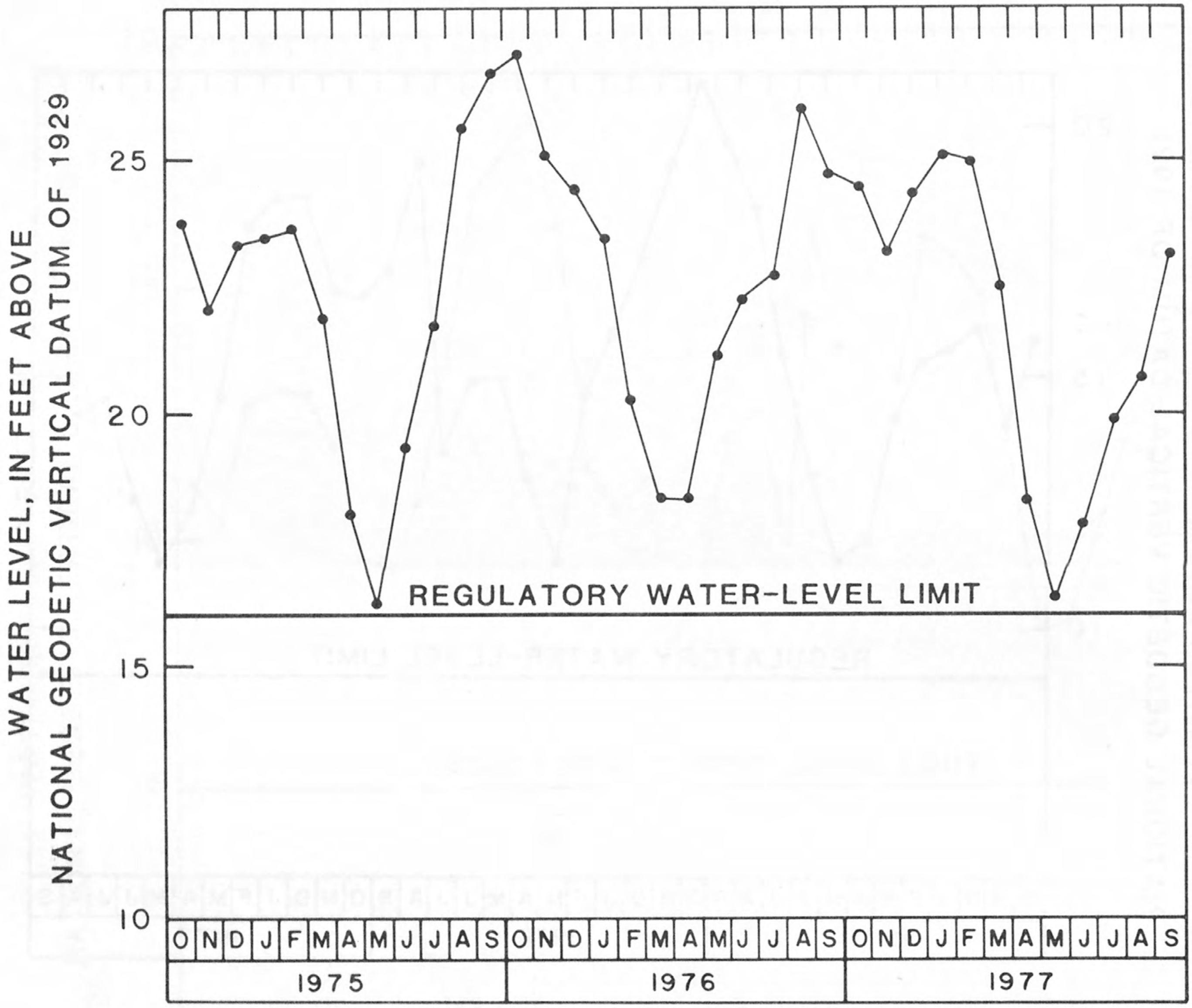

Figure 16.--Monthly means of daily maximum water levels in observation well 139G, 1975-77 water years.

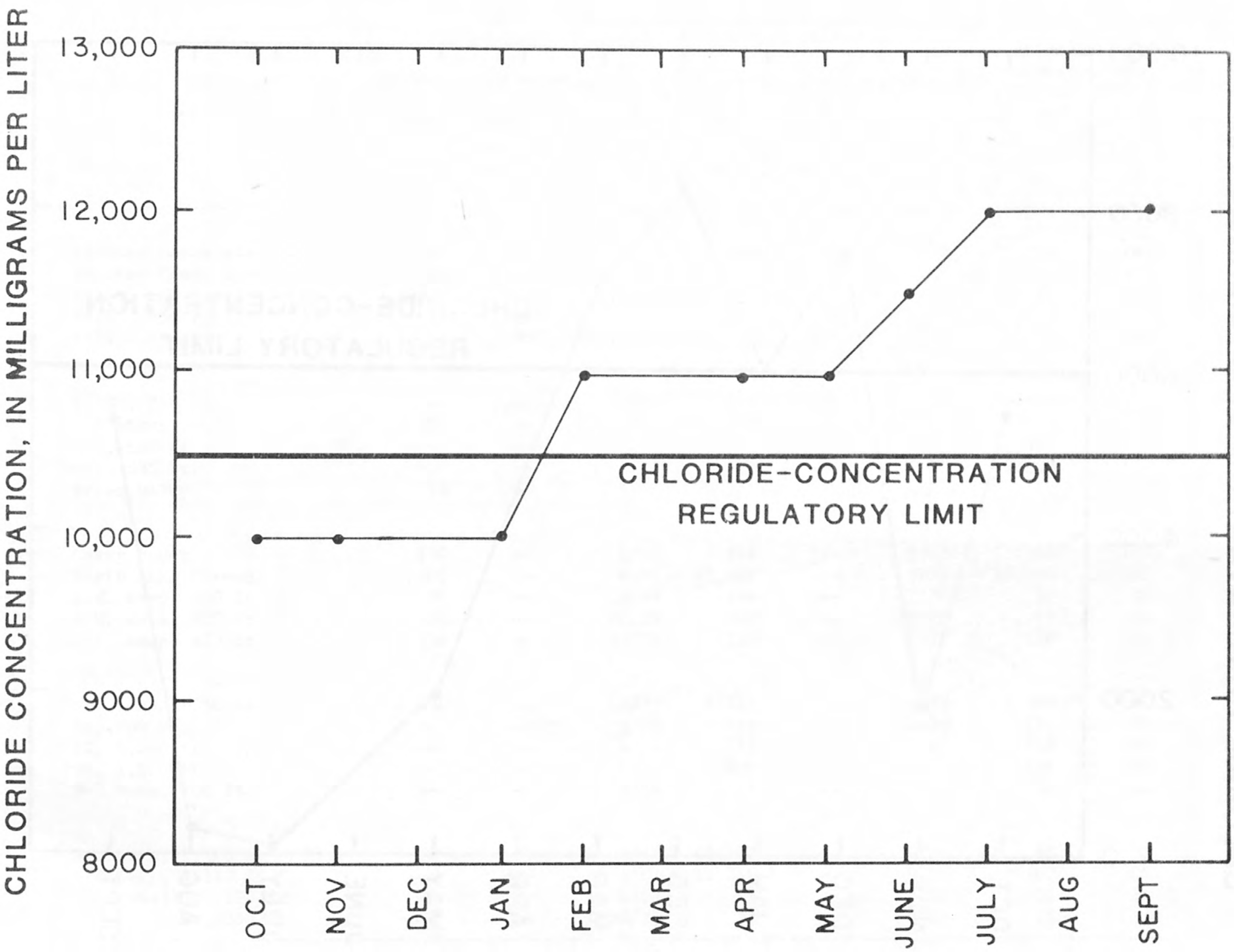

Figure 17.--Chloride concentrations in water from observation well North Lake Tarpon, 1977 water year.

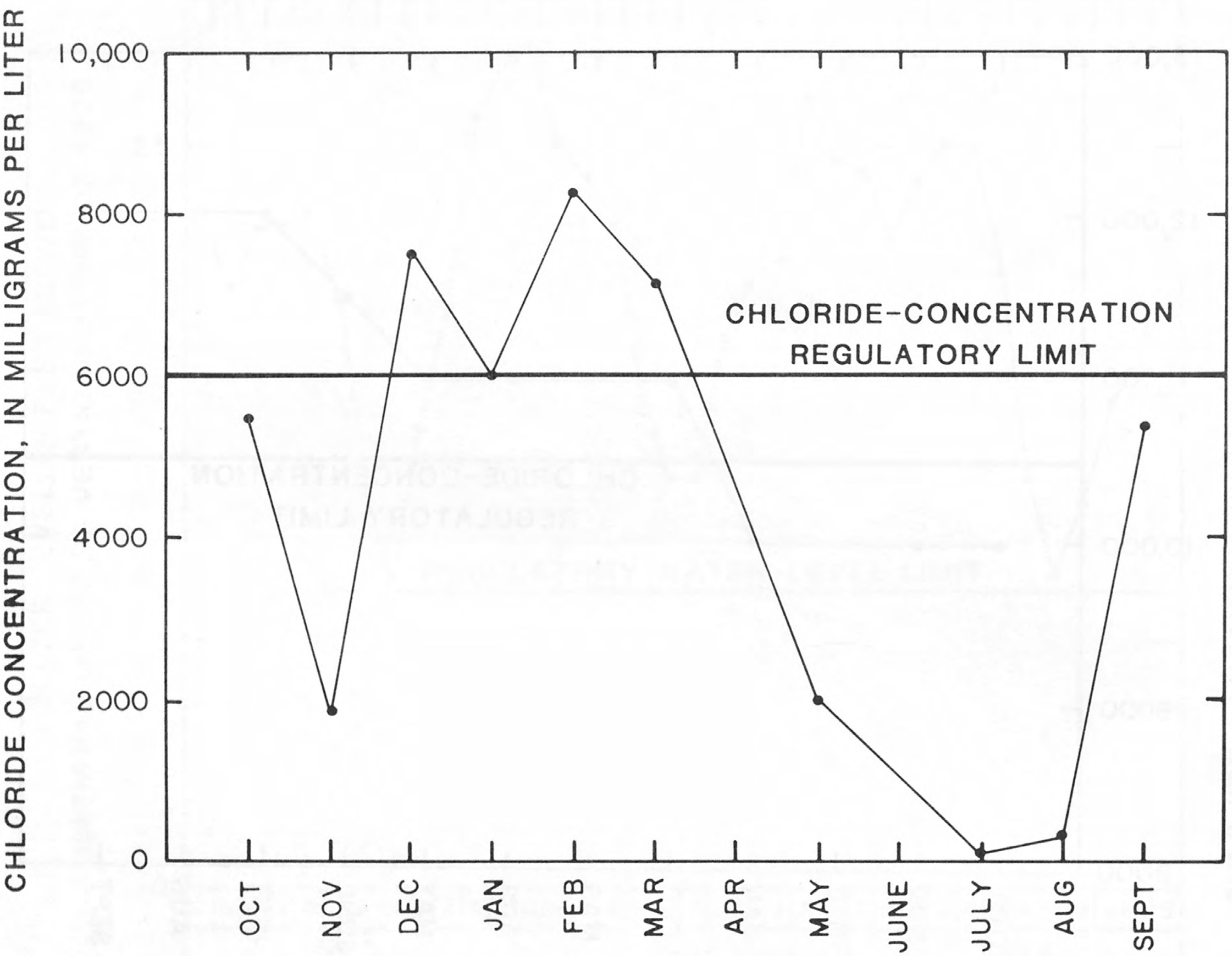

Figure 18.--Chloride concentrations in water from 730-foot depth in observation well S.W. deep, 1977 water year.

Table 4.--Chloride concentrations in water from selected observation wells

[Concentrations: mg/L, milligrams per liter. Specific conductances: umhos/cm, micromhos per centimeter.]

Well	Regulatory limits		Date sampling began	Maximums since sampling began			Chloride concentration 1976 and 1977 (mg/L)	
	Chlor-ide (mg/L)	Specific conduc-tance (umhos/cm at 25°C)		Chlor-ide (mg/L)	Specific conduc-tance (umhos/cm at 25°C)	Date of maxi-mum	9/76	9/77
Brooker Creek shallow	1,200	--	3/72	1,300	--	6/76	1/ 840	780
Brooker Creek deep	1,500	--	8/73	1,400	--	1/74	1/ 1,300	1,300
E-103, 600 ft	--	750	12/62	--	442	8/77	1/ 73	65
E-103, 650 ft	--	850	12/62	--	623	11/77	1/ 54	50
E-103, 700 ft	--	900	12/62	--	810	7/76	1/ 91	99
E-103, 750 ft	--	1,000	12/62	--	1,160	7/76	1/ 170	170
D&S Ranch	100	--	1/61	38	--	2/62	10	9
M-2, 510 ft	--	--	1/75	1,900	--	9/76	1,900	1,450
M-2, 535 ft	--	--	1/75	2,270	--	6/77	2,050	2,120
Bryan Dairy	50	--	1/61	11	--	4/77	10	9
Casey Ranch	250	--	1/61	164	--	6/77	144	154
North Lake Tarpon	10,500	--	9/71	12,000	--	3/76	1/ 10,000	12,000
S.W. deep, 560 ft	150	--	10/73	150	--	7/77	60	69
S.W. deep, 605 ft	550	--	10/73	340	--	12/76	70	134
S.W. deep, 620 ft	550	--	10/73	550	--	1/77	120	215
S.W. deep, 730 ft	6,000	--	10/73	8,250	--	1/77	5,500	6,000
3A, 700 ft	--	--	9/73	215	--	12/76	170	188
3A, 1,000 ft	--	--	9/73	275	--	2/76	210	198
3A, 1,100 ft	--	--	9/73	800	--	4/77	220	200
N-1 deep, 700 ft	--	--	3/69	95	--	7/76	22	44
N-1 deep, 1,100 ft	--	--	3/69	12,000	--	12/76	66	51
N-1 deep, 1,180 ft	--	--	3/69	14,740	--	5/73	102	300
N.W. shallow, 320 ft	--	--	2/76	25	--	7/77	21	21
S.W. shallow, 350 ft	--	--	10/73	15	--	8/76	15	11

1/ Sampled in July 1976.

These chloride concentration increases are probably due to the below normal rainfall in 1977, which, when coupled with pumpage from the Eldridge-Wilde well field, caused a lowering of both the water table and the potentiometric surface below their normal seasonal levels. The thickness of the freshwater part of the Floridan aquifer was therefore reduced, allowing the more dense saltwater to move upward and cause higher chloride concentrations. By the same reasoning, short-term variations in the chloride concentrations in these two wells were probably related to fluctuations in the potentiometric surface caused by well-field pumpages, as well as by seasonal differences in rainfall amounts.

Chloride concentration varied from 10,000 to 12,000 mg/L in North Lake Tarpon well and from 122 to 8,250 mg/L at the 730-foot depth of S.W. deep well during the 1977 water year. These two wells are only about 600 feet apart. The wide range of the chloride concentrations in S.W. deep well and the relatively narrow range in North Lake Tarpon well can probably be explained by the difference in the interval of the Floridan aquifer to which they are open. North Lake Tarpon well is open to a zone that is about 30 feet deeper than S.W. deep well. Its higher chloride concentrations and its lower variability suggest that it is tapping a zone that is always below the freshwater-saltwater interface at that location. Water from the lowest level of S.W. deep well had a lower maximum chloride concentration and varied significantly in chloride concentration during the 1977 water year. Therefore, it appears that the lowest level in S.W. deep well taps the zone through which the freshwater-saltwater interface fluctuates.

Figure 19 shows the approximate position of the 250-mg/L chloride line in the Floridan aquifer for September 1977 along a section from Tarpon Lake to N-1 deep well in the Eldridge-Wilde well field (fig. 1). The section shows that the 250-mg/L chloride line is about 700 feet deeper than the average 350-foot depth of the production wells in the Eldridge-Wilde well field. The deepest production well in the Eldridge-Wilde well field is 805 feet deep, about 300 feet above the 250-mg/L chloride line.

WATER USE

Pumping at Cypress Creek well field (located about 15 miles northeast of Eldridge-Wilde well field), which started in April 1976, enabled the Pinellas County Water System to meet its growing water supply needs without excessively pumping Eldridge-Wilde and East Lake Road well fields. Figure 20 shows the monthly pumpage from Cypress Creek, East Lake Road, and Eldridge-Wilde well fields for water years 1975-77. The maximum monthly pumpage from the Eldridge-Wilde well field was 1,245 Mgal in March 1976. The maximum monthly pumpage from East Lake Road well field was 230 Mgal in June 1977. Cypress Creek produced a monthly maximum of 523 Mgal in June 1977. The maximum aggregate monthly pumpage--the total for the three fields--was 1,666 Mgal in May 1977.

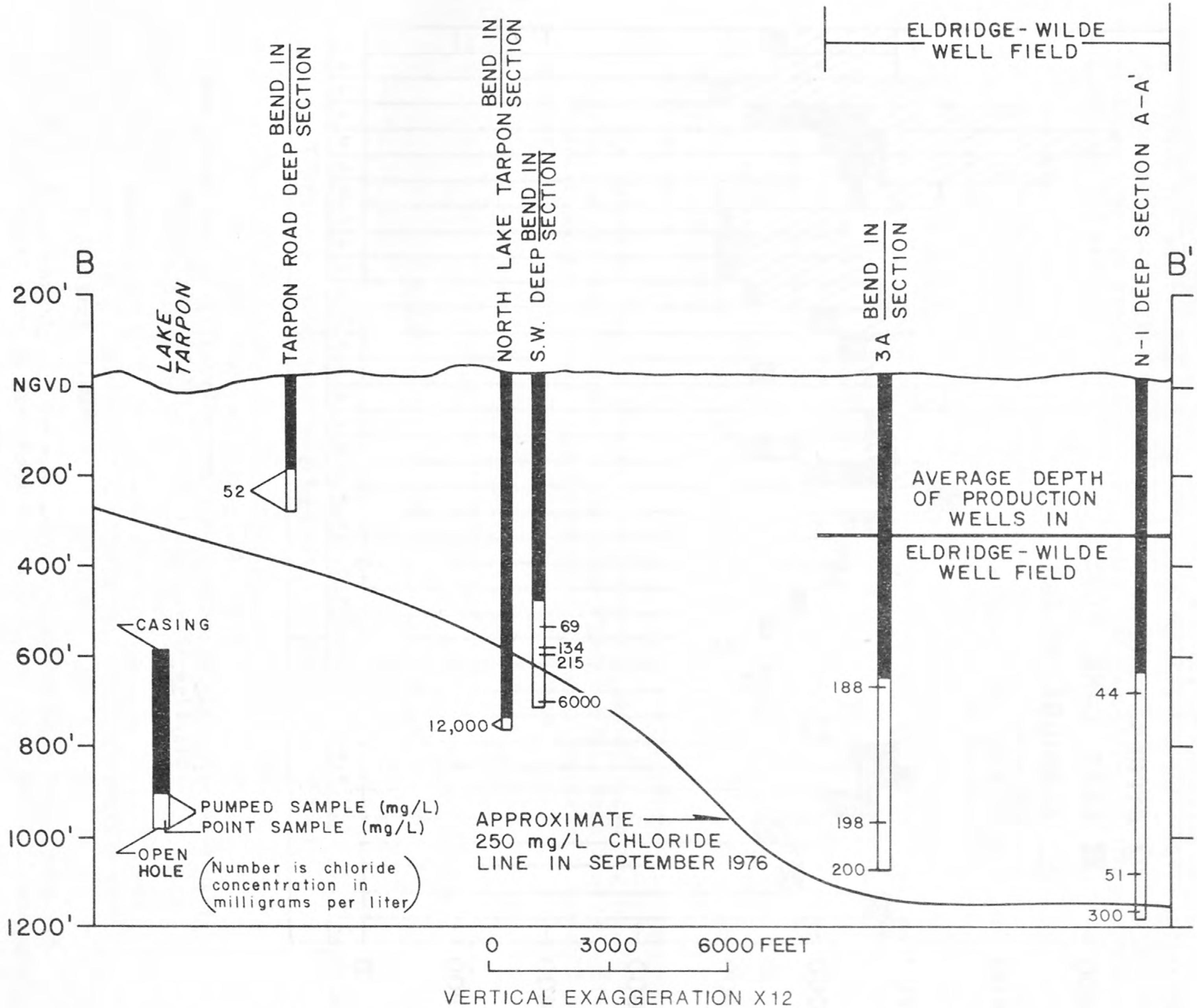

Figure 19.--Approximate location of 250 milligram per liter chloride line in the Floridan aquifer, September 1977 (location of section shown in figure 1).

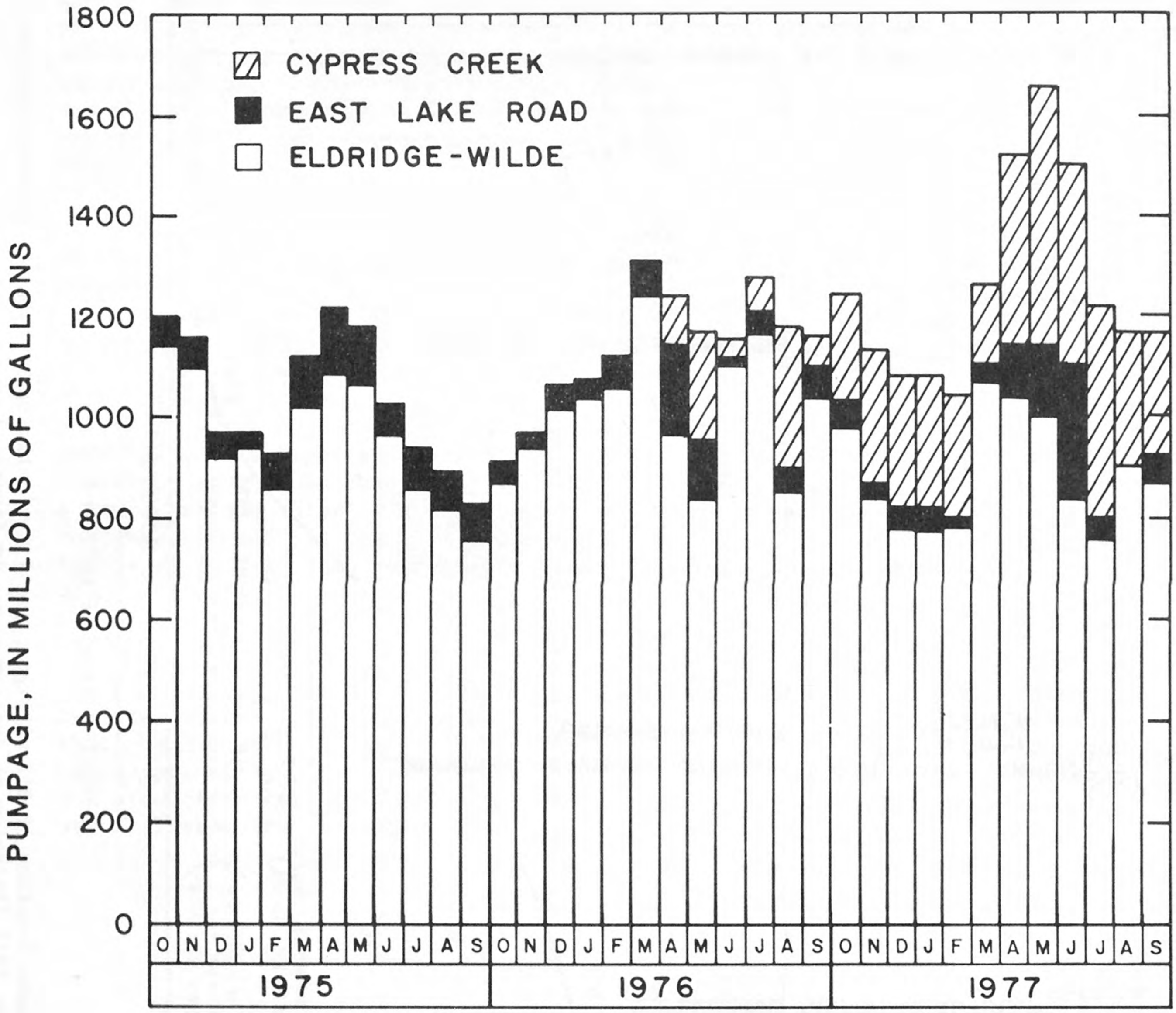

Figure 20.--Monthly pumpages from Cypress Creek, East Lake Road, and Eldridge-Wilde well fields, 1975-77 water years.

SUMMARY

The Eldridge-Wilde and East Lake Road well fields are being extensively monitored for water levels and water quality in both the surficial and the Floridan aquifers. The Floridan aquifer is monitored by means of observation wells open to the production zone and wells that penetrate the freshwater-saltwater interface.

A rainfall deficiency of 14 inches occurred in the two well fields from October 1976 to September 1977, resulting in a water table and a potentiometric surface that were about 2 feet lower in September 1977 than in September 1976. The water table and potentiometric surface were higher in May 1977 than May 1976, probably because of reduced pumpage.

Chloride concentrations in Brooker Creek shallow well and the upper level of well M-2 decreased significantly from September 1976 to September 1977. Chloride concentrations in North Lake Tarpon well, the lower three levels of S.W. deep well, and the lowest level of N-1 deep well increased significantly in the same time period. Water from North Lake Tarpon well and the lowest level of S.W. deep well exceeded the established chloride concentration regulatory limits during the 1977 water year. The below normal rainfall, along with the Eldridge-Wilde well-field pumpage (even though it was less than in 1976), was the probable cause of marked increases in chloride concentrations in these wells.

The increased pumpage from Cypress Creek well field, beginning in April 1976, helped relieve the stress on Eldridge-Wilde and East Lake Road well fields. The highest monthly pumpage from the three well fields was about 1,666 Mgal in May 1977.

Modifications in Observation-Well Network, 1977

The following modifications in the observation-well network were made in Eldridge-Wilde and East Lake Road well-field areas in the 1977 water year:

1. Began bimonthly water-level measurements on well M-5 in the East Lake Road well-field area.
2. Began bimonthly sampling of Tarpon Road deep well for specific conductance and chloride concentrations.
3. Installed continuous water-level recorders on wells N-3, N-4, and Mitchell well. These wells are in the production zone upgradient of Eldridge-Wilde well field.
4. Began monthly water-level measurements on wells EL-14 deep and EL-17 deep in East Lake Road well field along the Hillsborough-Pinellas County line.

Proposed Modifications

The following proposals are made for modifying the network in the Eldridge-Wilde and East Lake Road well-field areas:

1. The sampling of well E-103 for chloride concentrations could be discontinued because the expansion of East Lake Road well field has not been implemented.

2. The caving of material in N.W. deep well has prevented the collection of water samples from the well. The well needs repairing so that it can be logged and then sampled monthly for chloride determinations. This well will provide information on the freshwater-saltwater interface west of Eldridge-Wilde well field.

3. After an adequate water-level data base is collected from well N-4, consideration should be given to substituting well N-4 for regulatory well 139G. Well N-4 is 350 feet deep and is more representative of the production zone in Eldridge-Wilde well field than well 139G, which is only 195 feet deep. The average production-zone depth in Eldridge-Wilde well field is about 350 feet. The change would require approval by the Southwest Florida Water Management District.

4. The monitoring of chloride concentration monthly is excessive for the production wells. The sampling could be reduced to bimonthly or even quarterly for some of the wells. Another alternative would be to make field specific conductance measurements. Samples could then be collected for laboratory analyses for chloride and other parameters if increased specific conductance indicated deterioration of water quality.

5. The following wells are being logged for conductivity and sampled at the depths and frequencies indicated for dissolved solids and chloride and sulfate determinations.

Well	Sampled depths, in feet	Sampled frequencies
N.W. deep	760; 850	Every 2 months
S.W. deep	560; 620; 730	May and September
M-5	320; 350; 410; 490	May and September
M-2	535	May and September
N-1 deep	700; 1,100; 1,180	May and September
3A	700; 1,000; 1,100	May and September

It is proposed that these wells be sampled for chloride analysis on a monthly basis until more is known about the position of the underlying freshwater-saltwater interface.

6. It is difficult to define the freshwater-saltwater interface west of North Lake Tarpon and S.W. deep wells (see fig. 19). Tarpon Road deep well should be drilled to the freshwater-saltwater interface and sampled at various depths for chloride.

7. At least three more monitoring wells are needed to define the freshwater-saltwater interface west of the N.W. deep well. Suggested locations of the wells are as follows:

   (a) Corner of sections 3, 4, 9, and 10, T27S, R16E.

   (b) Corner of sections 4, 5, 8, and 9, T27S, R16E.

   (c) Northwest corner of section 4 and northeast corner of section 5, T27S, R16E.

   Wells (b) and (c) would be located just east of the Anclote River estuary. The three proposed wells should be drilled and cased to above the freshwater-saltwater interface and then continued with open hole a short distance below the interface. Sampling at various depths in these monitoring wells on a monthly basis would yield a periodic record of the shifting position of the freshwater-saltwater interface.

SELECTED REFERENCES

Black, Crow and Eidsness, Inc., 1976, Hydrologic monitor program for the Pinellas County Water System: Black, Crow and Eidsness, Inc., Project No. 272-74-02.

Black, A. P., Brown, Eugene, and Pearce, J. M., 1953, Salt water intrusion in Florida: Florida State Board of Conservation, Division of Water Survey and Research Paper 9, p. 13.

Brown, D. W., 1958, Interim report on the changes in the chloride content of ground water in Pinellas County, Florida: Florida Geological Survey Information Circular 16.

Cherry, R. N., 1963, Chloride content of ground water in Pinellas County, Florida: Florida Geological Survey Map Series 20.

Cherry, R. N., Stewart, J. W., and Mann, J. A., 1970, General hydrology of the middle Gulf area, Florida: Florida Geological Survey Report of Investigation 56.

Cooper, H. H., Jr., and Stringfield, V. T., 1950, Ground water in Florida: Florida Geological Survey Information Circular 3.

Heath, R. C., and Smith, P. C., 1964, Ground-water resources of Pinellas County, Florida: Florida Geological Survey Report of Investigation 12.

Mills, L. R., and Hutchinson, C. B., 1976, Water table in the surficial aquifer and potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, May 1976: U.S. Geological Survey Open-File Report FL-76005.

Ryder, P. D., and Mills, L. R., 1977a, Water table in the surficial aquifer and potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, September 1976: U.S. Geological Survey Open-File Report 77-353.

______ 1977b, Water table in the surficial aquifer and potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, May 1977: U.S. Geological Survey Open-File Report 77-552.

______ 1978, Water table in the surficial aquifer and potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, September 1977: U.S. Geological Survey Open-File Report 78-9.

Stewart, J. W., Mills, L. R., Knochenmus, D. D., and Faulkner, G. L., 1971, Potentiometric surface and areas of artesian flow, May 1969, and change of potentiometric surface 1964 to 1969, Floridan aquifer, Southwest Florida Water Management District, Florida: U.S. Geological Survey Hydrologic Investigation Atlas HA-440.

Stringfield, V. T., 1933, Artesian water in the Florida peninsula: U.S. Geological Survey Water-Supply Paper 773-C, p. 115-195.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
325 John Knox Rd--Suite F240
Tallahassee, Florida 32303

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
INT. 413

FIRST CLASS