

(200)

R290

no. 77-257

UNITED STATES  
(DEPARTMENT OF THE INTERIOR)  
GEOLOGICAL SURVEY

Reports - Open file  
series

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC  
SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS,  
WEST-CENTRAL FLORIDA, MAY 1976

By C. B. Hutchinson and L. R. Mills  
65.

✓ cat

OC9X

779  
cm  
✓ Twana

---

Open-File Report 77-257

Prepared in cooperation with the  
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT  
and SEVERAL STATE and LOCAL AGENCIES

Tallahassee, Florida

1977

277733

## CONVERSION FACTORS

For use of those readers who may prefer to use metric units rather than English units, the conversion factors for the terms used in this report are listed below:

<u>English</u>	<u>Multiply by</u>	<u>Metric</u>
in (inches)	$2.54 \times 10$	mm (millimeters)
ft (feet)	$3.05 \times 10^{-1}$	m (meters)
mi <sup>2</sup> (square miles)	2.59	km <sup>2</sup> (square kilometers)
Mgal/d (million gallons per day)	$4.38 \times 10^{-2}$	m <sup>3</sup> /s (cubic meters per second)

## ABSTRACT

The water table in the surficial aquifer (sand) and the potentiometric surface of the Floridan aquifer (limestone) in a 1,200-square-mile area in west-central Florida are mapped semiannually by the U.S. Geological Survey. Maps are prepared each May and September to coincide with seasonal low and high ground-water levels. The mapped area contains nine producing well fields which supplied 92.8 million gallons on May 12, 1976 to municipalities along the Gulf Coast. This pumpage came from the Floridan aquifer, the major aquifer in the State of Florida. The effect of well-field withdrawals is shown on the maps as cones of depression in both the potentiometric and water-table surfaces. The May 1976 maps indicate that water levels have declined below sea level in some areas. The decline results from reduced recharge during the dry spring combined with an increase in pumpage for lawn irrigation.

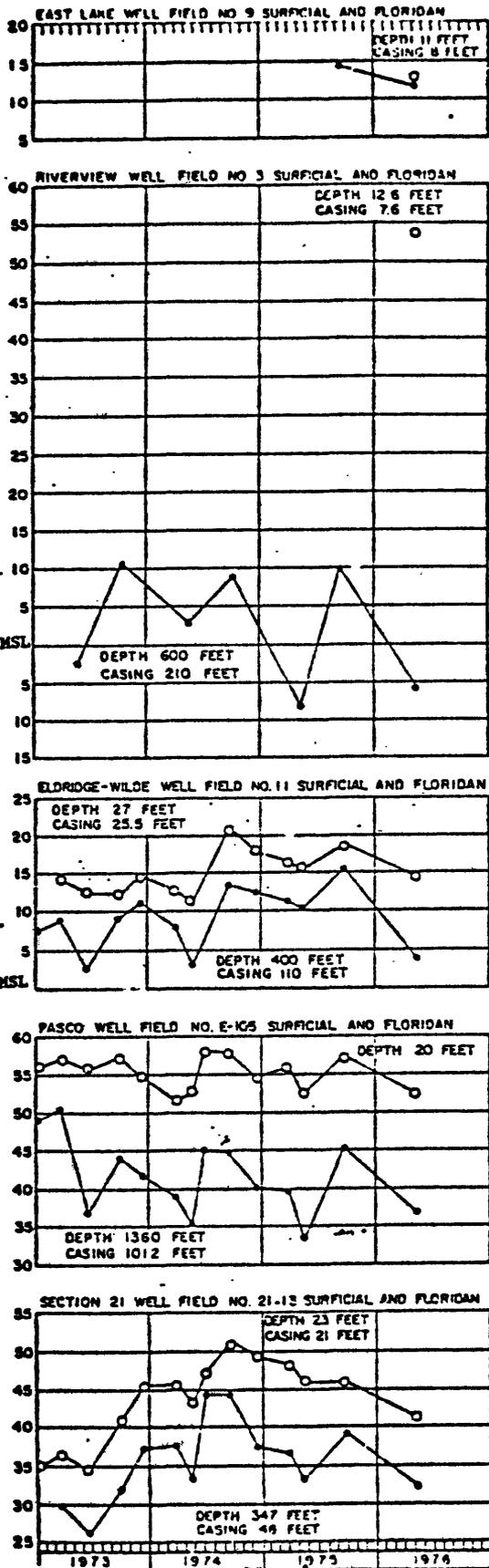
## INTRODUCTION

The accompanying maps show the configurations of the water table and potentiometric surfaces in a region of west-central Florida where water levels are affected by municipal pumping. The maps are prepared semiannually by the U. S. Geological Survey, in cooperation with the Southwest Florida Water Management District and State and local agencies.

The land area encompassed by the maps is about 1,200 mi<sup>2</sup> and includes parts of Hillsborough, Pinellas, and Pasco Counties. The area is underlain by unconsolidated fine-grained sediments, as much as 80 ft thick, which constitute the surficial aquifer. The surficial aquifer is underlain almost everywhere in the mapped area by clay that forms a leaky semiconfining layer separating the surficial aquifer from the underlying limestone of the Floridan aquifer. In southern Hillsborough County, the Floridan aquifer is separated into an upper part and a lower part by confining beds.

Nine producing municipal well fields (East Lake, Starkey, Cypress Creek, Sun City, Riverview, Pasco County, Eldridge-Wilde, Cosme, and Section 21) and one proposed well field (Morris Bridge) are included in the mapped area. The nine producing well fields supply water to urban and suburban areas of New Port Richey, St. Petersburg, Pinellas County, and southern Hillsborough County. The effect of ground-water withdrawal is shown on the maps as depressions in the potentiometric and water-table surfaces. Pumpage is usually greatest from April to June, because of lawn irrigation.

POTENTIOMETRIC SURFACE AND WATER TABLE, IN FEET ABOVE AND BELOW MEAN SEA LEVEL



EXPLANATION

- Surficial aquifer
- Floridan aquifer

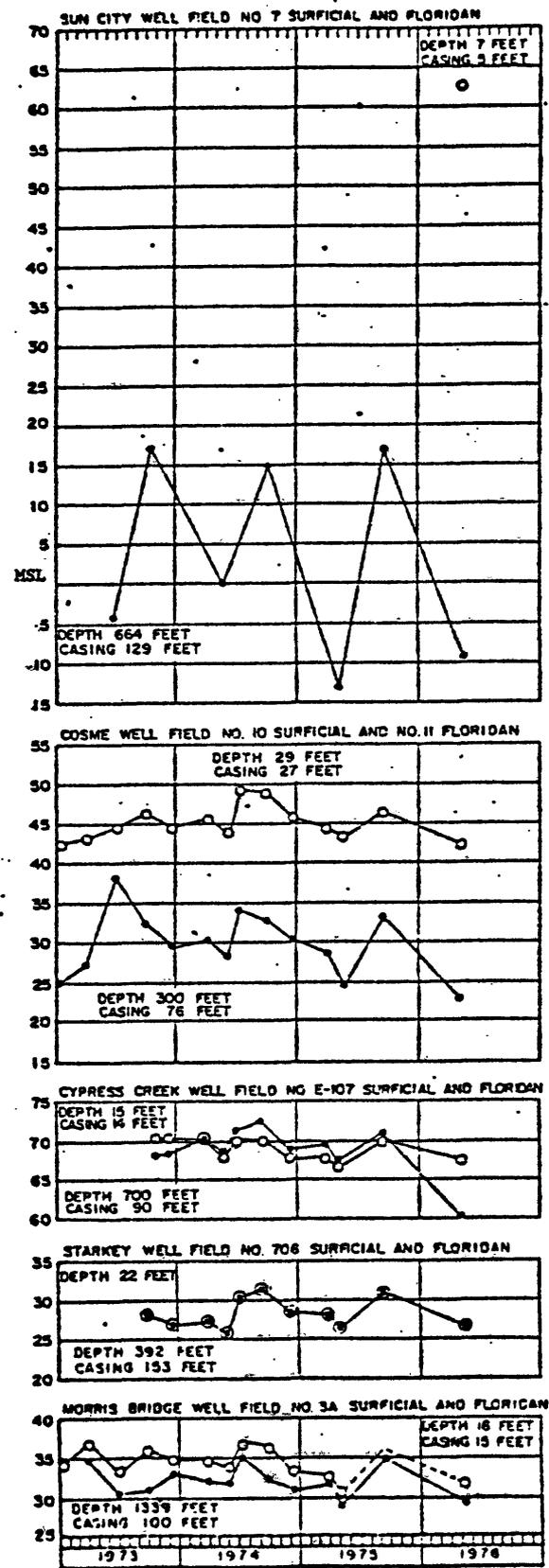


Figure 1. Hydrographs of selected wells tapping the surficial and Floridan aquifers.

This report contains four maps, one table, and one figure, as follows:

Sheet 1, Potentiometric surface of Floridan aquifer, west-central Florida, May 1976

Sheet 2, Potentiometric surface of the Floridan aquifer in selected well fields, west-central Florida, May 1976

Sheet 3, Water table in surficial aquifer, west-central Florida, May 1976

Sheet 4, Water table in surficial aquifer in selected well fields, west-central Florida, May 1976

Table 1, Rainfall in west-central Florida

Figure 1, Hydrographs of selected wells tapping surficial and Floridan aquifers

The following summary is based on conditions portrayed by these maps and table.

## SUMMARY OF CONDITIONS

Monthly rainfall totals were about normal from October 1975 to May 1976 (table 1). In May, water levels in observation wells in the surficial aquifer and the Floridan aquifer were below those measured in September 1975 (Mills and Hutchinson, 1976), reflecting a regional seasonal decline.

Total daily pumpage from the nine producing well fields at the time of measurement (May 12) was 92.8 Mgal. The average daily pumping rate in May 1976, was 24.8 Mgal more than the 68 Mgal measured in September 1975. The increased pumpage results largely from increased lawn irrigation.

The seasonal fluctuations of the water table in the surficial aquifer and the potentiometric surface of the Floridan aquifer, and the head relations of the two water surfaces at each well field are shown by hydrographs in figure 1. Water levels generally are lowest in May and highest in September. The water table normally stands at a slightly higher altitude than the potentiometric surface. In the producing well fields, lowering of the potentiometric surface by pumping from the Floridan aquifer has created a large head difference between the two surfaces.

Table 1. -- Rainfall in west-central Florida.

(Monthly rainfall, in inches, by National Oceanic and Atmospheric Administration, U. S. Geological Survey, and the City of St. Petersburg)

Station	October 1975	Normal 1941-70	November 1975	Normal 1941-70	December 1976	Normal 1941-70	January 1976	Normal 1941-70	February 1976	Normal 1941-70	March 1976	Normal 1941-70	April 1976	Normal 1941-70	May 1976	Normal 1941-70
RUSKIN	4.94	2.54	0.22	1.79	0.87	2.19	0.40	2.33	0.49	2.86	1.64	3.89	1.83	2.10	8.13	1.41
ST. LEO	4.34	6.56	1.97	2.63	1.31	2.62	0.73	2.55	0.67	3.19	3.15	4.53	3.06	3.10	10.33	3.79
SECTION 21	5.62	--	0.09	--	1.11	--	0.50	--	0.50	--	0.52	--	2.27	--	12.94	--
ELDRIDGE- WILDE	8.23	--	0.18	--	1.94	--	0.57	--	0.67	--	0.79	--	1.64	--	12.71	--
CYPRESS CREEK	7.34	--	1.00	--	1.28	--	0.70	--	0.65	--	3.22	--	3.18	--	9.74	--
ODESSA	4.26	--	0.25	--	1.68	--	0.25	--	0.57	--	0.71	--	1.83	--	13.60	--
COSME	6.48	3.15	0.83	2.42	1.18	1.91	0.59	2.30	0.80	2.79	0.77	4.17	1.52	2.20	12.39	2.68
PASCO WELL FIELD	4.77	--	0.16	--	1.91	--	0.46	--	0.55	--	0.39	--	2.40	--	14.83	--

## Pasco County Well Field

The Pasco County well field began production in March 1973. Its operation provides a relief for the Cosme and Section 21 well fields, which had been heavily pumped. The altitude of the potentiometric surface in well E-105 (fig. 1), near the center of the cone of depression in the Floridan aquifer, was about 37 ft in May, which represents a 7-ft decline since September 1975.

The water table in the surficial aquifer declined about 5 ft from September to May (fig. 1). At the center of the well field, the water table was about 14 ft above the potentiometric surface. The water-table contours on the regional map indicate that the surficial aquifer is discharging westward to the South Branch of the Anclote River.

## Section 21 Well Field

The section 21 well field began production in February 1963. Daily pumpage in May was 3 Mgal less than in September 1975. The 6-ft decline in the Floridan potentiometric surface below the September level reflects the regional water-level decline.

The water table in the surficial aquifer declined 5 ft between September 1975 and May 1976 (fig. 1), also reflecting the regional water-level decline. On May 12, the head in the water-table aquifer was 9 ft above the potentiometric surface at well 21-13, in the center of the well field.

### Eldridge-Wilde Well Field

Pinellas County began production from the Eldridge-Wilde well field in April 1956. The wells in the field serve both Pinellas and Hillsborough Counties. In May 1976, the potentiometric surface of the Floridan aquifer was about 10 ft below the September 1975 level in the Pinellas County part of the well field. In the Hillsborough County part of the well field, the potentiometric surface declined about 9 ft. Daily pumpage from the well field by Pinellas County decreased by 10 Mgal since last September. On May 12, the water level in the USGS recorder well north of production well 5 (sheet 2) was 0.1 ft below mean sea level. The amount of water pumped by Hillsborough County is not known.

In May 1976, the water table in the surficial aquifer was 4 ft lower than in September 1975 (fig. 1). The head difference between the water table and the potentiometric surface at well 11 was 10.5 ft on May 12. The water-table mound (sheet 4) near the western edge of the well field area overlies a thick layer of clay between 14 and 30 ft below land surface. The level of Lake Dan is maintained at a constant altitude by water pumped from the Floridan aquifer.

### Cosme Well Field

Production from the Cosme well field, outside the city, began in September 1930. Before then, St. Petersburg obtained its water supply from surface and ground-water sources within the city, whose quality

was gradually deteriorating. The potentiometric surface of the Floridan aquifer declined about 9 ft from September 1975 to May 1976. Daily pumpage on May 12, 1976 was 16 Mgal, 6 Mgal more than in September 1975. The decline in the potentiometric surface probably reflects both the increase in pumpage and the decrease in rainfall.

The water table in the surficial aquifer dropped 4 ft from September 1975 to May 1976 (fig. 1). The decline reflects the seasonal decline.

#### Morris Bridge Well Field

No wells in the Morris Bridge well field are as yet operational, so water levels in the area have not been affected by pumping. Hence, declines in the water-table and potentiometric surface in the field reflect only seasonal changes. The water table in the surficial aquifer and the potentiometric surface of the Floridan aquifer in the vicinity of the well field indicate the possibility of ground-water discharge to the Hillsborough River.

#### Starkey Well Field

The Starkey well field became operational in 1975. Currently, four production wells supply about 2 Mgal to the the city of New Port Richey. The altitudes of the potentiometric surface and water table generally coincide in the vicinity of the well field. Water levels in both aquifers were about 4 ft below those measured in September 1975 (fig. 1).

### Cypress Creek Well Field

The Cypress Creek well field was being tested on May 12, 1976 and a significantly large decline was observed in the potentiometric surface of the Floridan aquifer. Well C-3 (sheet 2) was pumping and part of the 12-ft water-level decline in observation well E-107, about 500 ft southwest of C-3, was the effect of the pumping (fig. 1).

The water table in the surficial aquifer declined 3 ft between September 1975 and May 1976 (fig. 1). The decline probably was not increased by the pumping.

### East Lake Well Field

The East Lake well field began production in September 1974 to supplement supply from the Eldridge-Wilde well field. On May 12, 1976, pumpage was 4.8 Mgal. The decline in the potentiometric surface since September 1975 was 3 ft. A cone of depression is apparent in the potentiometric surface.

The water table which slopes toward Brooker Creek was mapped for the first time using data from recently installed observation wells. The head difference between the water table and the potentiometric surface within the cone of depression averages about 6 ft.

### Riverview Well Field

The Riverview well field began production in 1969. The pumpage for May 12, 1976 was 2.3 Mgal. The water level at the center of the cone of depression was about 6 ft below sea level, or about 4 ft below the regional potentiometric surface. The potentiometric surface declined 6 ft between September 1975 and May 1976 (fig. 1).

The water table in the surficial aquifer was mapped for the first time. The water-table gradient across the well field is southeast to northwest toward Bullfrog Creek. The average head difference between the water table in the surficial aquifer and the potentiometric surface of the lower unit of the Floridan aquifer is 60 ft.

### Sun City Well Field

The Sun City well field began production in 1961. On May 12, 1976 it supplied the Sun City Center area with about 1.9 Mgal. The potentiometric surface of the lower part of the Floridan aquifer declined 26 ft from September 1975 to May 1976 (fig. 1).

The water table in the surficial aquifer was mapped for the first time. The average head difference between the water table in the surficial aquifer and the potentiometric surface of the Floridan aquifer is 60 ft.

## REFERENCES

- 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, September 1976: U.S. Geol. Survey Open-File Rept. FL-76004, 13 p.
- National Oceanic and Atmospheric Administration, October 1975 - May 1976, Climatological data, Florida: National Oceanic Atmospheric Admin. vol. 79, nos. 10-12, vol. 80, nos. 1-5.