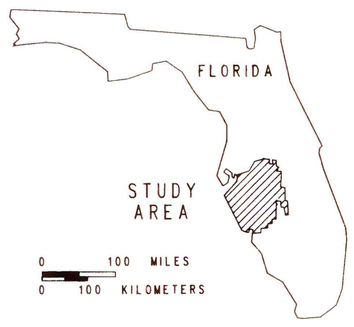
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

OPEN-FILE REPORT 91-523



INTRODUCTION

The intermediate aquifer system within the Southwest Florida Water Management District underlies a 5,000-square-mile area including De Soto, Sarasota, Hardee, Manatee, and parts of Charlotte, Hillsborough, Highlands, and Polk Counties. It occurs between the overlying surficial aquifer system and the underlying Floridan aquifer system and consists of layers of sand, shell, clay, calcareous clays, limestone, and dolomite of the Tamiami Formation and Hawthorn Group of late Tertiary age. The intermediate aquifer system contains one or more water-bearing units separated by discontinuous confining units (Duerr and others, 1988). This aquifer system is the principal source of potable water in the southwestern part of the study area and is widely used as a source of water in other areas where wells are open to the intermediate aquifer system or to both the intermediate and Floridan aquifer systems. Yields of individual wells open to the intermediate aquifer system range from a few gallons to several hundred gallons per minute. The volume of water withdrawn from the intermediate aquifer system is considerably less than that withdrawn from the Floridan aquifer system in the study area (Duerr and others, 1988).

In areas where multiple aquifers exist in the system, wells open to all aquifers were selected for water-level measurements whenever possible. The water levels along the northern boundary of the intermediate aquifer system generally reflect levels similar to those in the underlying Floridan aquifer system because the confining unit that separates the two aquifers is either absent or discontinuous, permitting direct hydraulic connection. In the southwestern and lower coastal region of the study area, the intermediate aquifer system comprises two aquifers separated by a confining unit (Wolansky, 1983): the Tamiami-upper Hawthorn aquifer and the underlying lower Hawthorn-upper Tampa aquifer. Lateral boundaries for the Tamiami-upper Hawthorn aquifer are undetermined because of limited hydrogeologic data available from wells.

This report shows the potentiometric surface of the intermediate aquifer system in May 1991. The potentiometric surface is an imaginary pressure surface represented by the level to which water will rise in tightly cased wells that tap an aquifer system. The surface is mapped by determining the altitude of water levels in a network of wells and is represented on maps by contours that connect points of equal altitude. This map represents water-level conditions near the end of the dry season when ground-water withdrawals for agricultural use are high. The cumulative rainfall for the study area was 1.4 inches above normal for the period from June 1990 to May 1991 (Southwest Florida Water Management District, 1990-91).

This report, prepared by the U.S. Geological Survey in cooperation with the Southwest Florida Water Management District, is one of an ongoing series of intermediate aquifer system potentiometric-surface map reports made for the study area since September 1985 based on synoptic measurements. Water-level data are collected twice annually in May and September to show the annual low and high water-level conditions, respectively. Most of the water-level data for this map were collected by the U.S. Geological Survey during the period of May 13-17. Supplemental data were collected by other agencies and companies.

SUMMARY OF GROUND-WATER CONDITIONS

The composite potentiometric surface of all water-bearing units within the intermediate aquifer system is shown in figure 1. The potentiometric surface of the Tamiami-upper Hawthorn aquifer is shown in figure 2; water levels are from wells drilled and open exclusively to this aquifer. The hydrographs for selected wells, shown in figure 3, indicate that the annual and seasonal fluctuations of the water levels are generally large in the central interior region where water demand for irrigation is high during fall and spring (hydrographs 2, 4, 5, and 9). Changes are smaller in the northern recharge area (hydrographs 1 and 3) and in coastal areas (hydrographs 7 and 8) where water use is predominantly for public supply. Hydrographs in figure 4 shown the maximum daily water-level altitudes in selected wells from May 1990 to May 1991.

Water levels measured in May 1991 for the composite intermediate aquifer potentiometric surface were lower than those measured in September 1990 (Mularoni and Knochenmus, 1991). In 147 wells with paired measurements, the May 1991 level ranged from 15.83 feet below to 3.12 feet above the September 1990 level and averaged 4.56 feet below the September level. In 36 wells in the Tamiami-upper Hawthorn aquifer, paired measurements for the May 1991 level ranged from 14.27 feet below to 1.76 feet above the September 1990 level and averaged 2.01 feet below the September level.

May 1991 water levels for the composite intermediate aquifer potentiometric surface were generally higher than those reported for May 1990 (Knochenmus, 1990). In 142 wells with paired measurements, the May 1991 levels ranged from 3.94 feet below to 16.06 feet above the May 1990 level and averaged 4.68 feet above the May 1990 level. In 36 wells in the Tamiami-upper Hawthorn aquifer, paired measurements for the May 1991 level ranged from 8.73 feet below to 9.16 feet above the May 1990 level and averaged 1.48 feet above the May 1990 level. A cone of depression is evident at the Pine Island well field in northwestern Lee County (fig. 1). A below-sea-level cone of depression is also evident at the Cape Coral well field in northern Lee County (fig. 2). A cone of depression also exists at warm Mineral Springs, which is a point of discharge from the intermediate aquifer system (figs. 1 and 2).

REFERENCES

Duerr, A.D., Hunn, J.D., Lewelling, B.R., and Trommer, J.T., 1988, Geohydrology and 1985 water withdrawals of the aquifer systems in southwest Florida, with emphasis on the intermediate aquifer system: U.S. Geological Survey Water-Resources Investigations Report 87-4259, 115 p.

Knochenmus, L.A., 1990, Potentiometric surface of the intermediate aquifer system, west-central Florida, May 1990: U.S. Geological Survey Open-File Report 90-555, 1 sheet.

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Wolansky, R.M., 1983, Hydrogeology of the Sarasota-Port Charlotte area, Florida: U.S. Geological Survey Water-Resources Investigations 82-4089, 48 p.

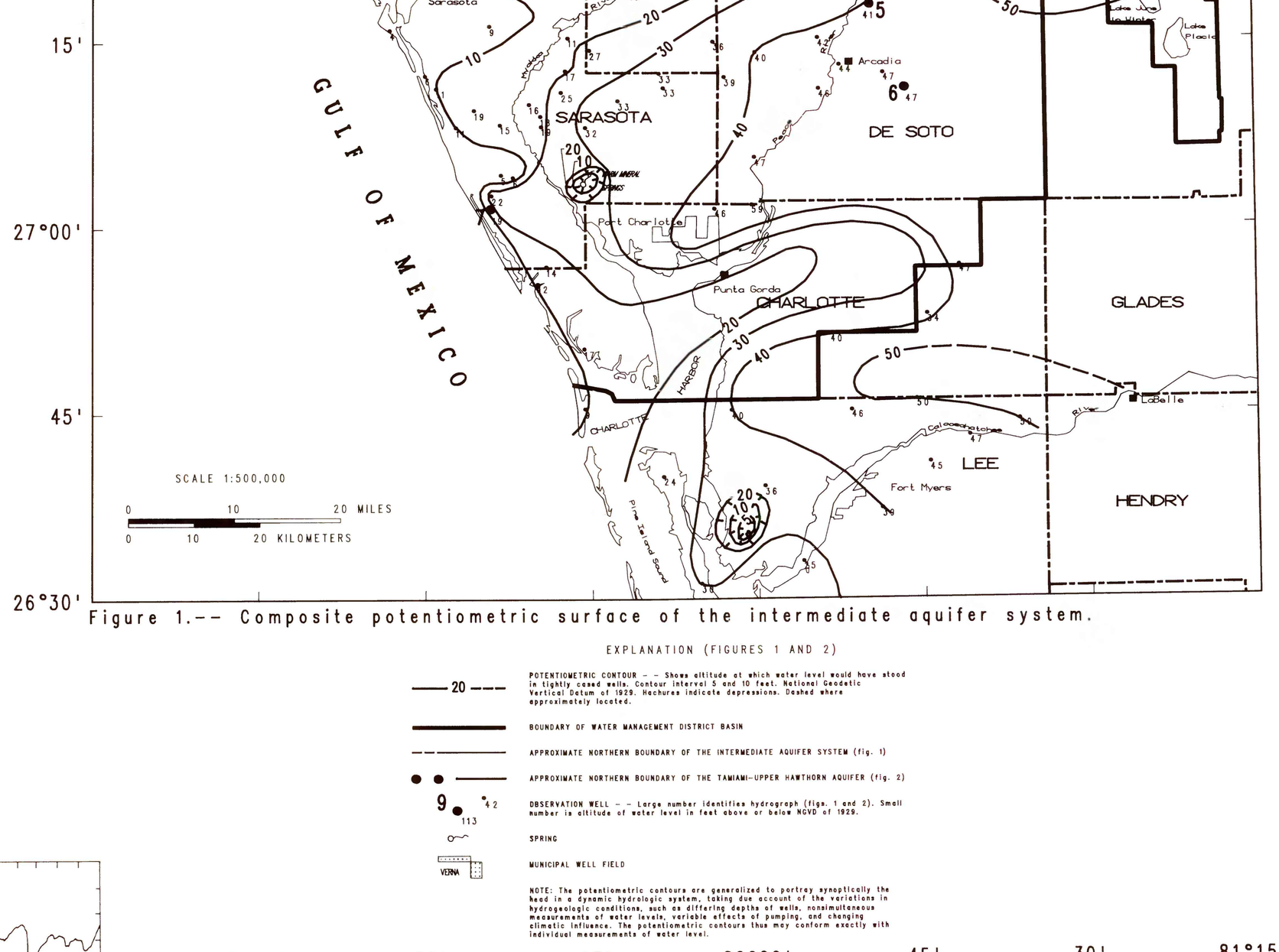
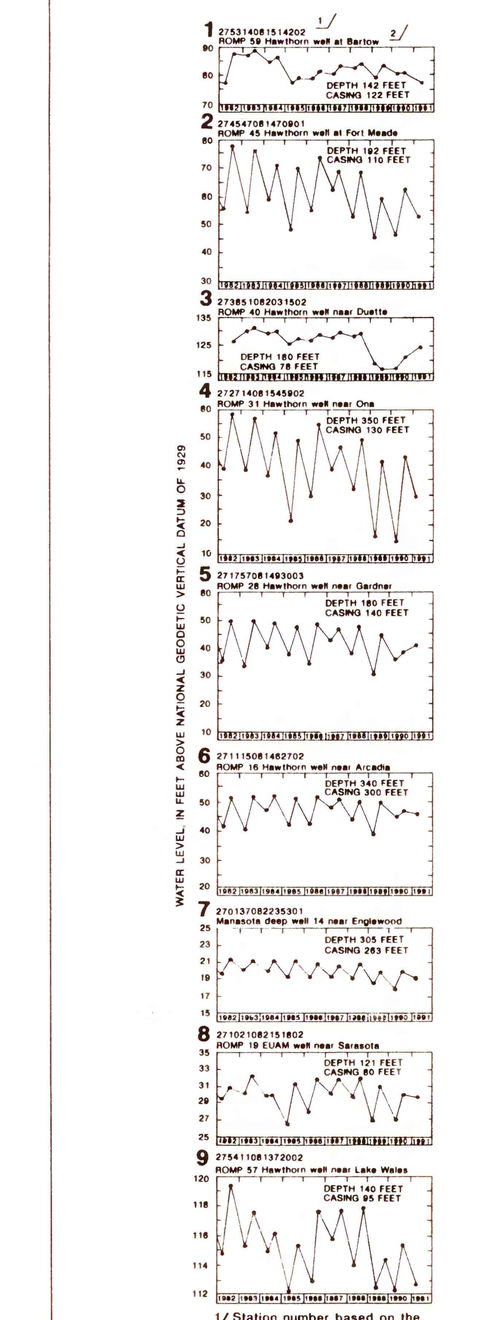


Figure 1.-- Composite potentiometric surface of the intermediate aquifer system.

EXPLANATION (FIGURES 1 AND 2)

- 20 — POTENTIOMETRIC CONTOUR -- Shows altitude at which water level would have stood in tightly cased wells. Contour interval 5 and 10 feet. National Geodetic Vertical Datum of 1929. Hachures indicate depressions. Dashed where approximately located.
- BOUNDARY OF WATER MANAGEMENT DISTRICT BASIN
- APPROXIMATE NORTHERN BOUNDARY OF THE INTERMEDIATE AQUIFER SYSTEM (fig. 1)
- APPROXIMATE NORTHERN BOUNDARY OF THE TAMIAMI-UPPER HAWTHORN AQUIFER (fig. 2)
- 9 113 42 OBSERVATION WELL -- Large number identifies hydrograph (figs. 1 and 2). Small number is altitude of water level in feet above or below NGVD of 1929.
- SPRING
- VERNA MUNICIPAL WELL FIELD

NOTE: The potentiometric contours are generalized to portray synoptically the head in a dynamic hydrologic system, taking due account of the variations in hydrogeologic conditions, such as differing depths of wells, nonsimultaneous measurements of water levels, variable effects of pumping, and changing climatic influence. The potentiometric contours thus may conform exactly with individual measurements of water level.



1/ Station number based on the latitude and longitude of the site

2/ Romp 59 (Regional Observation and Monitor Well Program) is a Southwest Florida Water Management District monitor well and identifying number

Figure 3.-- Water levels in selected wells for May and September 1982-1991

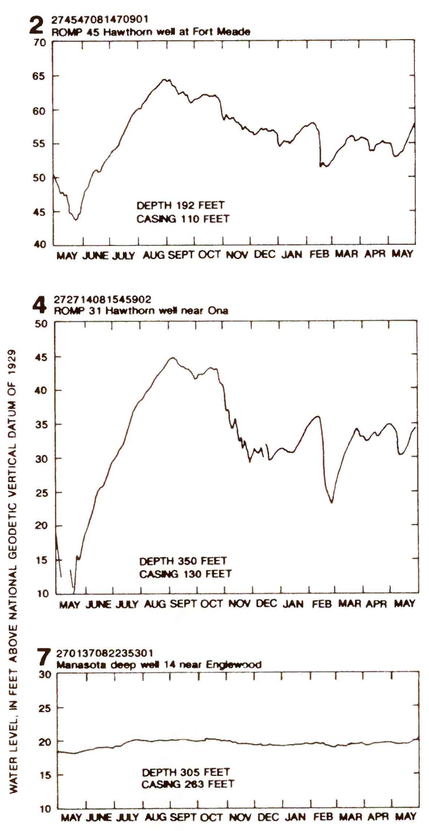


Figure 4.-- Maximum daily water levels in selected wells from May 1990 to May 1991

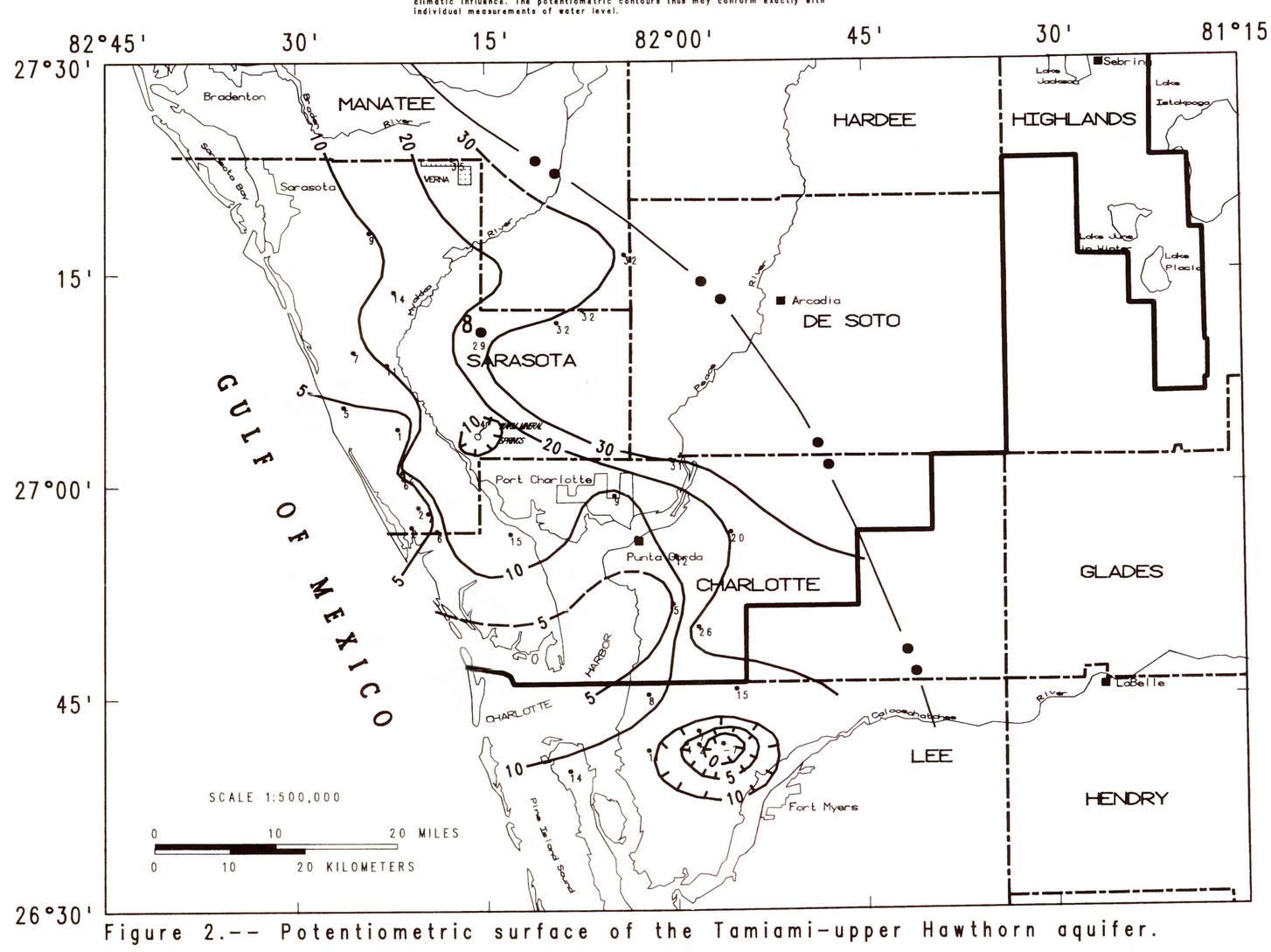


Figure 2.-- Potentiometric surface of the Tamiami-upper Hawthorn aquifer.

Base from digital data derived from State base map of Florida 1:500,000, 1967
Provided by Southwest Florida Water Management District

POTENTIOMETRIC SURFACES OF THE INTERMEDIATE AQUIFER SYSTEM, WEST-CENTRAL FLORIDA, MAY 1991

By

R.A. Mularoni

1992

Copies of this map can be purchased from:
U.S. Geological Survey
Book and Open-File Reports Section
Federal Center
Box 25425
Denver, Colorado 80225