Prepared in cooperation with
PALM BEACH COUNTY

WATER-RESOURCES INVESTIGATIONS
REPORT WRIR 86-4067

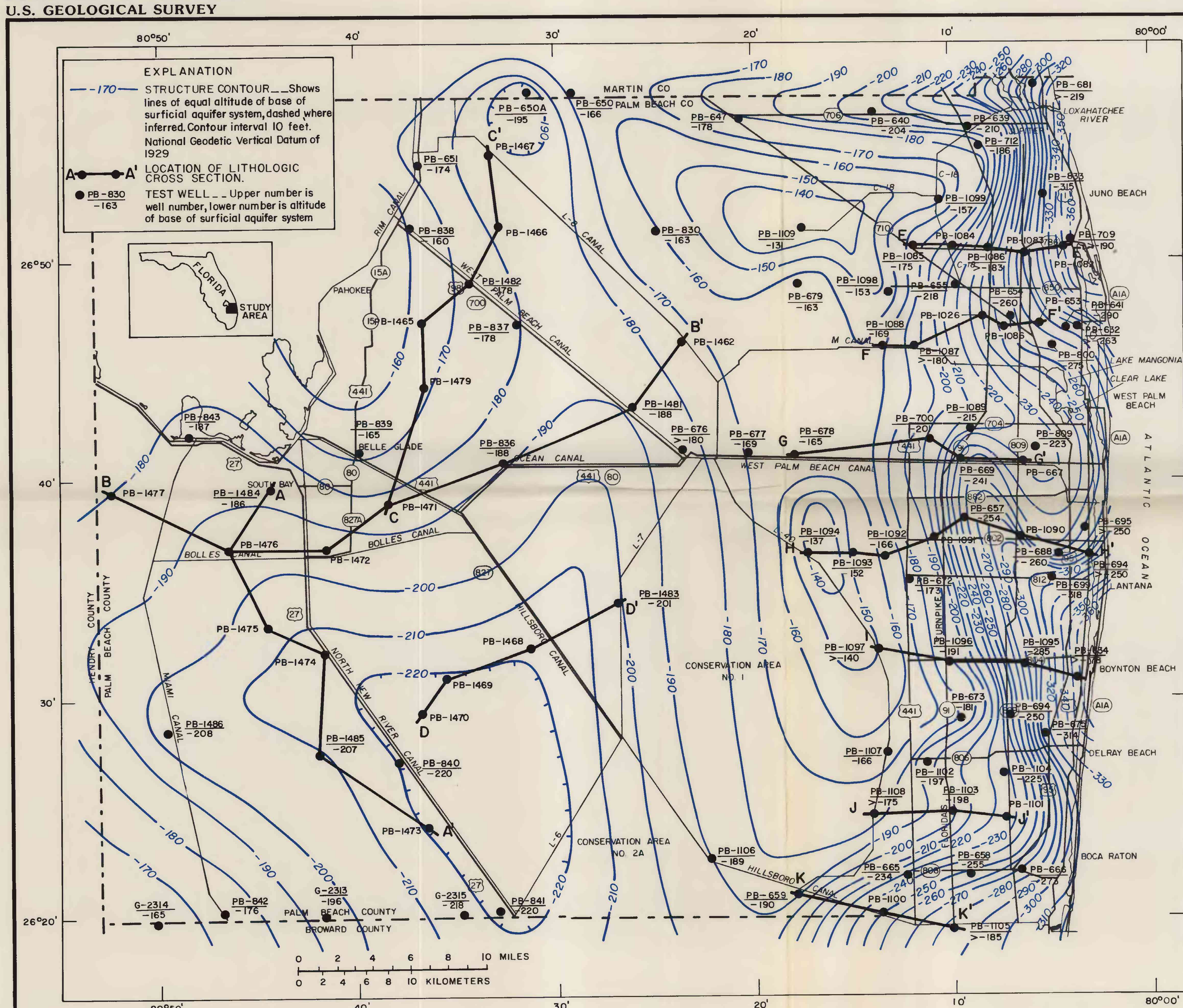
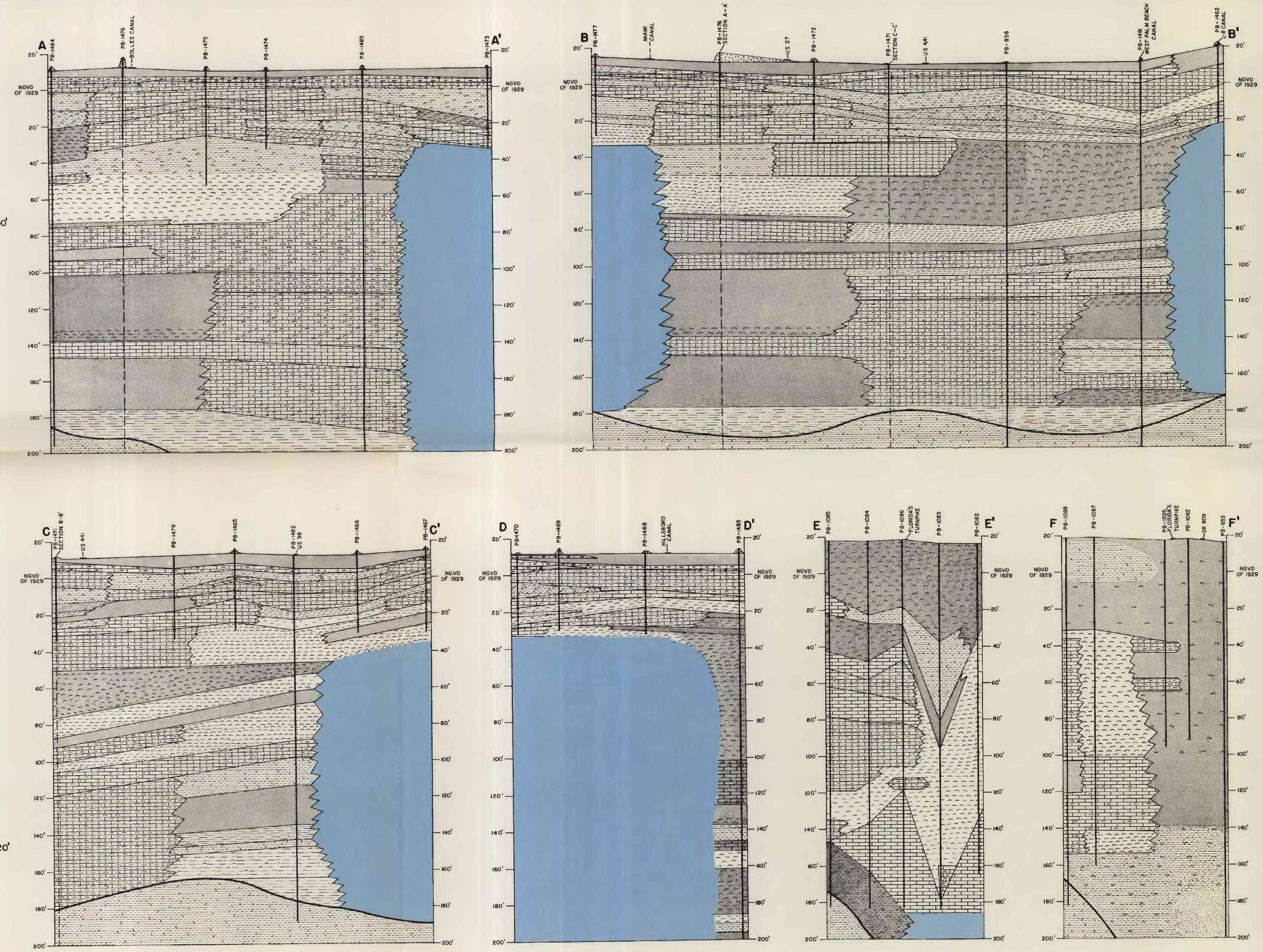
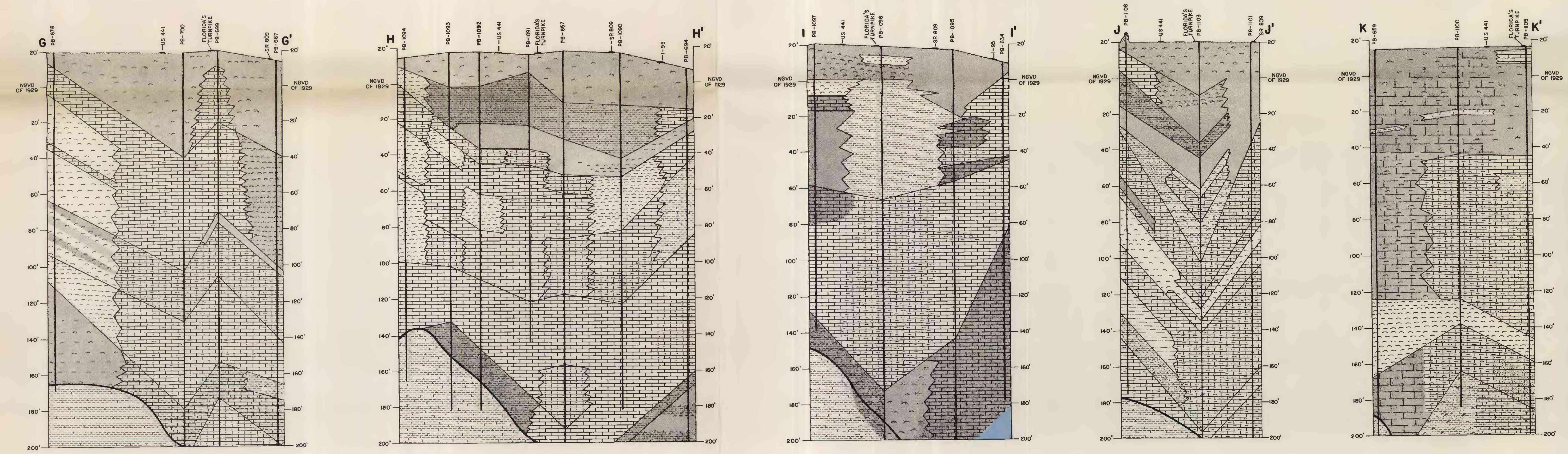


Figure 1.--Location of eleven lines of section and contours showing the base of the surficial aquifer system.

Geology by W.L. Miller, 1984; assisted by J.J. Milne, 1984.





The population of Palm Beach County in southeast Florida is increasing rapidly. Between 1978 and 1982, the county's estimated population increased by 103,389, or 16 percent (University of Florida, 1983, p. 21). This growth, coupled with westward expansion of urbanized areas into previous agricultural areas, has created new and shifting demands on the county's water resources. Long-term planning is necessary to ensure proper management and use of these resources.

The surficial aquifer system is a major source of freshwater in Palm Beach County. In 1982, public-supply withdrawals from the aquifer system totaled 33,543 million gallons, 77.5 percent of total public-supply withdrawals (Miller and Alvarez, 1984, p. 3). To evaluate the aquifer system and its geologic framework, a cooperative study with Palm Beach County was begun in 1982 by the U.S. Geological Survey. The purpose of this report is to describe the geologic framework of the aquifer system to provide a better understanding of some natural constraints that may affect future development. Lithologic and geophysical logs of 100 wells penetrating the aquifer system were compiled and used for this purpose.

The surficial aquifer system in Palm Beach County is primarily composed of sand, sandstone, shell, silt, calcareous clay (marl), and limestone deposited during the Pleistocene and Pliocene Epochs. Previous investigations have assigned the sediments forming the aquifer system to the Pamlico Sand, Fort Thompson and Anastasia Formations (all Pleistocene), and the Caloosahatchee Marl (Pleistocene and Pliocene). Permeable sediments in the upper part of the Tamiami Formation (Pliocene) are also part of the aquifer system (Parker and Hoy, 1943, p. 34-45). Cross sections A-A' through K-K' show the stratigraphy and lithology and indicate complex facies changes which characterize the aquifer system. The aquifer system is unconfined or semiconfined throughout the county and is divided into three zones recognizable by their relative permeabilities.

In the western two-thirds of Palm Beach County (sections A-A' to D-D'), sediments in the aquifer system are poorly consolidated sand, shell, and sandy limestone. Owing to interspersed calcareous clays and silt and very poorly sorted materials, permeabilities in this zone of the aquifer system are relatively low. In this area, the aquifer system is overlain by the freshwater Lake Flirt Marl (Pleistocene and Holocene), a nearly impermeable unit ranging in thickness from a few inches to nearly 5 feet. In much of the area, the Lake Flirt Marl has been indurated to a cherty limestone which is locally penetrated by numerous solution holes and is overlain by and intercalated with organic (peat) soils. Residual seawater trapped in the sediments due to the low permeabilities is common in this zone of the aquifer system (Parker and Hoy, 1943, p. 54).

Two other zones of the aquifer system are found in the eastern one-third of the county (sections E-E' to K-K') where the sediments are appreciably more permeable than in the west due to better sorting and less silt and clay content. The location of more detailed lithologic logs for wells in these sections, along with data from nearby wells, allowed enhanced interpretation and depiction of the lithology which had previously been generalized by Swayze and Miller (1984, figs. 2.1.1-1 to 7). The most permeable zone of the aquifer system in this area is characterized by highly developed secondary porosity where infiltrating rainwater and solution by ground water have removed calcitic-cementing materials from the sediments to produce interconnected cavities. This discontinuous zone of secondary porosity, locally called the "cavity-riddled zone," has been delineated and determined to be the northernmost extension of the Biscayne aquifer (Swayze and Miller, 1984, p. 8). Increased permeability in the aquifer system is generally coincident with the eastern boundary of the overlying organic soils and Lake Flirt Marl.

Impermeable and semipermeable marls (calcareous clays) of the Hawthorn Formation (Miocene), and in some areas the Caloosahatchee Marl and Tamiami Formation, unconformably underlie the surficial aquifer system and form its base. The configuration of structure contour lines (fig. 1) suggests extensive erosion of Miocene and Pliocene sediments prior to and, in some areas, contemporaneous with deposition of the aquifer system materials. Lithologic logs of wells in Palm Beach County (Schneider, 1976, p. 9-55; Swayze and others, 1980, p. 7-92) indicate that sediments forming the aquifer system were deposited directly on the erosional surface of the Hawthorn Formation in some areas. In other locations in the county, lithologic logs indicate that the base of the aquifer system was formed by fluvial deposits containing erosional materials from the Tamiami and Hawthorn Formations and Caloosahatchee Marl.

ABBREVIATIONS AND CONVERSION FACTORS

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

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
million gallons	0.189	cubic meter
(Mgal)	3,785	(m^3)

SELECTED REFERENCES

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EXPLANATION

FILL MATERIAL
SHELL
PEAT (ORGANIC SOIL)
CALCAREOUS CLAY (MARL OR LIME MUD)
SAND OR SANDSTONE
SILT OR SILTSTONE
LIMESTONE
CALCITE-CEMENTED SAND, SHELL
CHERTY LIMESTONE
BASE OF SURFICIAL AQUIFER SYSTEM
NO DATA AVAILABLE
NGVD OF 1929 — NATIONAL GEODETIC VERTICAL DATUM OF 1929 (FORMERLY MEAN SEA LEVEL)

VERTICAL SCALE GREATLY EXAGGERATED

0 1 2 3 4 5 MILES
0 1 2 3 4 5 KILOMETERS

LITHOLOGY AND BASE OF THE SURFICIAL AQUIFER SYSTEM, PALM BEACH COUNTY, FLORIDA

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