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CONFIGURATION OF THE BASE AND THICKNESS OF THE UNCONFINED AQUIFER IN SOUTHEASTERN SUSSEX COUNTY, DELAWARE

BY

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PURPOSE AND SCOPE

The purpose of this study was to map the thickness and the configuration of the base of the unconfined aquifer in southeastern Sussex County, Delaware (figure 1). The unconfined aquifer provides much of the water used in this part of the State and is the first unit to be affected by pollution or waste disposal problems. Contour maps and geologic sections were prepared from available geologic, geophysical, and drillers' logs and previously published reports and maps. Six test holes (figure 1) were drilled to supplement available data. The information in this report will be useful for water-resources planning and for locating water-supply wells in the unconfined aquifer.

ACKNOWLEDGMENTS

This study is part of an ongoing program of ground-water investigations made by the U. S. Geological Survey in cooperation with the Delaware Geological Survey. The staffs of the Delaware Geological Survey and the Delaware Department of Natural Resources and Environmental Control, Water Supply Branch are thanked for their assistance with data collection.

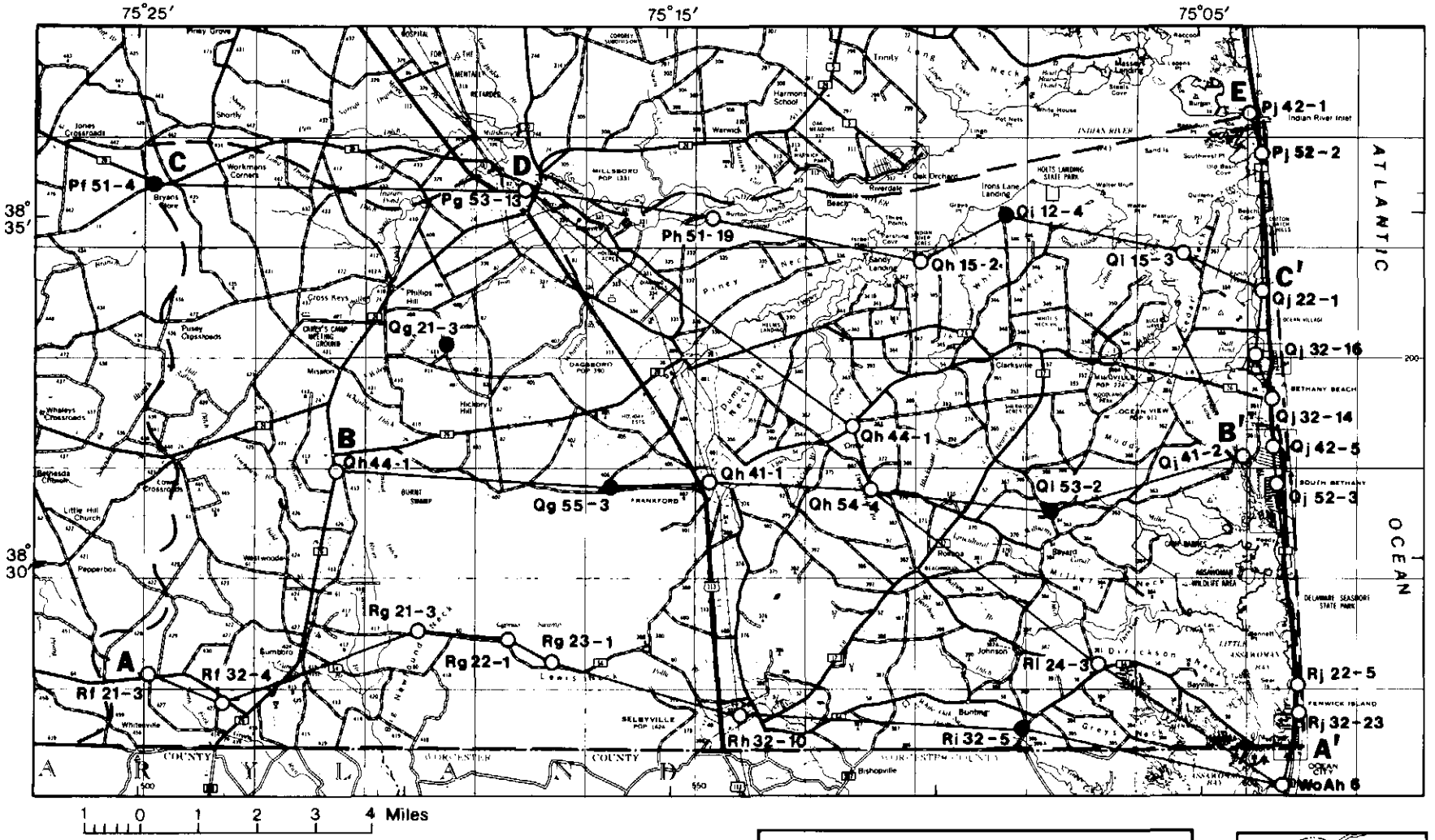


Figure 1. Location of study area, test holes, and geologic sections in southeast--ern Sussex County, Delaware.

DATA COLLECTION

Most of the geologic and geophysical logs used in this report are from the files of the Delaware Geological Survey. Additional drillers' logs were obtained from well-completion reports on file with the Water Supply Branch of the Delaware Department of Natural Resources and Environmental Control. Test holes were augered by the Delaware Geological Survey and gamma logged by the U. S. Geological Survey. Wells and test holes are identified by numbers assigned by the Delaware Geological Survey.

The altitude data in this report are related to the National Geodetic Vertical Datum of 1929 (NGVD of 1929). This is 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." NGVD of 1929 is referred to as sea level in this report.

INTERPRETATION OF DATA

The Unconfined Aquifer

Sediments defined as the unconfined aquifer consist of (1) Holocene age deposits, (2) the Columbia Group of Jordan (1962), and (3) the subcrop of the Pocomoke aquifer (Pickett, 1976). Deposits of Holocene age overlie the Columbia Group along the coast and in major river valleys. Kraft (1971) gives a detailed description of the Holocene deposits.

Jordan (1962) divided the Columbia Group in the study area into the Omar Formation, interbedded gray to dark-gray quartz sand and silt and the underlying Beaverdam Formation, a predominantly white to buff medium quartz sand. These units are considered Pleistocene in age by Jordan (1962, 1964, 1974). Owens and Denny (1979) agree that the Omar Formation is of Pleistocene age but state: "The Beaverdam Sand is presumed to be Pliocene on the basis of its microflora." (p. A14). They also identify two additional younger Pleistocene formations near the coast: the Ironshire Formation, a cross-stratified and gravelly sand and the Sinepuxent Formation, a fine-grained sand with thin beds of black clay (1979). Owens and Denny do not use the term "Columbia Group."

The Pocomoke aquifer is the youngest Miocene sand bed in the study area and part of a sequence of sand and clay-silt beds of the Chesapeake Group. It is a gray, silty, medium to coarse sand containing fine gravel (Sundstrom and Pickett, 1969).

Geologic Sections

Locations of the geologic sections are shown in figure 1. Figures 2 through 6 represent five geologic sections showing the base of the unconfined aquifer.

The first continuous confining unit encountered in the underlying Chesapeake Group was used to determine the base of the unconfined aquifer. Identification of the contact between the Columbia Group and the Chesapeake Group was based on interpretations of geologic and geophysical logs in conjunction with previously published interpretations (Sundstrom and Pickett, 1969; Miller, 1971; Johnston, 1973; Weigle, 1974). The confining unit was identified on geologic logs as a gray to dark gray clayey silt and by interpretation of a change on the geophysical logs from an aquifer to a confining unit. Where the Pocomoke aquifer is considered part of the unconfined aquifer an attempt was made to distinguish it from the Columbia Group. The limit of the Pocomoke aquifer subcrop was based on Pickett (1976).

Configuration of the Base of the Unconfined Aquifer

The configuration of the base of the unconfined aquifer, figure 7, was determined from geologic sections (figures 2 - 6) and geophysical and geologic logs. The base of the unconfined aquifer ranges from about 30 feet below sea level at wells Og21-3 and Qf44-1 on the western side of the study area to more than 175 feet below sea level near Holts Landing. The trough extending from Indian River Bay to Selbyville coincides with the Pocomoke aquifer subcrop area. A minor trough occurs near Bethany Beach.

Wells or test holes penetrating the entire thickness of the unconfined aquifer are widely spaced in the northwestern and southeastern parts of the study area. The base of the unconfined aquifer is not well defined in these areas.

Figure 2-4 Geologic section showing the base of the unconfined aquifer in south--eastern Sussex County, Delaware.

Figure 2.

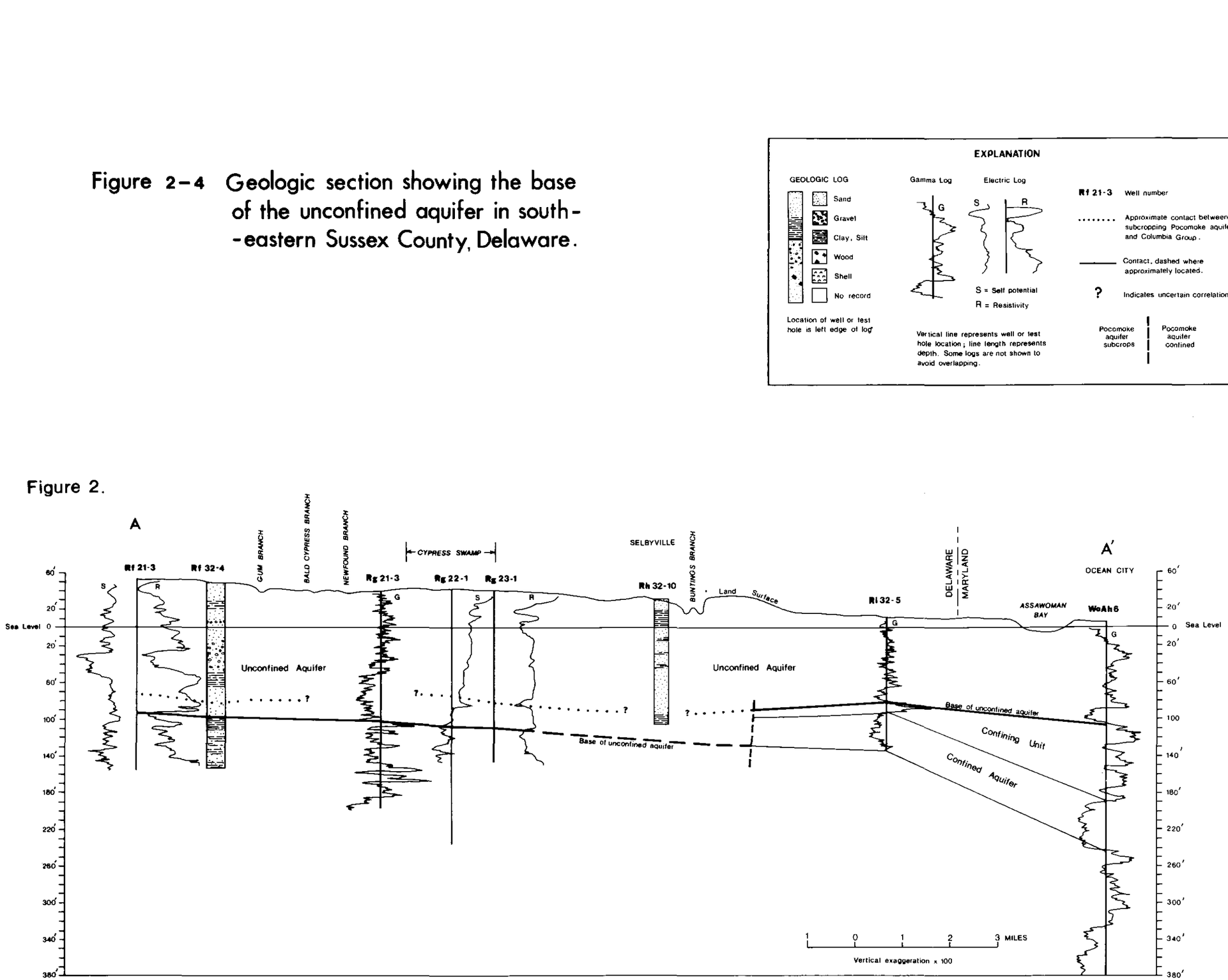


Figure 3

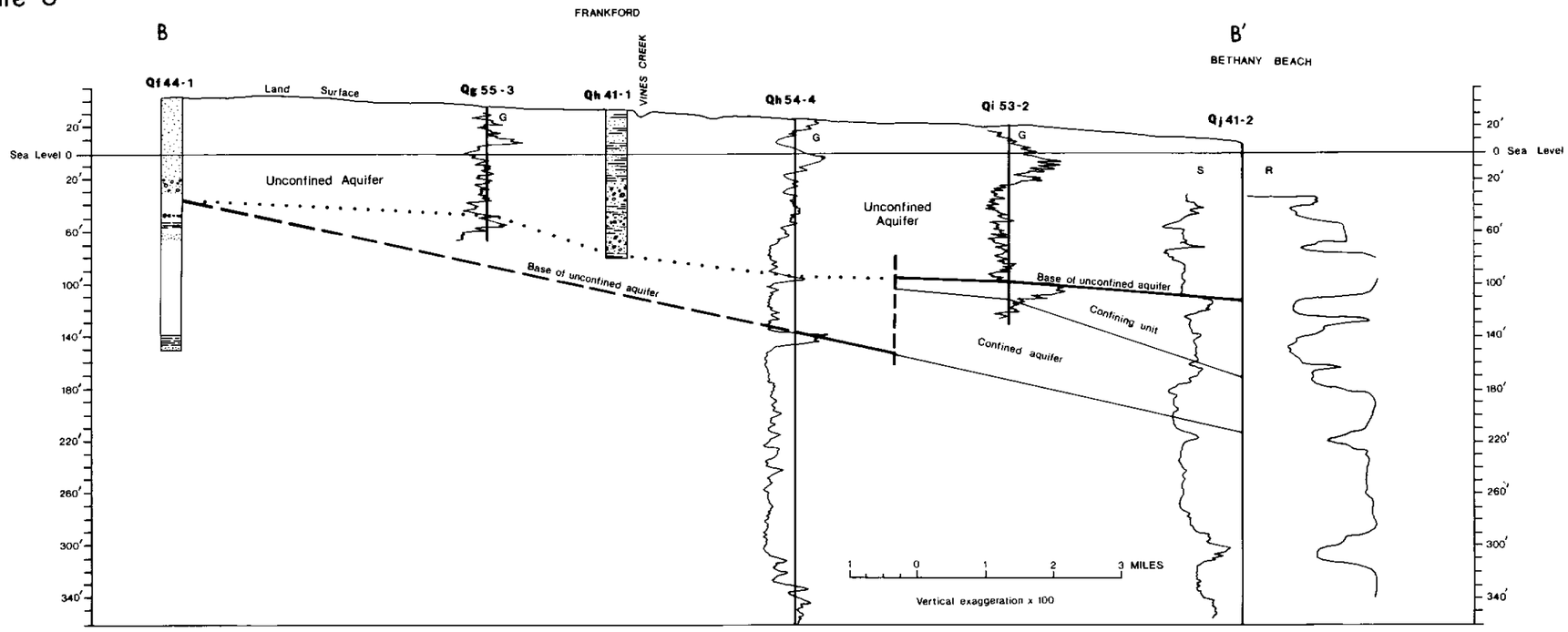


Figure 4

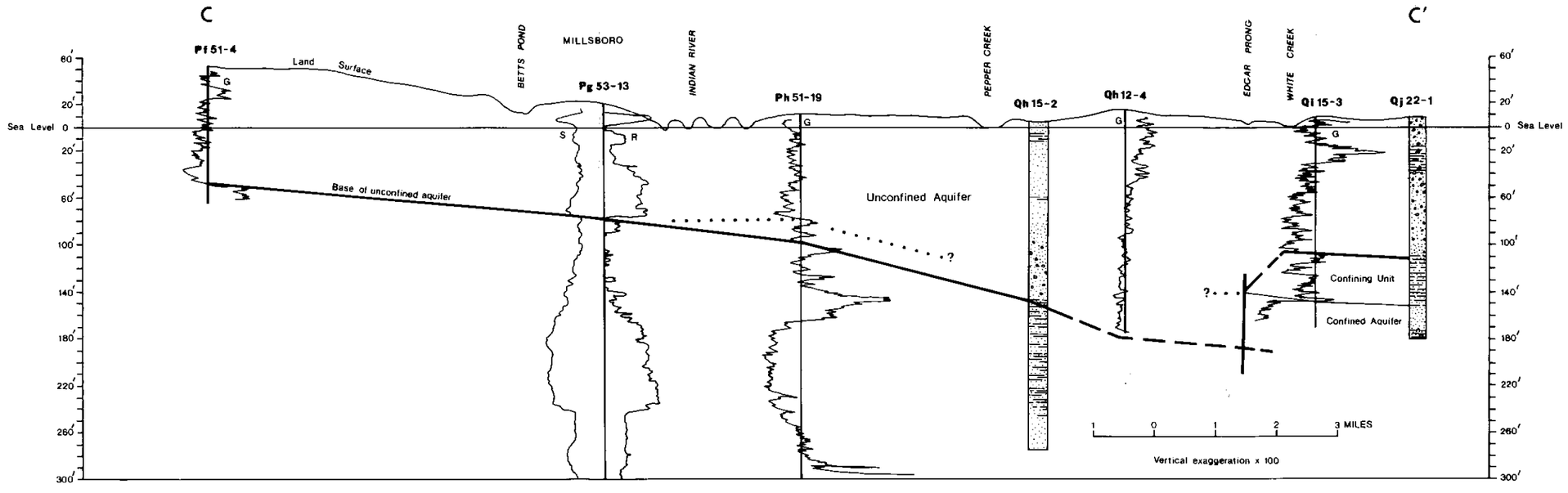


Figure 5

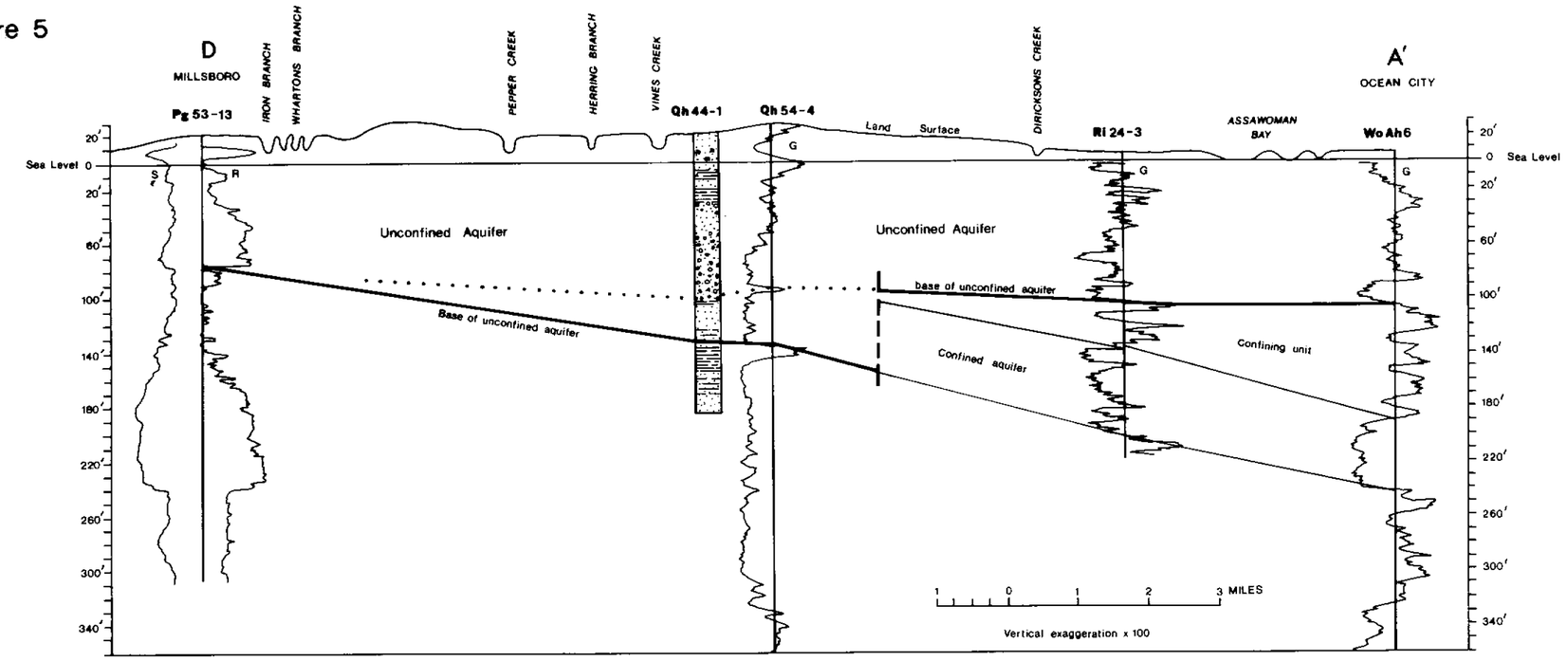
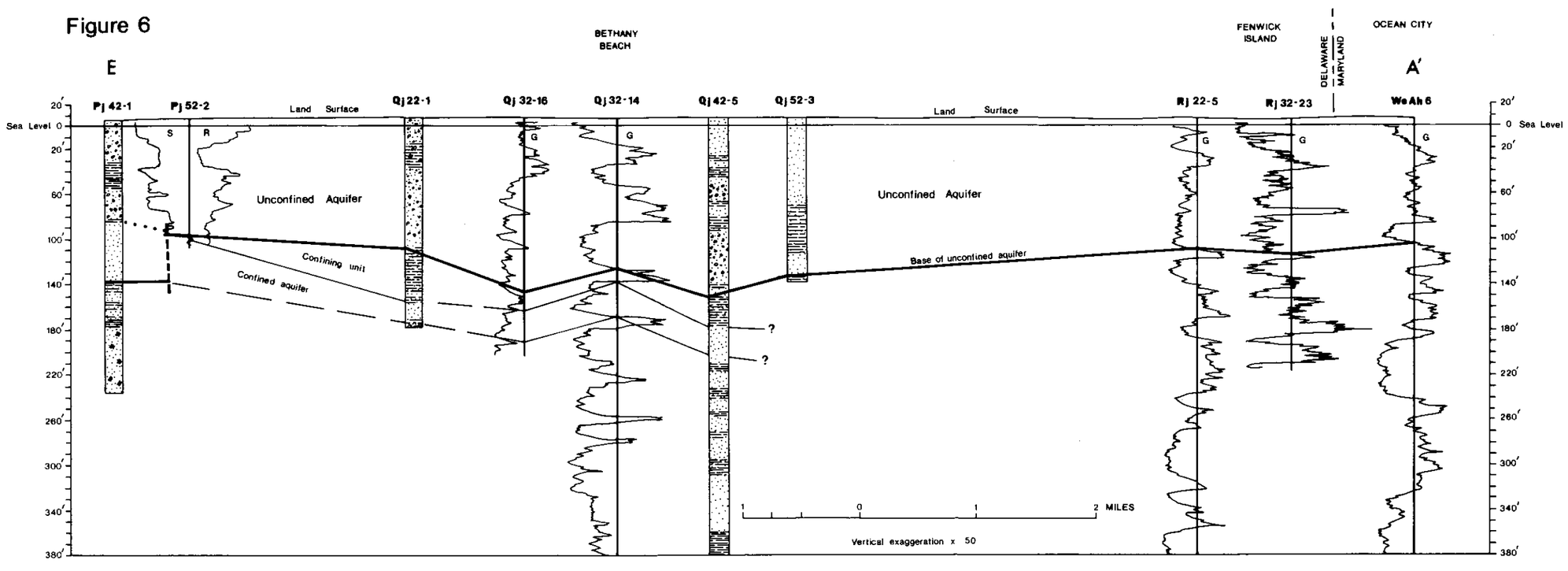


Figure 6



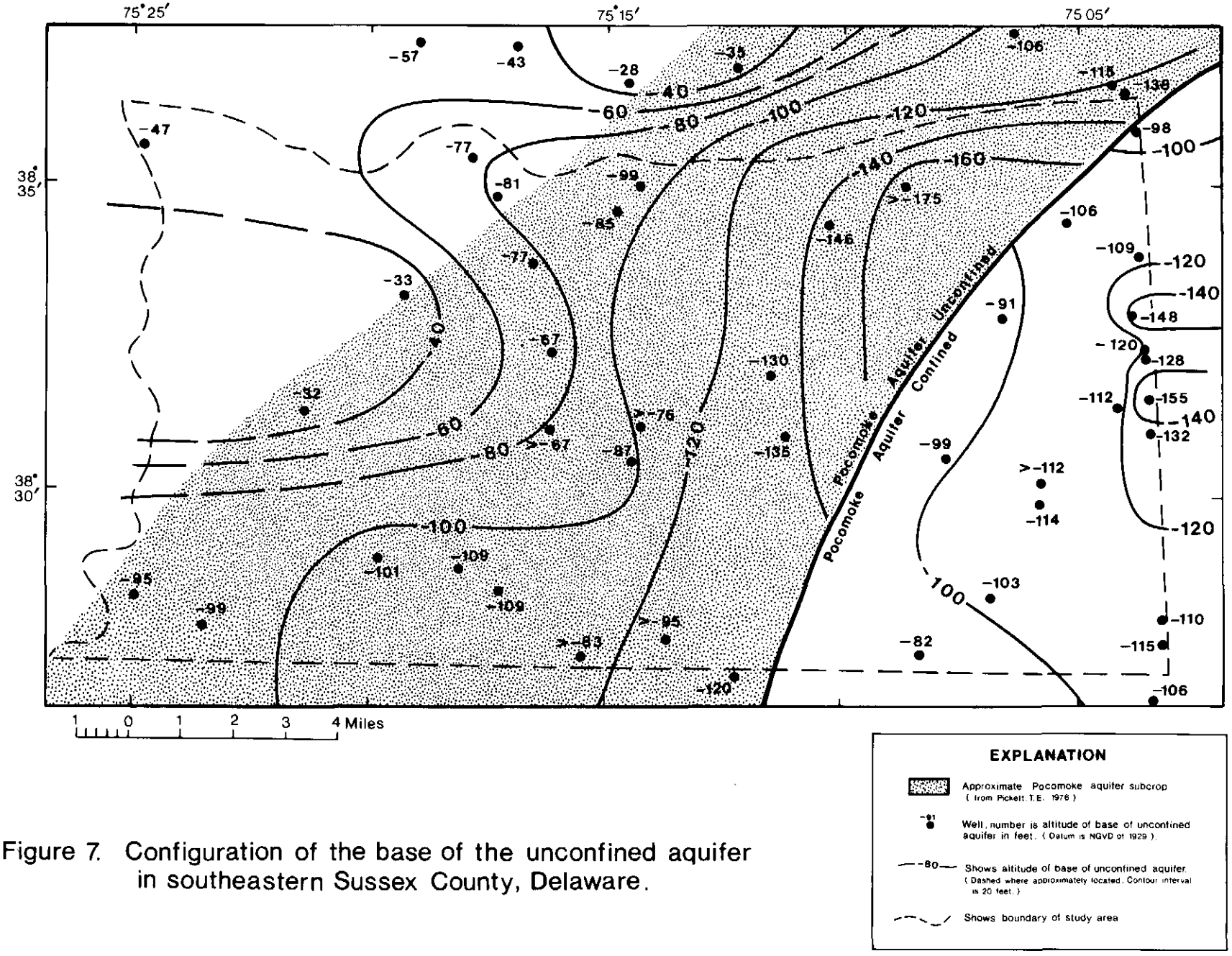


Figure 7. Configuration of the base of the unconfined aquifer in southeastern Sussex County, Delaware.

Thickness of the Unconfined Aquifer

The thickness of the unconfined aquifer, figure 8, was compiled from the same logs used for figure 7. The altitude of the base of the unconfined aquifer was subtracted from the altitude of the land surface shown on U. S. Geological Survey topographic maps to determine the total thickness of the aquifer.

The total thickness includes clay and silt layers within the aquifer. Most of the clay and silt layers are in the Omar Formation and may comprise about half of its thickness of about 45 feet. The aquifer may be locally confined or have a perched water table where the Omar Formation is present.

The greatest thickness is between Indian River Bay and Selbyville, coinciding with the Pocomoke aquifer subcrop area. The unconfined aquifer is thinnest in the northwestern corner of the study area.

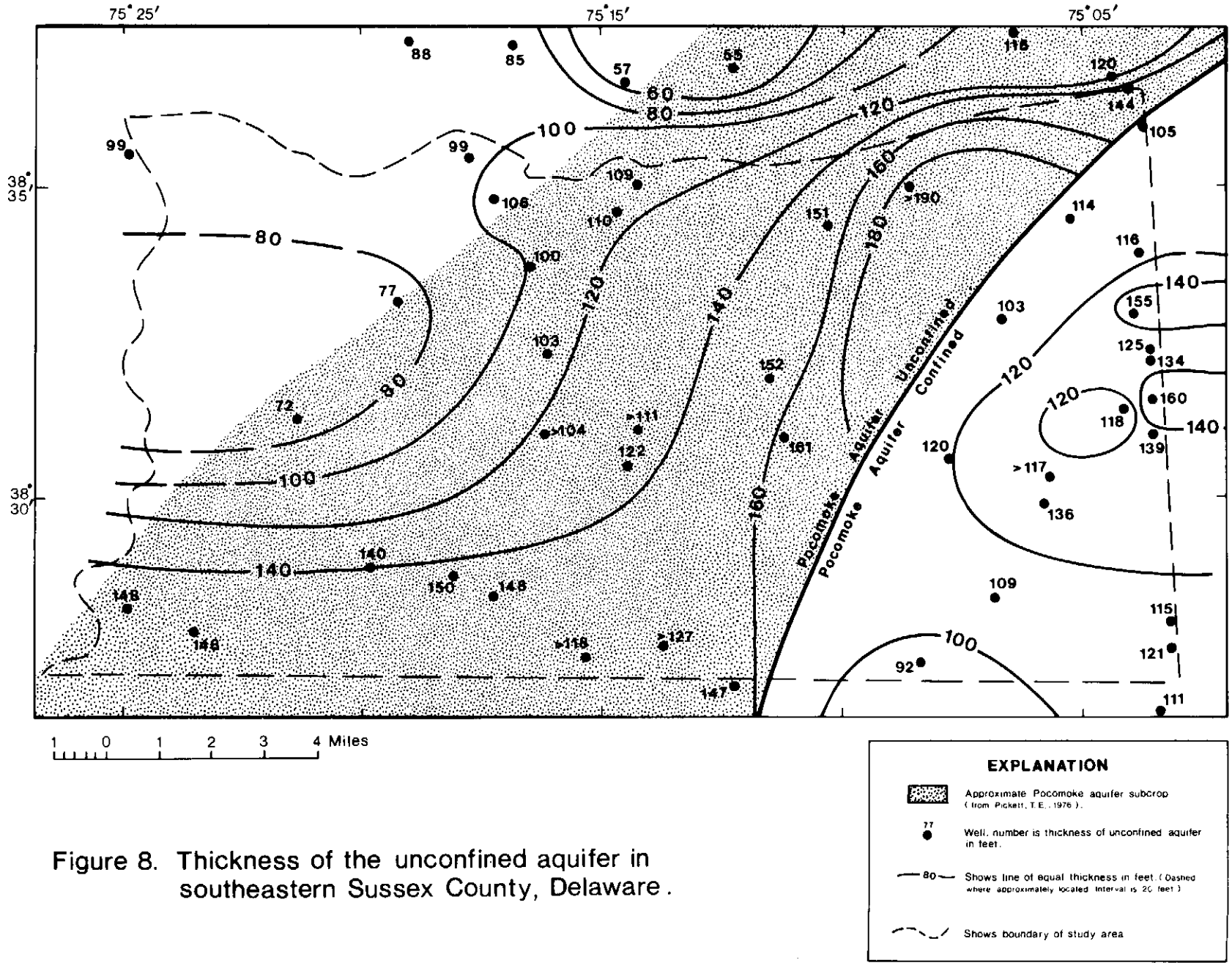


Figure 8. Thickness of the unconfined aquifer in southeastern Sussex County, Delaware.

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