GEOLOGIC RECONNAISSANCE OF AN EXTENSIVE CLAY UNIT IN NORTH-CENTRAL SUFFOLK COUNTY, LONG ISLAND, NEW YORK

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(in pocket)

CONVERSION FACTORS AND ABBREVIATIONS

Multiply inch-pound units	By	To obtain SI[1] units
inch (in)	25.4	millimeter (mm)
foot (ft)	0.348	meters (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.509	square kilometer (km^2)

NGVD - National Geodetic Vertical Datum of 1929,
equivalent to mean sea level

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[1] International System of units

Geologic Reconnaissance of an Extensive Clay Unit in North-Central Suffolk County, Long Island, New York

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ABSTRACT

Recent geologic data indicate an extensive lacustrine clay unit within the glacial deposits in the area between the Harbor Hill and Ronkonkoma moraines in north-central Suffolk County. The unit, locally known as the "Smithtown clay unit" (informal usage), is an integral part of the glacial aquifer in this area.

The clay occurs at depths varying from 90 feet above to 150 feet below National Geodetic Vertical Datum of 1929 (NGVD) and attains a maximum thickness of 170 feet in the northern part of the Town of Smithtown. Its upper surface is mostly above NGVD and reaches a maximum altitude of 90 feet in the Town of Huntington. The unit is predominantly clay but locally contains lenses of sand, silt, and gravel. The upper part of the clay is generally light to dark brown; the lower part is light gray, which is characteristic of other clays in the glacial aquifer.

INTRODUCTION

Recent population growth in Suffolk County has given rise to a need for increased ground-water development. Because ground water is the only source of supply for the area, ground-water resources are of great concern to water-management officials and the public.

In north-central Suffolk County, an extensive lacustrine clay unit lies within the glacial deposits between the Harbor Hill and Ronkonkoma moraines. The unit, locally known as the "Smithtown clay unit," is an integral part of the upper glacial aquifer in this area because it acts as a confining layer between the upper and lower parts of the upper glacial aquifer. Evidence of its confining effect is indicated by differences in hydraulic head observed in wells completed in outwash deposits above and below the clay.

Purpose and Scope

This report presents results from an evaluation of geologic data collected and compiled as part of a continuing investigation and appraisal of hydrologic conditions in Suffolk County. The investigation is part of a cooperative program of water-resources studies made by the U.S. Geological Survey in cooperation with the Suffolk County Water Authority and the Suffolk County Department of Health Services.

Location and Extent of Clay Unit

The Smithtown clay unit is in north-central Suffolk County between 72°55' and 73°20' W. long and 40°48' and 40°57' N. lat (fig. 1). Its main area is bounded on the south by the Ronkonkoma moraine and on the north by the Harbor Hill moraine, except in the Nissequogue River-Stony Brook Harbor area, where the unit extends northward beneath the Harbor Hill moraine toward Smithtown Bay. The east boundary is near the present-day divide separating the eastward-flowing Peconic River from the southward-flowing Carmans River. The west boundary is adjacent to a group of higher glacial deposits west of the Nissequogue River in Huntington. Figure 2 shows the location of selected wells that penetrate the unit.

The Smithtown clay unit occurs at depths ranging from 90 feet above to 150 feet below NGVD of 1929 and attains a maximum thickness of 170 feet in the northern part of the Town of Smithtown. The upper surface is generally above NGVD of 1929 and reaches a maximum altitude of 90 feet in the Town of Huntington. The thickness of the unit is shown in figure 3; the altitude of its upper surface is shown in figure 4. The values for thickness and altitude were correlated from drillers logs and geophysical logs.

Previous Investigations

The first investigation to allude to the "Smithtown clay" (H. R. Blank, U.S. Geological Survey, written commun., 1928) describes a clay body underlying the Smithtown area as a possible equivalent to the Gardiners Clay. DeLaguna (1963, p. A32-33) tried to relate this unit to a glaciolacustrine

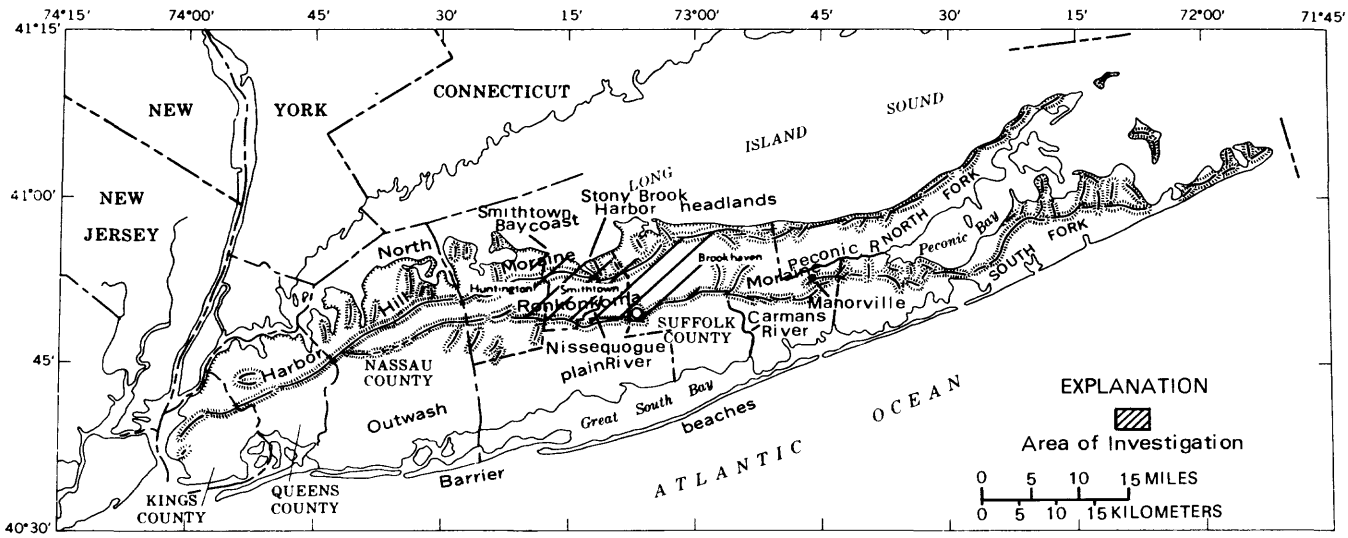

Figure 1.--Major geographic features of Long Island and location of area of investigation.

clay at Manorville, in the eastern part of the Town of Brookhaven, which was deposited in a temporary lake north of the Ronkonkoma moraine. Well data were not sufficient to delineate the continuity and extent of this clay. Lubke (1964, p. D22-26) cited Blank and named the unit "clay unit of Smithtown." He also suggested that the unit was a glaciolacustrine deposit in the upper Pleistocene sequence and that it may have been laid down in a glacial lake (or lakes) during the recession of the Ronkonkoma ice that formed the Ronkonkoma moraine. Again, well data only approximately defined the areal extent of the clay; however, Foord and others (1970, p. 202-203) defined the "clay unit of Smithtown" as one of five postulated stratigraphic units in the Smithtown area and agreed with Lubke on the the unit's origin. Soren (1971, p. 14), citing Lubke, called the unit the "Smithtown clay" and stated that the main area of deposition was in a large postglacial lake in the intermorainal area. The lake occupied a partly filled depression on the surface of the Matawan Group and Magothy Formation, undifferentiated, called the "Ronkonkoma basin." Jensen and Soren (1974) referred to the Smithtown clay as an integral part of the glacial aquifer, although they did not delineate the unit in geologic sections.

GEOLOGY

Geologic Setting

Geology and hydrology of Long Island are summarized in many reports, notably Veatch and others (1906); Fuller (1914); Suter and others (1949); Lubke (1964); Cohen and others (1968); Jensen and Soren (1974); and Koszalka (1980).

The ground-water reservoir of Long Island is composed of a thick sequence of unconsolidated deposits underlain by a Precambrian(?) basement complex (fig. 5). The formations strike northeast and dip to the southeast. The basement rock is overlain by the Raritan Formation, which consists of the Lloyd Sand Member and an overlying clay member. The Lloyd Sand Member and clay member are approximately 200 and 150 ft thick, respectively. The Raritan Formation is overlain by the Magothy Formation-Matawan Group, undifferentiated, which ranges in thickness from 0 at the north shore to more than 900 ft in the southern part of the study area. These three units are of Late Cretaceous age and are overlain by a relatively thick layer of glacial outwash and morainal deposits of Pleistocene age. The Pleistocene deposits of the area consist of several glacial, periglacial, and interglacial units including a marine clay and the Smithtown clay unit.

Stratigraphic and Textural Relations

The Smithtown clay unit lies between varying thicknesses of outwash. The overlying deposits are outwash of the Harbor Hill ice; the underlying deposits are outwash deposited during recession of pre-Ronkonkoma ice and (or) during a surge of the retreating ice front in post-Ronkonkoma, pre-Harbor Hill time. This stratigraphic sequence (outwash-clay-outwash), present at most wells in the intermorainal area except in the Nissequogue River lowland, is a major indicator in delineating the areal extent of the clay. Geohydrologic sections showing this sequence are presented in plate 1 and also in Lubke (1964, pl. 4, sections D-D' and F-F'):

The unit is predominantly clay but locally contains lenses of sand, silt and gravel. The silt and sand-size fraction contains abundant flakes of muscovite, biotite, chlorite, and very fine quartz grains. No peat horizon or lignitic zones have been found.

According to Foord and others (1970, p. 202), the clay unit is not texturally consistent from top to bottom. It contains a distinct sequence of relatively coarser grains at the base, very fine grains in the middle, and then progressively coarser grains toward the top.

The color of the Smithtown clay unit also varies with depth. The upper part is generally light to dark brown; the lower part is light gray, the characteristic color of most clay beds in the glacial aquifer.

Occurrence of Clay Minerals

The clay-mineral assemblage of the entire unit is generally characterized by chlorite, montmorillonite, illite, and kaolinite (Foord, 1970). Comparison with textural data clearly shows a relationship between composition and texture that is consistent throughout the unit. Other patterns have also been noted. The lower (coarse) part of the unit is characterized by a predominance of illite and chlorite, with a lesser amount of montmorillonite and kaolinite than in the middle or upper parts. The trend indicates a gradual overall increase in kaolinite and montmorillonite, and a decrease in illite and chlorite upward within the unit. Also, the base of the unit contains a greater percentage of each clay mineral than the upper part, probably as a result of greater weathering and accumulation, aided by the flow of ground water in the coarser glacial sediments immediately below.

SUMMARY

The Smithtown clay unit is a distinct deposit within the upper Pleistocene sequence. Its upper surface is above sea level in most places and reaches a maximum altitude of 90 feet in the Town of Huntington. Depth of the upper clay surface ranges from 90 feet above to 150 feet below NGVD; the unit attains a maximum thickness of 170 feet in the northern part of the Town of Smithtown. The unit lies mostly within the intermorainal area, but its boundaries can be clearly defined only when more geologic data become available.

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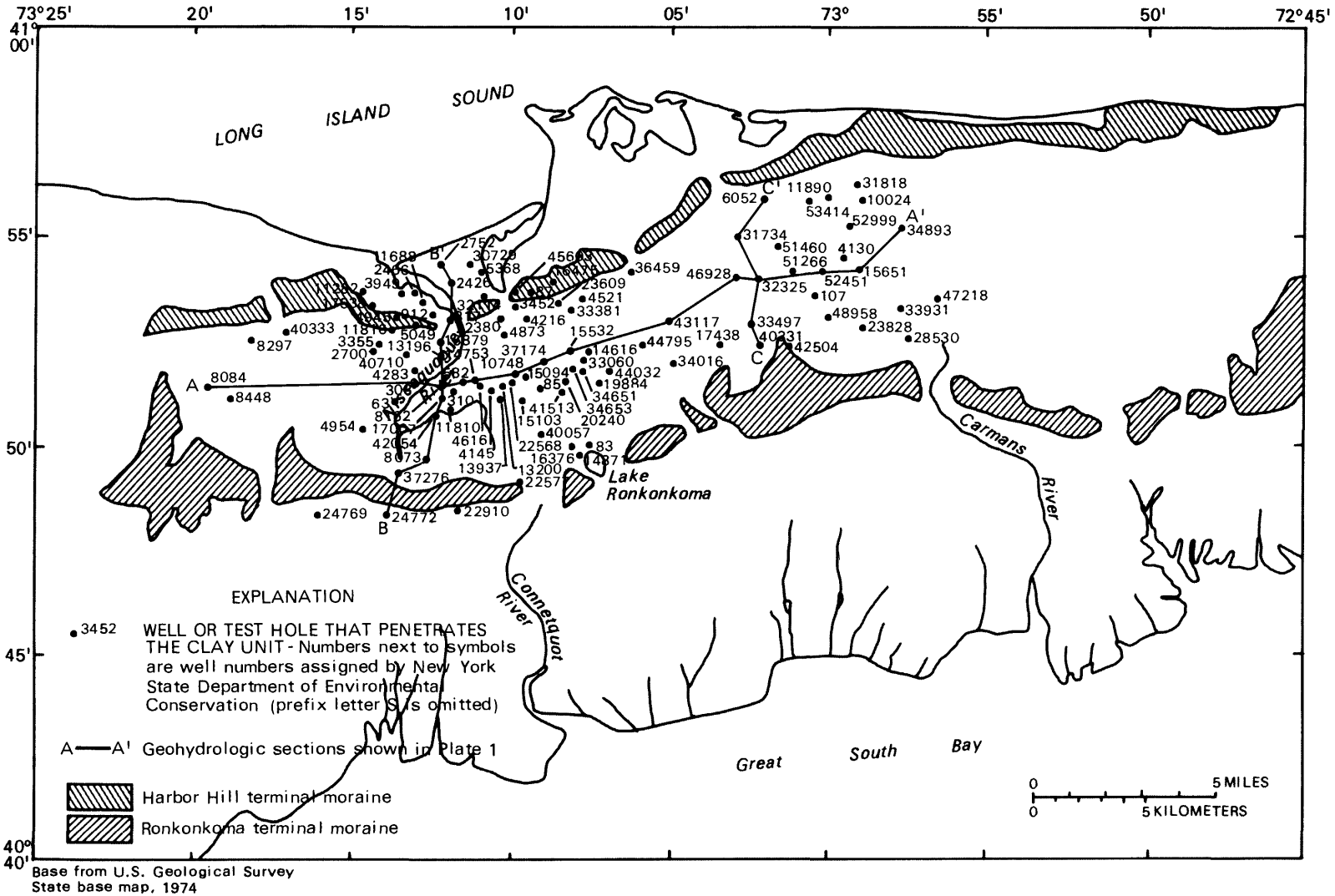

Figure 2.--Location of selected wells penetrating Smithtown Clay. Solid line shows location of geohydrologic cross sections shown in plate 1.

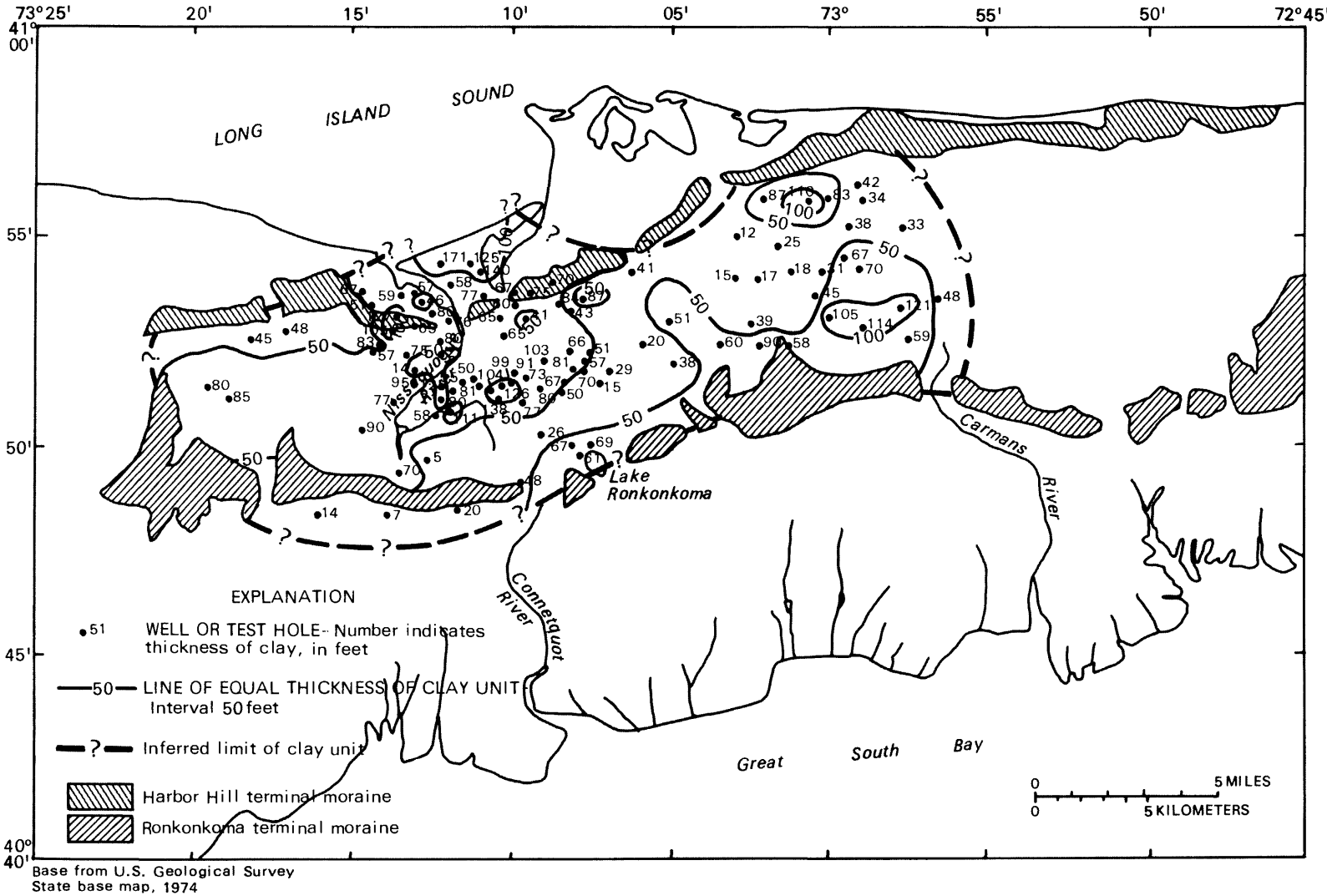

Figure 3.--Thickness of clay unit.

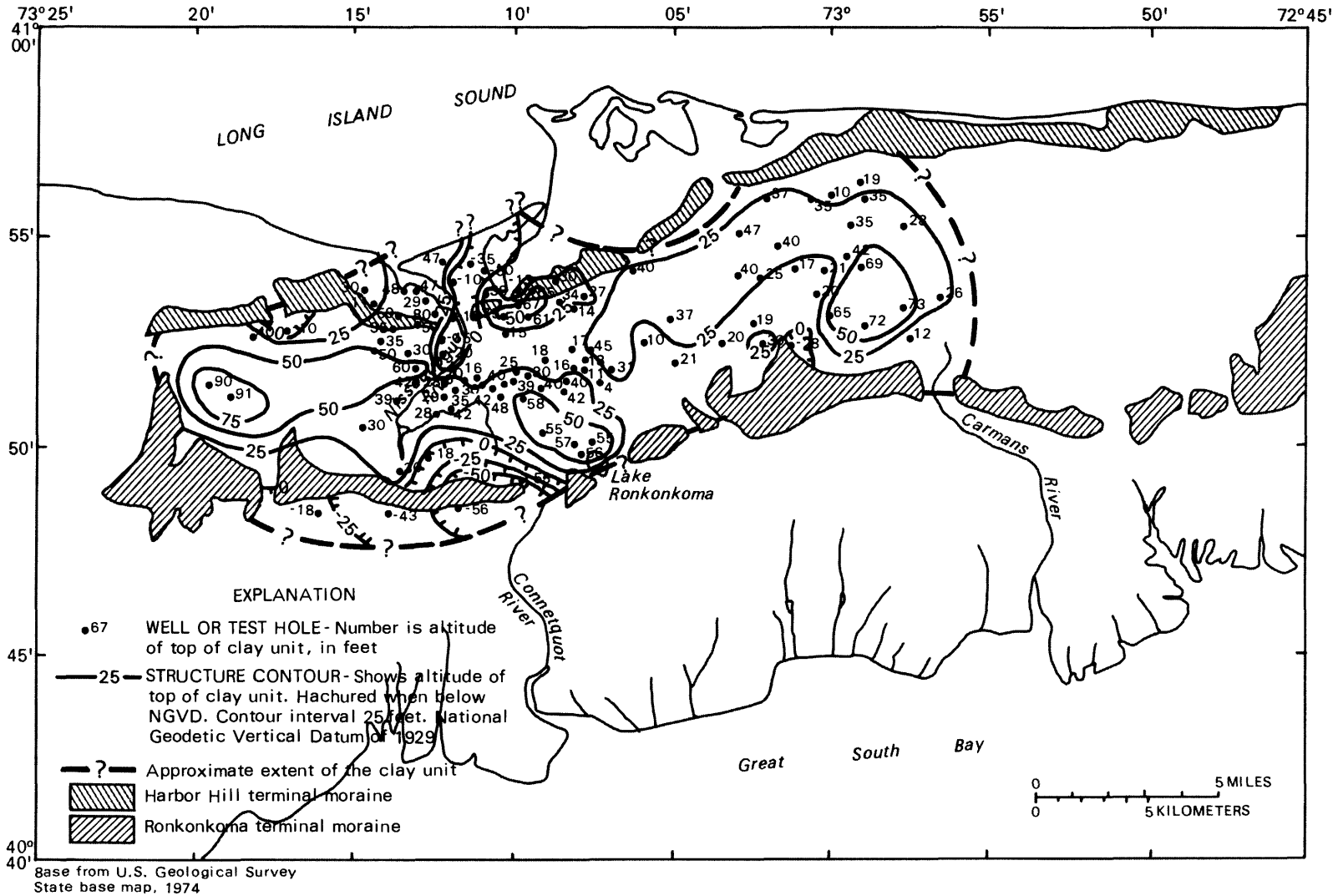

Figure 4.--Altitude of top of clay unit.

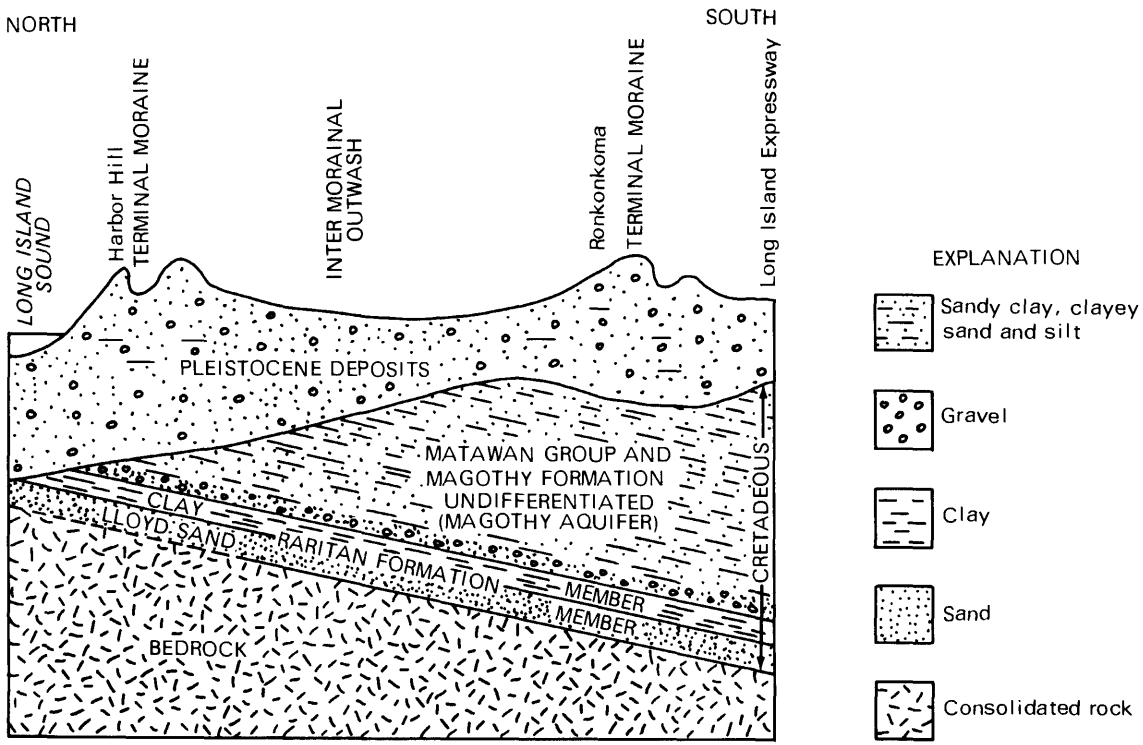

Figure 5.--Generalized geologic cross section of north-central Suffolk County. (From Cohen and others, 1968.)