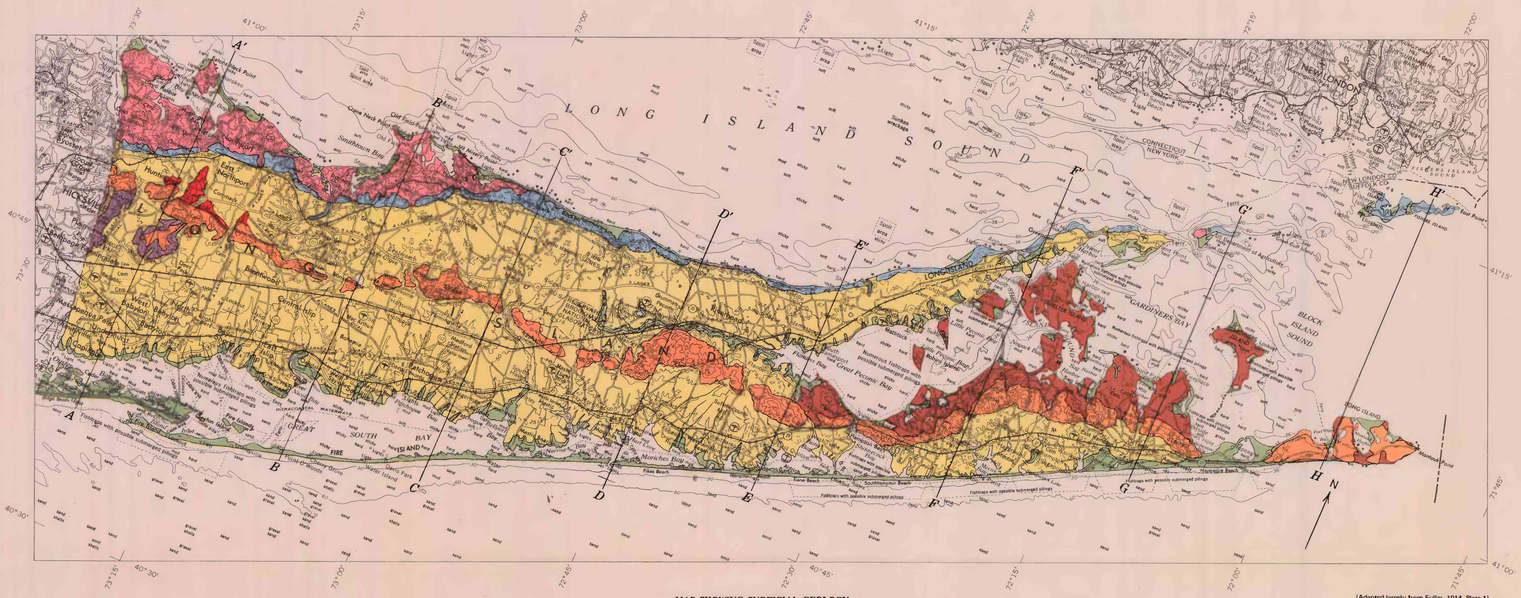
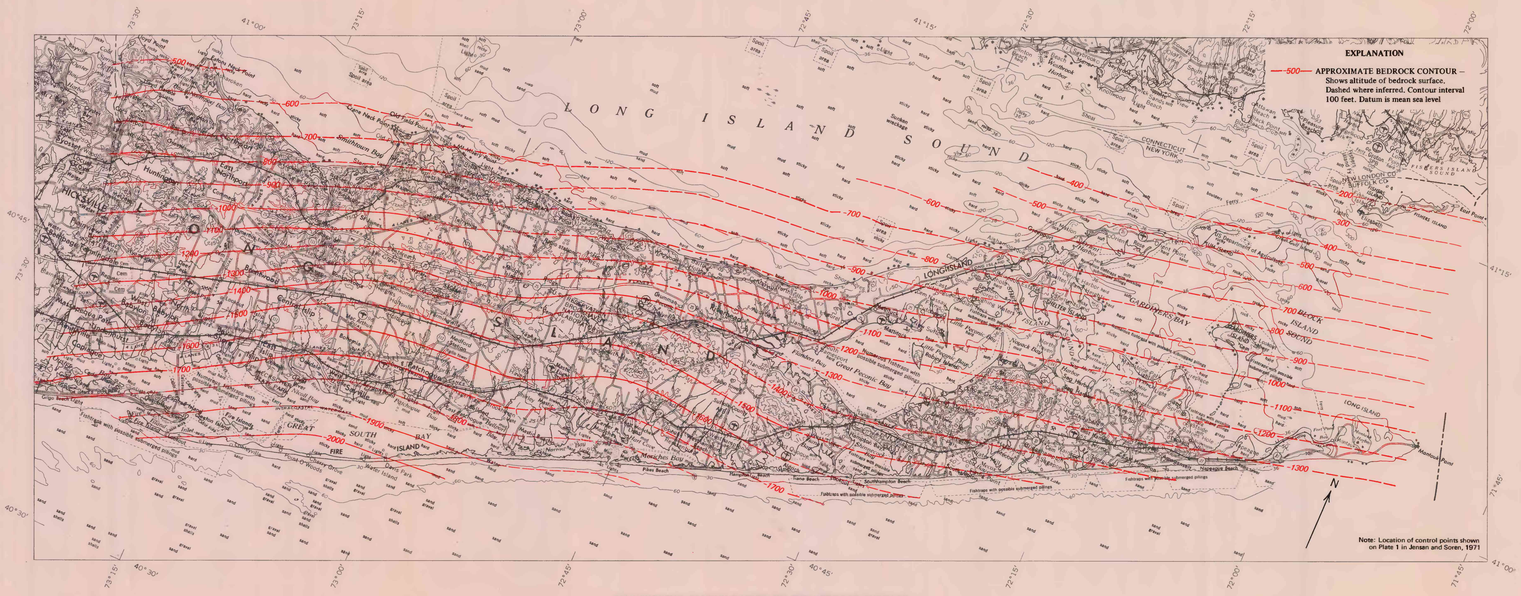
Prepared in cooperation with the
SUFFOLK COUNTY WATER AUTHORITY
and
SUFFOLK COUNTY DEPARTMENT OF ENVIRONMENTAL CONTROL

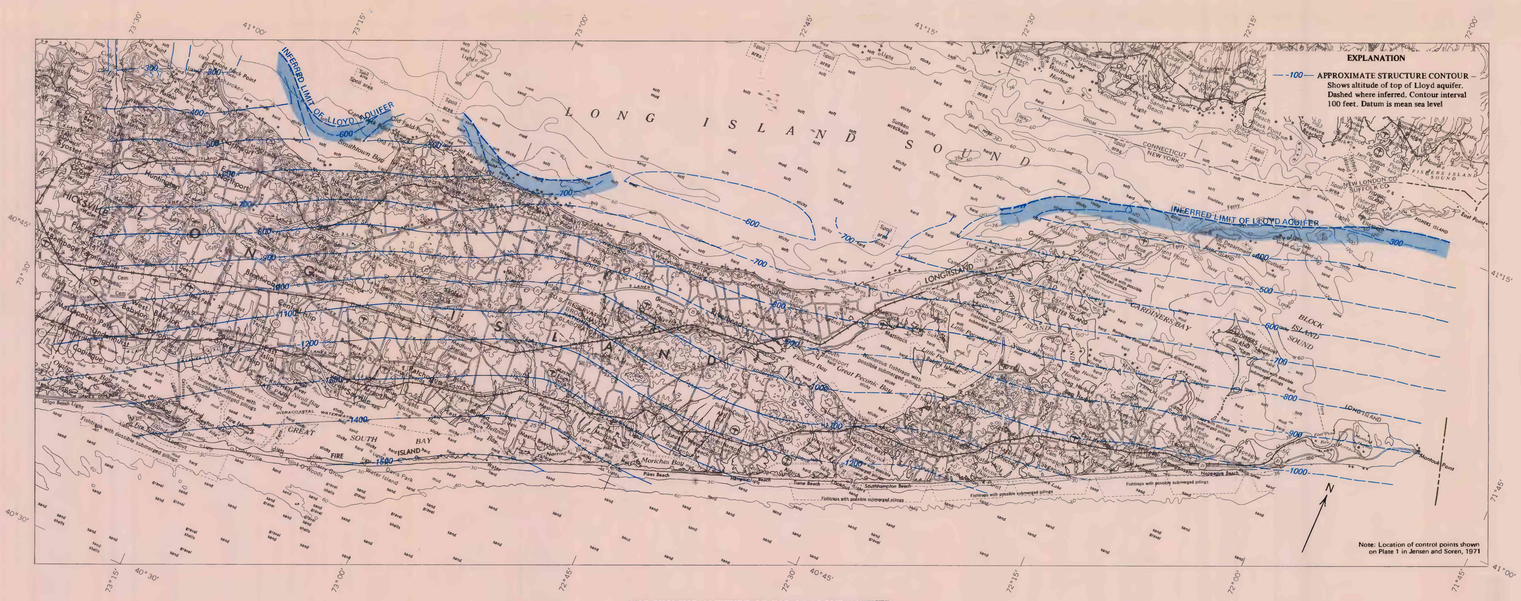


MAP SHOWING SURFICIAL GEOLOGY

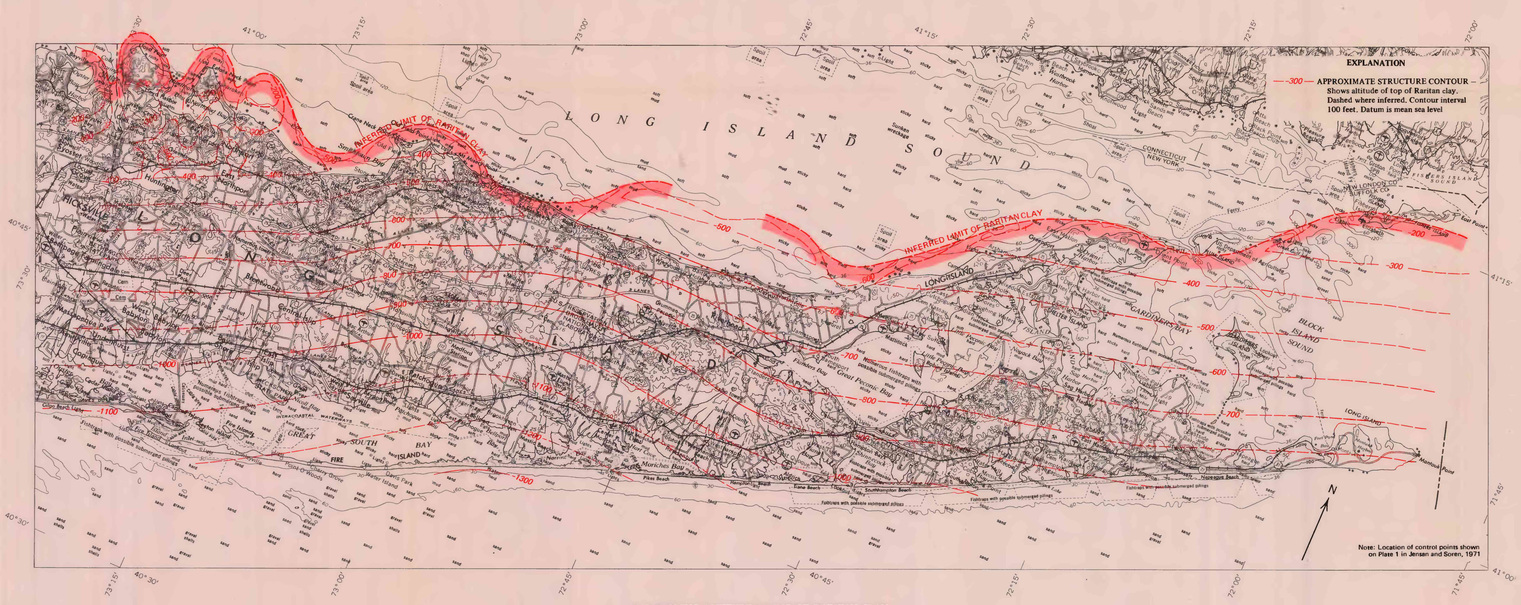
(Adapted largely from Fuller, 1914, Plate 1)



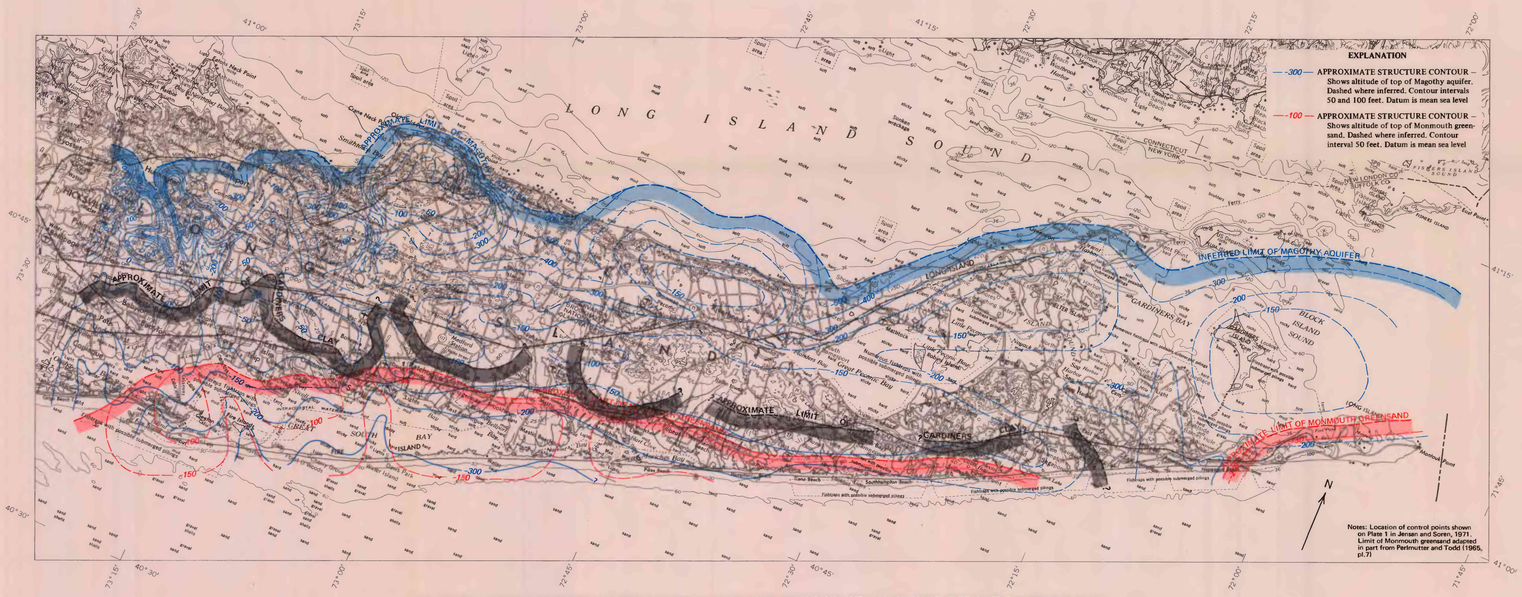
MAP SHOWING CONFIGURATION OF THE BEDROCK SURFACE



MAP SHOWING ALTITUDE OF TOP OF LLOYD AQUIFER



MAP SHOWING ALTITUDE OF TOP OF RARITAN CLAY



MAP SHOWING ALTITUDE OF TOP OF MAGOTHY AQUIFER AND MONMOUTH GREENSAND AND APPROXIMATE LIMIT OF THE GARDINERS CLAY

CORRELATION OF MAP UNITS

	Holocene	QUATERNARY
	Pleistocene	QUATERNARY
	Pliocene(?)	TERTIARY(?)

DESCRIPTION OF MAP UNITS

- SHORE, BEACH, AND SALT-MARSH DEPOSITS AND ARTIFICIAL FILL, UNDIFFERENTIATED
- HARBOR HILL GROUND MORAINE
- HARBOR HILL TERMINAL MORAINE
- RONKONKOMA GROUND MORAINE
- RONKONKOMA TERMINAL MORAINE
- OUTWASH DEPOSITS, UNDIFFERENTIATED
- TILL DEPOSITS, UNDIFFERENTIATED
- MANNETTO GRAVEL
- Contact

INTRODUCTION

WATER NEEDS OF SUFFOLK COUNTY

Water pumped from aquifers underlying Suffolk County (index map) is the sole source of water used for public supply, agriculture, and industry. The county's population grew from less than 200,000 in 1940 to 1.1 million in 1970. Most of the growth occurred after 1950. Ground-water pumpage increased from 40 mgd (million gallons per day) in 1950 to 155 mgd in 1970 (New York State Department of Environmental Conservation, written commun., June 1, 1971). The projected ground-water use for an anticipated population of 2 million in the county by 1990 is 300 mgd (New York State Conservation Department, 1970, p. 26–27).

INDEX MAP SHOWING LOCATION (SHADED) OF SUFFOLK COUNTY

PURPOSE AND SCOPE

The large and growing demand for ground water in Suffolk County has created a need for a detailed knowledge of the geometry and the hydrologic characteristics of the ground-water reservoir. Mapping of subsurface geology and hydraulic heads in the aquifers are important prerequisites to obtaining this information. Maps of the subsurface geologic units of Long Island were first shown in a report by Suter and others (1949, pls. VIII to XXI). But those maps were highly generalized, because there were few data on deep borings and wells in the county when the report was prepared. Since 1949, additional data from many deep borings and wells in the county have been collected.

In 1968, as part of a continuing cooperative program of water-resources studies with the Suffolk County Water Authority and Suffolk County Department of Environmental Control, the U.S. Geological Survey began an updating of the hydrogeologic and hydrologic maps of all the county. The basic data in Jensen and Soren (1971), the first product of the program, are the basis for the hydrologic maps in this report.

ACKNOWLEDGMENTS

The authors appreciate the cooperation of well-drilling companies, their employees, and the many officials of public and private water companies who furnished geologic and hydrologic data for use in this report.

GEOLOGIC AND HYDROGEOLOGIC UNITS

Pleistocene glacial drift generally mantles the county's surface. Pleistocene deposits overlie unconsolidated deposits of Late Cretaceous age. The Cretaceous strata lie on a peneplain that was developed on Precambrian(?) crystalline rocks.

Major landforms include ridges, valleys, and plains. These landforms are roughly oriented in belts parallel to the county's length. The northern and the central parts are traversed by irregular sandy and gravelly ridges of terminal moraine. The crest of the northern ridge ranges in height from 100 to 300 feet above sea level and the crest of the central ridge from 150 to 400 feet. The highest altitudes in the inter-ridge area range from 100 to 200 feet. Irregular plains and rolling hills, formed from sandy and gravelly ground moraine and outwash deposits of sand and gravel lie in the area between the ridges. An outwash plain slopes at a near-uniform gradient from the southern base of the central ridge, which is about 100 feet above sea level, southward to Great South Bay and the ocean. Along the north shore, steep bluffs as high as 100 feet and generally narrow sandy and gravelly beaches face Long Island Sound. The barrier-bar system at the southernmost side of the county is composed of sandy beach and dune deposits. The highest altitudes of the barrier bars generally range from 10 to 45 feet.

The ground-water reservoir system of Suffolk County is composed of hydrogeologic units that include lenses and layers of clay, silt, clayey and silty sand, sand, and gravel. A hydrogeologic unit consists of a geologic unit or a group of contiguous geologic units classified by hydraulic characteristics. These units include aquifers, which are principal water sources, and confining layers, which separate the aquifers. The aquifers are, from the land surface downward, the upper glacial aquifer, the Magothy aquifer, and the Lloyd aquifer. The major areal confining layers are, in descending order, the Gardiners Clay, the Monmouth greensand, and the Raritan clay. The base of the ground-water reservoir is the crystalline bedrock. Characteristics of the geologic and the hydrogeologic units are summarized in the table, and the following data of hydrologic significance are shown on the maps: base of ground-water reservoir, altitudes of aquifers, altitudes and limits of confining layers, and distribution of surficial deposits. The hydrogeologic sections show the vertical relations of the units to each other.

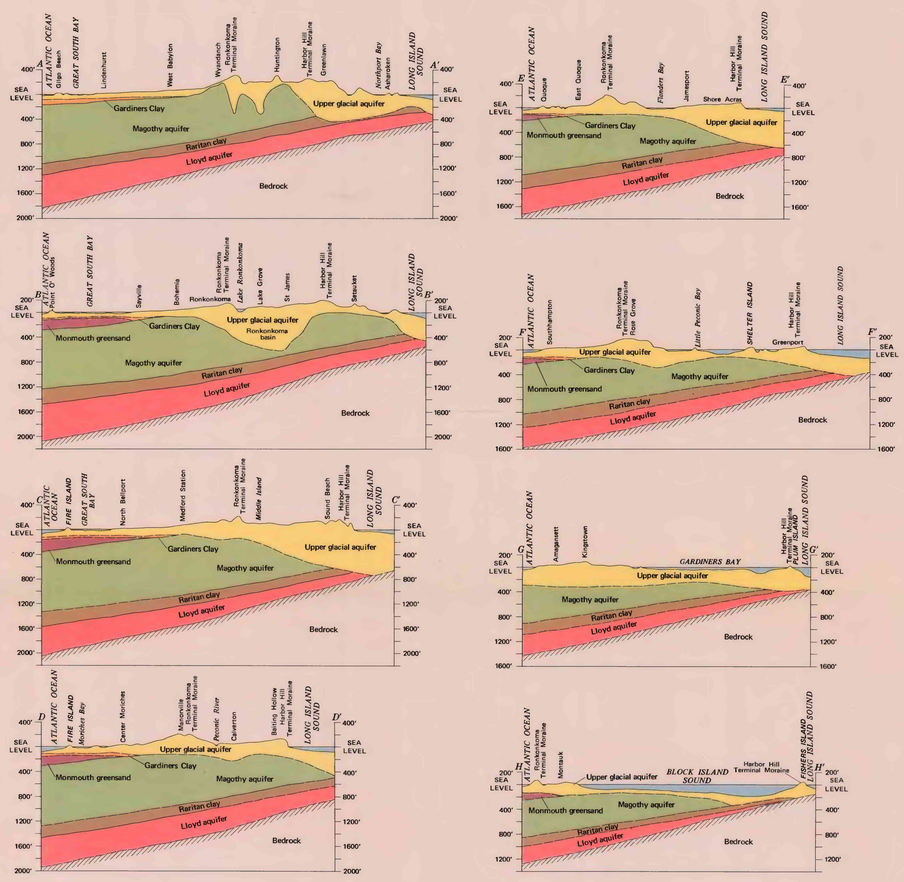
The sharp angular shapes of some of the contours reflect the fact that in places the contours are drawn on stratigraphic tops of the hydrogeologic units and in places the contours are drawn on erosional surfaces. The sharp angles result from the juncture of a stratigraphic top and an eroded surface.

HYDROGEOLOGIC UNITS AND STRATIGRAPHY

(Major water-bearing units are indicated by blue shading)

Stratigraphy: System	Stratigraphy: Series	Geologic unit			Hydrogeologic unit[4]	Approximate thickness (feet)	Description and water-bearing properties
QUATERNARY	Holocene	Undifferentiated		Shore, beach, salt-marsh deposits, and artificial fill	Upper glacial aquifer	0-60	Beach sand and gravel and dune sand, tan, brown, and white and black, brown, and gray bay-bottom deposits of clay and silt. Beach and dune deposits in shore areas contain thin lenses of fresh water underlain by salty ground water. Clay and silt in bay bottoms tend to confine water in underlying strata.
QUATERNARY	Pleistocene	Wisconsin Glaciation		Till; includes terminal-, ground-, and ablation-moraine deposits	Upper glacial aquifer	0-150	Clay, silt, sand, gravel, and boulders, tan, brown, and brownish-gray. Deposits are commonly unsorted and unstratified but can also include crudely to well sorted and stratified glacial drift. Deposits lie chiefly above water table and are not an important source of ground water. Hydraulic conductivity is very low to moderate. Clayey till causes local perched ground-water bodies.
QUATERNARY	Pleistocene	Wisconsin Glaciation		Lacustrine and marine deposits	Upper glacial aquifer	0-300	Lacustrine deposits consist chiefly of clay and silt, brown, brownish-gray, and gray. These beds occur at many places in the northern part of the county, chiefly in the Smithtown area where they have been referred to as the "Smithtown clay." Marine beds of gray-green clay and silt occur at shallow depths in shoreline areas. Hydraulic conductivity is generally very low. Not a source of ground water. Deposits serve chiefly to confine water in underlying strata.
QUATERNARY	Pleistocene	Wisconsin Glaciation	Upper Pleistocene deposits[3]	Outwash deposits		0-350	Stratified fine to coarse sand and gravel, light- to dark-brown, tan, and yellowish-brown. Hydraulic conductivity of outwash is usually high, estimated to be as much as 200 feet per day. Wells screened in outwash deposits yield as much as 2,000 gallons per minute and have specific capacities that are usually more than 50 gallons per minute per foot of drawdown in the well. Deposits generally contain water under water-table conditions. The Mannetto Gravel of Pliocene(?) age (below) is included with these deposits because of lithologic resemblance and physical continuity. Mannetto beds lie above the water table and are not a source of water.
UNCONFORMITY							
QUATERNARY	Pleistocene	Sangamon Interglaciation		Gardiners Clay	Gardiners Clay	0-75	Marine deposits of clay and silt with some interbedded sand and gravel, greenish-gray and gray. Deposits have low hydraulic conductivity and confine water in underlying strata. Unit occurs mainly along southshore area.
UNCONFORMITY							
TERTIARY(?)	PLIOCENE(?)	Mannetto Gravel			See "upper glacial aquifer, outwash deposits," above	0-125	See "outwash deposits," above.
UNCONFORMITY							
CRETACEOUS	Upper Cretaceous	Monmouth Group			Monmouth greensand[5]	0-200	Interbedded marine deposits of clay, silt, and sand, dark-greenish-gray, greenish-black, greenish, dark-gray, and black, containing much glauconite and lignite. Unit has low hydraulic conductivity and confines water in underlying Magothy aquifer in southshore area.
UNCONFORMITY							
CRETACEOUS	Upper Cretaceous	Matawan Group-Magothy Formation undifferentiated			Magothy aquifer	0-1,000	Deposits consist of gray to white fine to coarse sand with interstitial clay, silt, and lignite, interbedded with lenses and thin to thick beds of light- to dark-gray clay, silt, and clayey and silty sand, and laminae and thin beds of lignite and pyrite. Basal 100 to 200 feet is generally composed of coarse sand and gravel beds. Commonly with much interstitial clay and silt, interbedded with strata similar to those in upper part. Hydraulic conductivity of unit varies widely but is estimated to average about 70 feet per day. Wells screened in the Magothy aquifer yield as much as 1,500 gallons per minute, and they have specific capacities that are usually less than 50 gallons per minute per foot of drawdown in the well. Water in the aquifer is poorly to well confined; confinement is greatest near south shore where unit is overlain by Monmouth greensand and Gardiners Clay.
UNCONFORMITY							
CRETACEOUS	Upper Cretaceous	Raritan Formation		Clay member[4]	Raritan clay	0-250	Unit consists chiefly of clay, silty clay, and clayey and silty fine sand, light- to dark-gray, brownish-red, red, pink, and grayish-white. Beds and lenses of lignite, pyrite, and sand are common, and thin beds of gravel occur locally. Unit has low hydraulic conductivity and confines water in underlying Lloyd aquifer.
CRETACEOUS	Upper Cretaceous	Raritan Formation		Lloyd Sand Member	Lloyd aquifer	0-550	Deposits of fine to coarse sand and gravel, grayish-white, light- to medium-gray and yellowish-gray, with intercalated beds and lenses of light- to dark-gray clay, silt, clayey and silty sand, and some lignite and pyrite. Unit is of moderate hydraulic conductivity, estimated to range from 20 to 70 feet per day. Wells screened in the Lloyd aquifer yield as much as 1,500 gallons per minute and have specific capacities that are usually less than 40 gallons per minute per foot of drawdown in the well. Aquifer is not significantly developed in county because of its depth and the availability of shallower aquifers.
UNCONFORMITY							
PRECAMBRIAN(?)		Undifferentiated		Crystalline rocks	Bedrock	Not known	Mainly gneiss and schist of low hydraulic conductivity. Surface of the bedrock is commonly highly weathered to a greenish-white residual clay. Bedrock surface is considered to be the bottom of the ground-water reservoir.

[1] Unit names partly from Cohen and others (1968, p. 18).
[2] Unit name from deLaguna (1948, p. 8 and 16).
[3] Unit name from Jensen and Soren (1971).
[4] Unit name from deLaguna (1948, p. 7, 8, and 12).



EXPLANATION

GEOLOGIC CONTACT – Solid line where approximately known; dashed line where inferred

VERTICAL EXAGGERATION ABOUT X 20

HYDROGEOLOGIC SECTIONS

Base from U.S. Geological Survey, Hartford, 1962; New York, 1957; and Providence, 1947

SCALE 1:250 000

CONTOUR INTERVALS 25, 50, AND 100 FEET
DATUM IS MEAN SEA LEVEL

HYDROGEOLOGY OF SUFFOLK, COUNTY, LONG ISLAND, NEW YORK

By
H. M. Jensen and Julian Soren

1974

Interior—Geological Survey, Washington, D.C.—1974—W73072

For sale by U.S. Geological Survey, price $1.50 per set