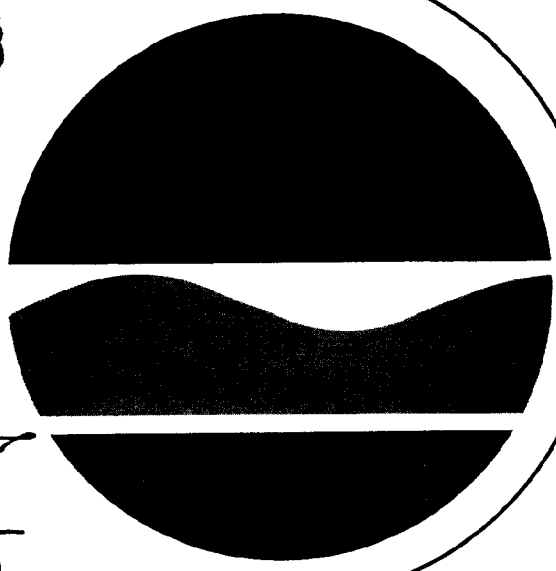


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INTERIM REPORT
on
Water Supply for
Coastal Zone Management
(Task 8.5, Long Island Subarea)

April 1976

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION



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DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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Water Supply Report
for
Coastal Zone Management Program
(Task 8.5, Long Island Subarea)

Prepared by
New York State Department of Environmental Conservation
Office of Program Development, Planning and Research
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Albany, New York 12233

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Introduction

The Coastal Zone Management Program has to unravel many environmentally intertwined elements to create a program that will ensure the optimum use of the coastal zone resources.

For purposes of the public water supply element of the coastal zone management study the New York State coastal zone area was divided into five subareas. The Long Island subarea is one of these divisions and consists of Nassau and Suffolk Counties. As consistent with the other subareas, water supply is examined on a county by county basis with emphasis placed on water supply systems serving communities adjacent to the coast.

The North and South shores of Long Island contrast sharply in physical features. The North shore tends to be rapid high rise cliffs like shore lines while the South shore is a glacial outwash plain which includes off shore barrier beaches. The narrow North and South "forks" on the easterly end of Suffolk County maintain these respective characteristics as they taper to land points in the Atlantic Ocean.

Due to these geographical features the Long Island subarea is broken down into separate north and south shore zones. Both forks due to their narrowness and by being virtually surrounded by salt water are treated as complete coastal units.

SUMMARY

The Long Island coastal zone area does not appear to be in a precarious state at the present time due to current water supply practices.

The New York State Department of Environmental Conservation's responsibilities regarding decisions on water supply applications for expansion, increased pumpages, new locations etc., have aided greatly in protecting the underground reservoir. Restrictions on pumping in shore areas and requiring new wells to be located inland are perhaps the most important actions that have kept the Long Island shore area secure from salt water intrusion.

While the study area does not reveal any major conflict with coastal zone resources and present water supply needs. It is known however, that significant population increases especially in the eastern forks of Suffolk, can jeopardize the fresh water-salt water and ecological balances. Quality deterioration of the underground reservoir must also be considered with population expansion.

The predictability of changes in the coastal zone area under various proposed water management alternatives should be greatly enhanced under the on going PL 92-500 Section 208 waste water management study. The 208 study being conducted under the Nassau-Suffolk Regional Planning Board includes a computerized model study for the Long Island ground water system. Any water management determinations should await the 208 study results.

COASTAL ZONE MANAGEMENT
PUBLIC WATER SUPPLY
NASSAU COUNTY

Area Boundaries

For public water supply investigation in Nassau County's Coastal Zone the following boundaries were arbitrarily selected for purposes of this report only.

The Coastal Zone boundary for the South Shore of Nassau County will not be contiguous with the area of influence exerted on the coastal zone by water supply considerations. For this reason the coastal area of concern for this report designated on the attached map (See Figure 1) is bounded on the west by the Queens-Nassau line and on the south by the southermost boundaries of the barrier beaches. The northern boundary, Sunrise Highway, approximates the 20' contour. This water supply sector has an area of about 40 square miles, with an additional 6 square miles of low tidal lands in the bay area.

The Coastal Zone boundary for the North Shore of Nassau County will encompass a relatively small area immediately adjacent to the bays, harbors and the Long Island Sound. For purpose of this water supply report a relatively larger area has to be considered due to its implication on causes and effects relating to the coastal zone. The arbitrary southern boundary that has been selected is the east-west surface water divide which is north of but approximates the Long Island Expressway (See Figure 1). The area included is approximately 70 square miles (about 26% of the total county areas) and contains about 15% of the county population.

General Description

Nassau County, an area of about 300 square miles located on Long Island, is bordered on the west by Queens County (N.Y.C.) and on the east by the Suffolk County boundary. The north and south boundaries are Long Island Sound and the Atlantic Ocean respectively. The barrier beach area on the Atlantic is separated from the

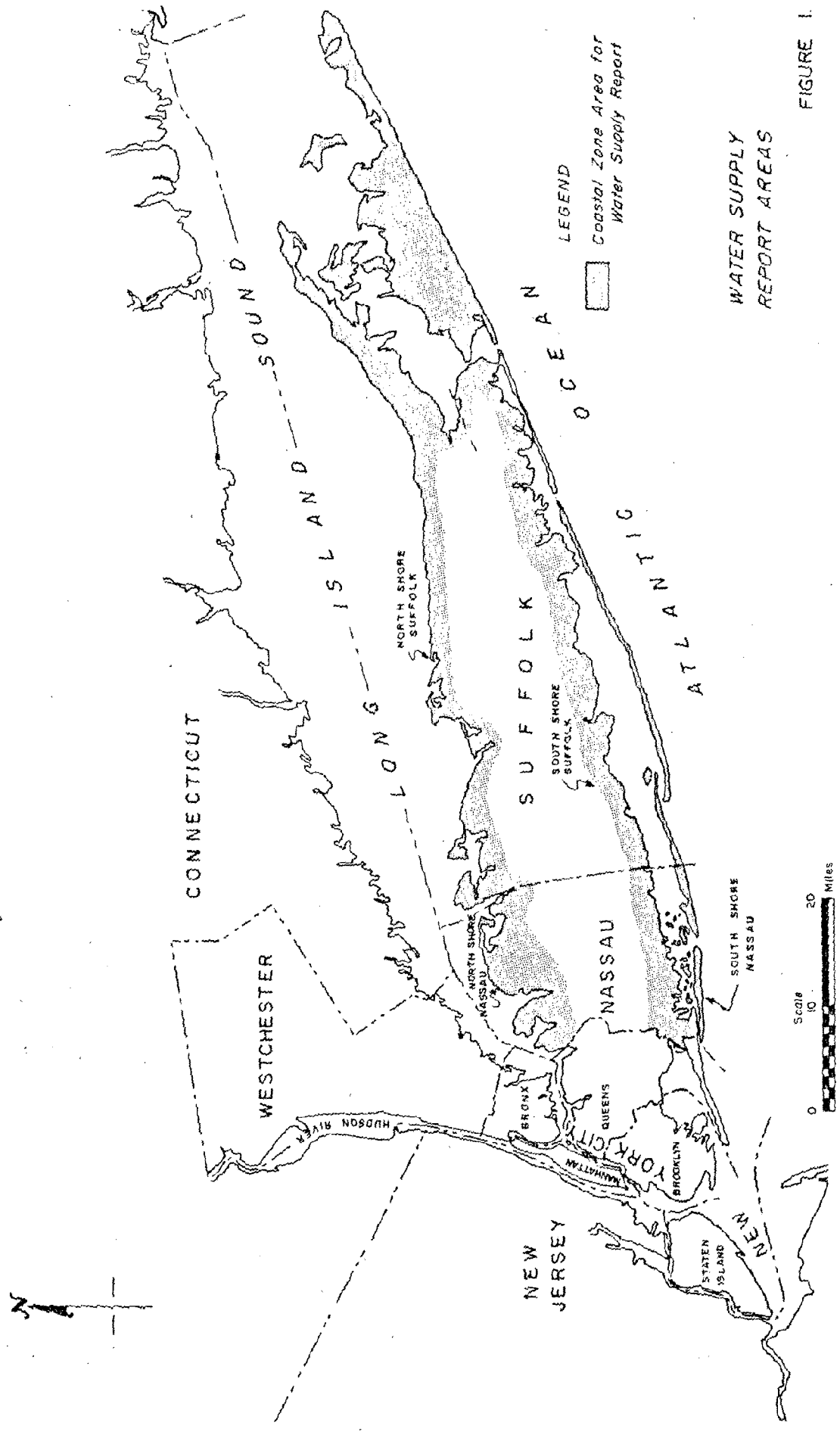


FIGURE 1.

WATER SUPPLY
REPORT AREAS

P. 10

mainland by a bay area which contains dozens of marsh and wetland islands which are an important part of the local ecology.

The North Shore coastal area is broken into five distinct bays and harbors. (Little Neck Bay, Manhasset Bay, Hempstead Harbor, Oyster Bay and Cold Spring Harbor) between the New York City and Suffolk boundaries. The shoreline is characterized by steep slopes or bluffs, many of them wooded, with narrow sandy or rocky beaches. In some instances the land elevation is over 100 feet above sea level less than 1,000 feet from the shoreline. Such features have limited access and shoreline development, but there are lowlands and previously filled wetlands particularly at the heads of harbors which have major residential and commercial development.

Population and Land Use

Nassau County has rapidly transformed from a semi-rural suburb of New York City with a population of 400,000 in 1940 to a present dynamic urban center of approximately 1.5 million residents, with the largest concentrations in the South Shore area. Extensive development in this area has stabilized the population to some extent with medium to intermediate population densities and with average and high population densities in the City of Long Beach and in local sectors of several other communities. Present (1975) LILCO population estimates indicate 204,000 people now located in the mainland study area and 47,000 within the Long Beach, Island Park areas; averaging over 12 persons per acre.

With less than 5% vacant land remaining in the South Shore study area, and with the Nassau-Suffolk Comprehensive Development Plan indicating the subject area may expand to complete medium to high population densities, apartment and high-rise type dwellings will be part of future development. The Development Plan indicates that within the townships of Hempstead and Oyster Bay, of which the study area is part, that by 1985, 54,500 apartment units should be built and 13,300 publicly

assisted housing units should be provided. Relatively little of the housing expansion is expected south of Sunrise Highway with the possible exception of Long Beach.

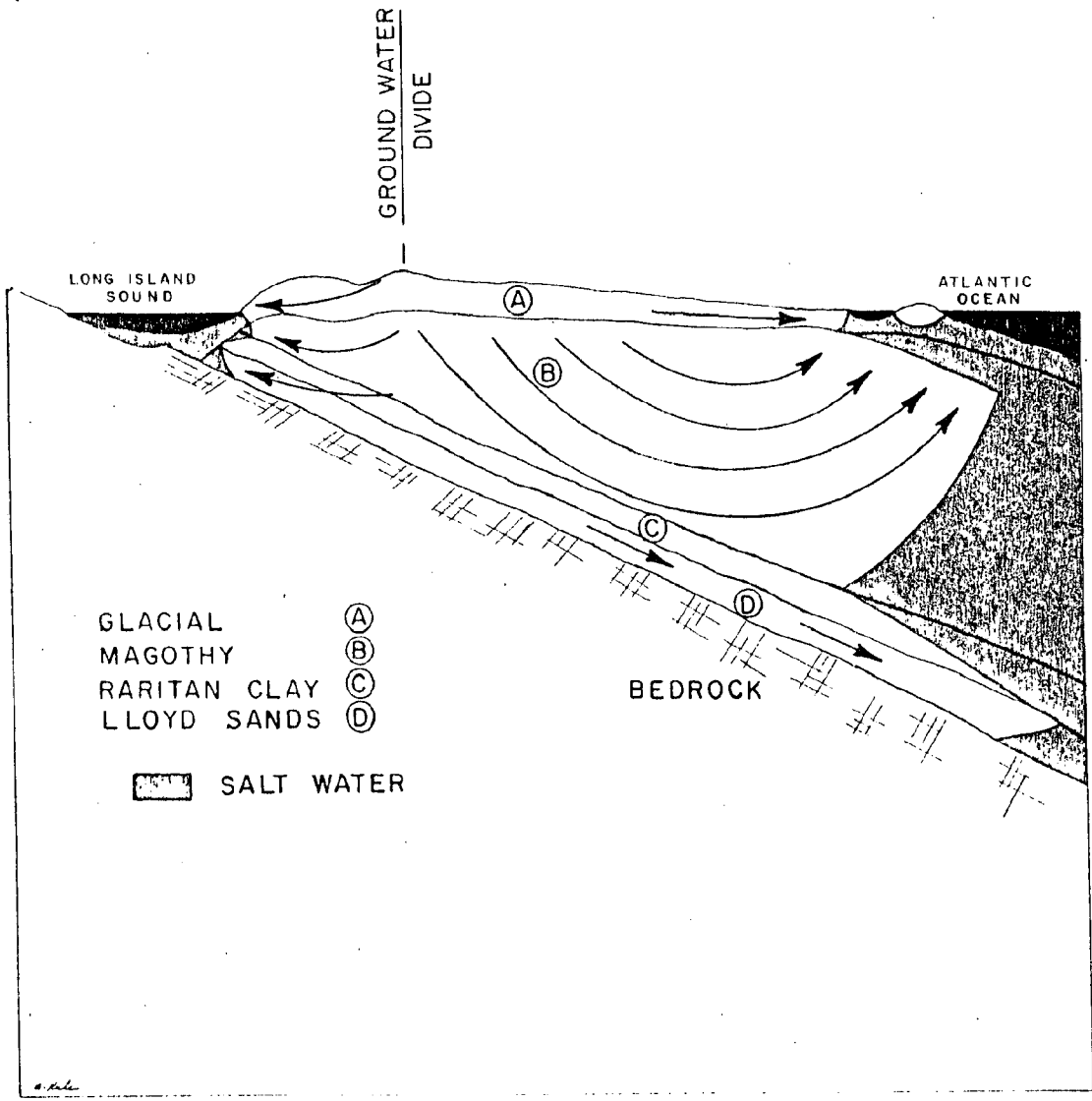
The Nassau - Suffolk Regional Planning Board Comprehensive Development Plan indicates that future North Shore population densities may reach intermediate to medium density figures with significant area earmarked for park and conservation purposes.

PUBLIC WATER SUPPLY

All water supply is from groundwater sources and all groundwater originates from precipitation that falls on the county. Half of the average precipitation of 45 inches infiltrates into the groundwater reservoir and the remainder is lost by evapotranspiration and direct runoff into tidal water.

Sandy unconsolidated deposits which underlie the county make up the three major aquifers used for water supply. The Glacial aquifer is the uppermost and is readily accessible for water supply. The Magothy aquifer is directly below and is the largest, accounting for 80% of the public pumpage. The Lloyd formation is the deepest aquifer and lies above bedrock and under a Raritan clay layer.

The groundwater flows away from the groundwater divide near the central portion of the county towards Long Island Sound and the Atlantic Ocean at about 1 foot per day. Near the groundwater divide a downward component of flow serves to recharge the deeper formations. As the groundwater moves toward the shoreline an upward flow component exists. Thus recharge water in the inner portion of the county eventually will be a part of and interact with the shallow coastline subsurface flows into Long Island Sound and the Atlantic Ocean. (See Figure 2)



CROSS SECTION NASSAU COUNTY-GROUND WATER FLOW

FIG 2

South Shore Water Supply Area

The study area's public water supply needs are served by five municipal and two private suppliers. All water is obtained from ground water wells and rainfall is the sole source of recharge.

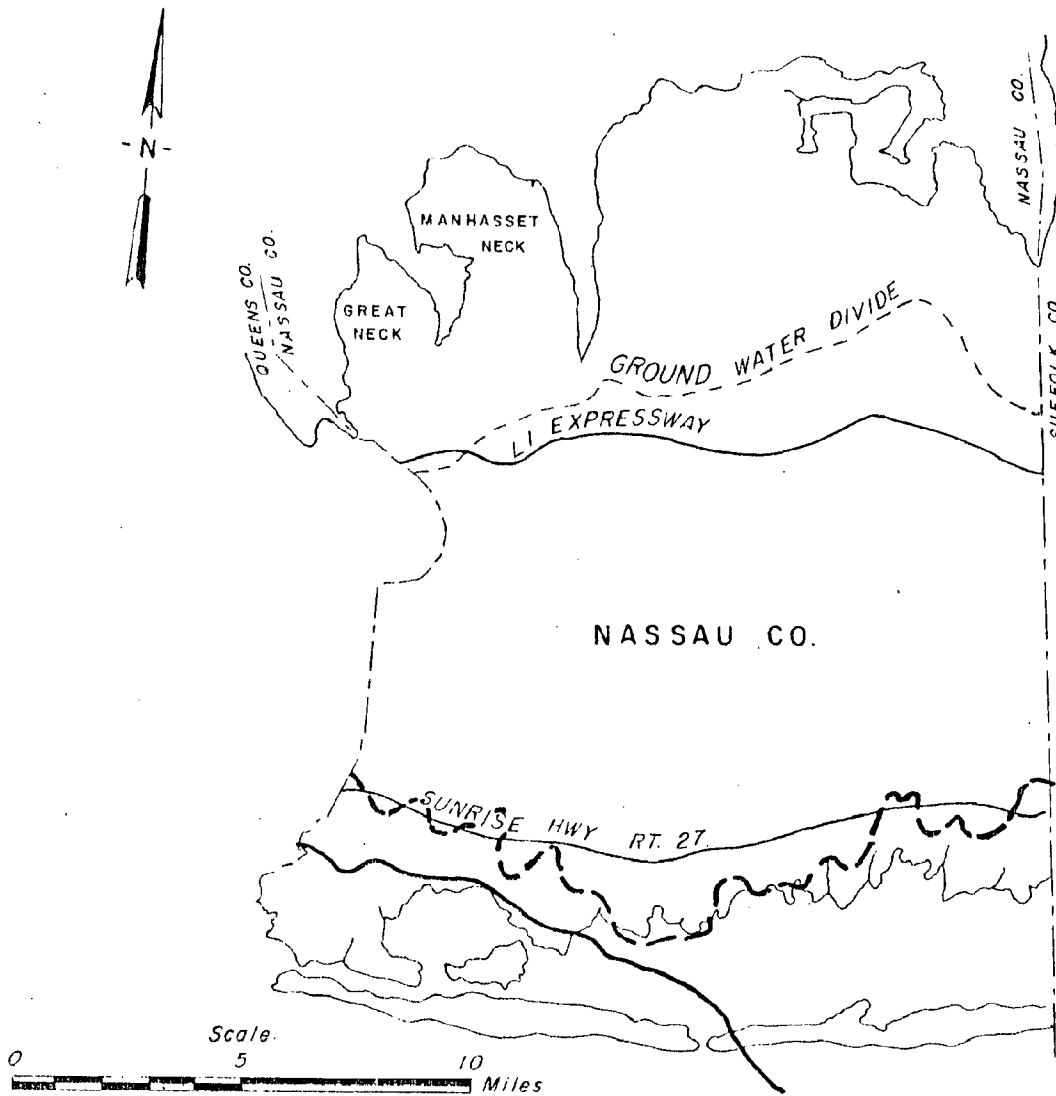
All of the suppliers franchised areas, with the exception of the City of Long Beach and Lido-Point Lookout, extend beyond the study area boundaries. The total pumpage for public water supply wells within the study area, however, averaged 12 mgd (1974).



The greatest withdrawals within the study area were from the Lloyds aquifer (6.3 mgs) followed by the Jameco (4.0 mgd), Magothy (1.6 mgd), and Glacial aquifers (0.2 mgd). The study area encompasses an area outside the hydrologically-defined water budget area of Nassau County (Greeley-Hansen Study-1971) and thus all pumpages for the study area exceed the permissive sustained yield allowances as defined by the G-H Study. The county total permissive sustained yield for an average year is 151 mgd which is projected to be exceeded by 1985.

Since 1954, glacial pumpage has dropped in Nassau County from 15% of the total pumpage to less than 5% while the Magothy pumpages increased from 72 to 85% of the total pumpage. This is a result of shutdowns and reduced glacial pumpage due to wells having high nitrates, iron, detergent or ammonia concentrations.

Saltwater encroachment is another serious concern in the study area aquifer. The U.S.G.S. has confirmed bodies of salty groundwater or wedges under southwestern Nassau in each of the four aquifers. The approximate landward limit of the four wedges has been delineated by Lusczynski and Swarzenski, 1966-(See Figure 3).

Recognizing the sensitivity of the area to increased chlorides with increased groundwater withdrawals, the former New York State Water Resources Commission and



-  APPROXIMATE LANDWARD EXTENT OF INTERMEDIATE WEDGE OF SALTY GROUND WATER
-  APPROXIMATE LANDWARD EXTENT OF DEEP WEDGE OF SALTY GROUND WATER
- *REF. : POSITIONS OF SALTY WEDGES AFTER LUSCZYNSKI & SWARZENSKI (1966)

NASSAU CO.

A. 125

the Department of Environmental Conservation have prohibited new well construction south of the Sunrise Highway. Existing mainland wells which are now south of Sunrise Highway are usually within a few hundred feet of the highway boundary. The barrier beach section which includes Atlantic Beach and City of Long Beach lacks any tie-in to mainland water supply sources and has historically had quality problems with chlorides in the shallow aquifers. As a result, all barrier beach public suppliers now have wells exclusively in the lower Lloyd formation. The Lloyd formation rests above the bedrock formation and is considered the last resort for water supply in the Long Island aquifer system. The Department of Environmental Conservation practice is to protect the Lloyds whenever alternative sources are available. This is in part due to the experience with the Brooklyn area, where high population and geographic and hydraulic conditions similar in most respects to southern Nassau suffered drastic water-level reductions and severe salt water intrusion due to over-pumping in the 1930's. This resulted in abandonment of all Brooklyn groundwater wells as a source of public water supply to the problem areas.

The quality of Nassau groundwater has undergone deterioration with nitrates and detergent problems which have been documented by several reports. (Greeley-Hansen, 1971). Some local situations involving thermal and industrial waste contamination are potential threats to groundwater quality, but widespread abuses, if existing, have not been highlighted. Recharge of treated STP effluents in the shore areas has at various times been proposed to protect the underground freshwater from salt water intrusion. However, distances to the water table are shallow throughout this shore area. Prospects for recharge are poor as little soil medium would be available for filtration and any high-quantity recharge would ultimately affect the bay water salt concentration and existing estuary limits from a dilution standpoint. The quality and nature of the recharge, of course, would demand further consideration of the local ecology. While recharge is technically feasible, detailed ecological studies from the effects of recharge have not been conducted to date.

Recommendations

The Nassau-Suffolk Comprehensive Development Plan indicates that the subject area ultimately may have medium to high population densities. The area will soon be almost 100% sewerred, allowing for industrial and domestic waste to be treated rather than recharged directly to the groundwater reservoir. The concerns which have to be dealt with are the consequences of overpumping as the population increases, and suitable recharge of treated effluents to counteract saltwater intrusion and depletion of the groundwater supply. If quality deterioration continues, alternative sources or importation of water would have to be considered. The Greeley-Hansen Study (GPWS-60-Nassau County) has offered alternative management suggestions and recommendations some of which are summarized as follows:

Greeley-Hansen

- A. Inject tertiary-treated STP effluent into the groundwater supply near the salt water edge to raise the water table and prevent salt water intrusion.
- B. Inject treated STP effluent into a system of shallow recharge basins together with injection wells to substitute for natural subsurface outflow and raise fresh water yield.
- C. If no action is taken on "A" above then permit salt water intrusion to create new equilibrium which will reduce the groundwater withdrawal area.
- D. Import water from Suffolk County or the New York City System where permissive sustained yields are high.

North Shore Water Supply Area

Public water supply needs within the defined coastal zone are furnished by 13 municipal and 4 privately owned suppliers. In 1974 these suppliers pumped an average of 38 million gallons per day from 105 wells with the greatest pumpage from the Magothy aquifer.

Public water supply pumpage in the Great Neck and Manhasset area has induced changes in the natural freshwater saltwater interface and at times drastically lowered the groundwater table. The Glacial aquifer is limited for pumping water as it is believed to exist only as valley fill of the Magothy. The Magothy structure tends to be quite clayed in these areas and some wells intended for public water supply were abandoned due to poor yields. Saltwater intrusion occurred in Lloyd wells due to overpumping in the 1950's when chloride content jumped from a range of 5 to 15 parts per million to 65 parts per million. Wells in all aquifers in the Port Washington Water District are affected by increased chloride levels during increased summer pumpage.

In several cases among the various water suppliers located near the shoreline, groundwater levels dropped below sea level during periods of peak pumpage. For example, the Citizens Water Supply Company has had pumping levels as low as 68 feet below sea level on peak days.

The former New York State Water Resources Commission recognizing the consequences of overpumping in the peninsula areas imposed conditions and restrictions on existing wells and regulated capacities on wells constructed during recent expansion. As a result observation wells are now used to monitor pumping and pumping cannot continue on certain wells if drawdown levels in observation wells are lowered beyond designated elevations and/or chlorides increase to 50 parts per million.

Due to these sensitivities the Department of Environmental Conservation disapproved the Port Washington Water District's request to construct wells within their own district, but approval was given to construct two wells inland where drawdown and chlorides are not critical.

Inland wells in some instances have had quality problems with nitrates. The United States Geological Survey conducted a study of nitrate between 1966 and 1970 and nitrate content exceeded the drinking water standards of 10 mg/l in Glacial and

Magothy wells in substantial portions of the mid-Nassau area. Computations indicate insufficient dilution under Nassau County to bring nitrate nitrogen concentrations below 10 mg/l in unsewered areas where the population density is in excess of 3 persons per acre. With the Glacial formations showing the most serious deterioration, community supply wells have moved to deeper formations. This may only be a temporary expedient as degradation indicated by increasing nitrate content extends downward into the Magothy formation with this movement encouraged in part by pumping of deeper wells in addition to natural flow. In 1973 25 of 384 community supply wells in Nassau County exceeded nitrate nitrogen drinking water standards with the heaviest concentration in the northern and central portion. Some steps taken to cope with degradation of water quality are blending water from 2 or more wells and deepening wells. Ion-exchange nitrate removal plants are being investigated and one such plant is presently in operation and being tested.

Discussion of coastal zone public water supply necessitates examination of the inland and mid-island sources. With what is presently known of the natural underground flow the deeper mid-island water is the potential water which travels outward to the shoreline sectors (Figure 2) Freshwater contained within the coastal zone sector is contiguous to the inland supply. High public water supply withdrawals in the coastal areas lead quickly to changes in the saltwater-freshwater balance mechanism both from capturing the normal freshwater outflow and the accompanying drawdown effects. However, groundwater flows between the three main Long Island aquifers and their inter-relationship with the non-static freshwater-salt-water interface are thought of as separate units and vary individually in respective water quality and boundary limits.

Recommendation

The ecological changes which may result from introduction of salty and brackish water into previously freshwater environments from overpumping have received little study at this time. With complex inter-relationships it is advisable to prohibit

any further public water supply well construction in the peninsula area until a firm ecological knowledge base is established. The ongoing PL 92-500 Section 208 wastewater management study for Nassau-Suffolk counties is scheduled to investigate such concerns using computerized model studies and any further determination should await the 208 study results.

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COASTAL ZONE MANAGEMENT
PUBLIC WATER SUPPLY
SUFFOLK COUNTY

Area Boundaries

For public water supply investigation in Suffolk County's Coastal Zone the following boundaries were arbitrarily selected for purposes of this report only.

The South Shore water supply report area is defined as having the Nassau County border line on the west, the Atlantic Ocean on the south and Route 27 (Sunrise Highway) on the north from Nassau County east to Shinnecock Inlet. The entire south fork from Shinnecock Inlet east, due to its proximity to Peconic Bay will be considered wholly as a coastal zone area (See Figure 1)

The North Shore water supply report area will be arbitrarily defined here as having Nassau County as its western boundary, Long Island Sound as the north boundary, and Route 27A from Nassau County east to Riverhead as the southern boundary. From Riverhead east the entire North Fork, due to its proximity to Peconic Bay will be considered wholly as a coastal zone area.

General Description

Suffolk County comprises the eastern two-thirds of Long Island and includes a land area of about 922 square miles. Its western boundary is Nassau County and the remaining three sides are bounded by water. Suffolk County is recognized as a major suburban area of New York City with extensive residential and industrial development and a total population of 1,300,000 (est. LILCO - Jan. 1975).

The source of all freshwater in Suffolk County is precipitation which is transmitted to the main groundwater body as recharge. All public water supply

is from wells tapping the groundwater reservoir. The only exception is Fishers Island located about 12 miles east of Suffolk in Long Island Sound. Fishers Island, with a year round population of less than 500, has some runoff fed ponds which are used as the primary public water supply. Suffolk County is virtually unsewered at present and except for a few local areas, all waste water is disposed of thru septic tanks or cesspools.

The Suffolk shorelines are bounded by Long Island Sound on the north; Peconic Bay on the east with several bays and the Atlantic Ocean off the barrier beaches to the south. The shorelines total 784 miles, with the Long Island Sound shoreline 191 miles, the south shore bays 239 miles, the Atlantic Ocean 92 miles and Peconic Bay 262 miles.

Geology and Aquifers

Suffolk County is composed of unconsolidated sediments resting on a Pre-Cambrian rock base which varies in depth from 400 to 1800 feet below sea-level. The deepest aquifer is the Lloyd sand formation, 150 to 300 feet thick, which lies above the bedrock. A Raritan clay member (100 to 300 feet thick) overlies the Lloyd sands. Above the Raritan clay is the Magothy formation ranging from 200 to 1000 feet thick making up the Magothy aquifer. Glacial deposits form the uppermost Glacial aquifer which in places may be as much as 700 feet thick in buried Magothy valleys, but averages 100 to 200 feet thick.

The interface between fresh ground water which underlies Suffolk County and the salty ground water which surrounds it varies with the different geological and hydrological characteristics of the various aquifers and the hydraulic potential within the aquifers. If large withdrawals of fresh water were to lower the hydraulic potential, the surrounding salty groundwater would move landward into a portion of the aquifer previously occupied by fresh water.

24
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With the exception of a very few localized areas, there has been no salt water encroachment to date in Suffolk County and the position of the interface is a result of natural equilibrium. The Lloyd aquifer is fresh beneath south shore beaches, but it is salty beneath the two eastern forks and possibly beneath some of the North Shore necks. The Magothy is fresh for its entire depth beneath the south shore beaches, but on the south fork only the upper Magothy is fresh and then only in the center of the Island. On the North Fork the Magothy is salty east of Mattituck Creek. The Glacial aquifer contains at least some fresh water beneath land surfaces all over Long Island and in most places is entirely fresh water.

The salt water interface in the Magothy and Lloyd aquifer lies an unknown distance south of Fire Island in western Suffolk. A Hele-Shaw analog model of a cross section from Huntington Harbor to Robert Moses State Park indicated that the toe of the wedge might be close to Fire Island. The interface in the Magothy is probably closer to the shore on the north shore than on the south. (See Figure 2)

The position of the salt water interface is a function of the amount of fresh water outflow from the aquifer system. Any large scale reduction in the amount of outflow because of consumptive use will result in a landward movement of the salt water interface.

In eastern Suffolk County the knowledge of the position of the salt water - fresh water interface has been expanded significantly through the findings of the Suffolk County Test Well Program. Test borings for five deep test wells on the South Fork penetrated the fresh water - salt water interface. Studies of the South Fork indicate some areas where chloride levels are suspect of being 250 ppm. or greater. For any well located in the low lying coastal areas localized salt water intrusion can be expected to occur.

24

Suffolk County - South Shore Water Supply Area

The South Shore Coastal area as defined here is about 140 square miles and an estimated population of 240,000 people with highest densities occurring in the western end. There are twenty-four corporately owned well sites located on the mainland between Nassau and Shinnecock which furnish over half of the area's public water supply.

There are also seventeen public supply well sites on the barrier beaches, many of which however, contain only one well, mainly for seasonal water supply to summer communities. A great many residents within the defined south shore coastal area, exclusive of the South Fork, are supplied from inland public supply wells located outside the coastal zone boundaries. As many as 60,000 residents depend on private domestic wells and total withdrawal from the designated area is estimated to range from 17 to 30 million gallons per day.

With a safe yield of one million gallons per day per square mile accepted for the inland area of Suffolk, the population in the coastal area west of Shinnecock can be adequately served in the foreseeable future without environmental consequences even with anticipated population increases. With NYS Department of Environmental Conservation permits required for all public water supply well construction and exercising current powers for spacing, pumping, and monitoring of public supply withdrawals, the NYS DEC is alert to ecology considerations of public water supply. It does not appear for the coastal area west of Shinnecock, that any limitations are warranted due to water supply considerations.

For the south fork, however, future population expansion may stress the availability of fresh water due to salt water encroachment.

Recommendations

Public water supply well construction should be maintained in the middle portion of the south fork with population expansion. As permissive sustained yields are reached, land use regulation or alternate sources of fresh water such as importation from western Suffolk will have to be considered to maintain adequate supply.

Suffolk County North Shore Water Supply Area.

The total county area within the defined north shore water supply zone is over 150 square miles, with an estimated population of 120,000. The population density varies from 1400 persons per square mile in the western area to less than 400 in the eastern portion.

Generally, like Nassau County, the north shore of Suffolk County consists of lightly wooded bluffs which ascend steeply to a height of 30 to 100 feet or more from narrow sandy-gravel beaches.

The upland or inland areas on the western end of Suffolk are heavily residential, but a noticeable drop in population densities starts from the Riverhead area eastward where the residential character changes to agriculture and remains so to Orient Point.

Over fifty well sites exist in the defined North Shore zone with dozens of the well sites belonging to small privately owned suppliers which furnish specific developments or operate seasonally in the eastern portion of the coastal area. There are an estimated 40,000 or more residents in this study area using private domestic wells with the total water withdrawals ranging from 10 to 20 million gallons per day.

In the defined area from Nassau County east to Riverhead there are only a few and relatively minor concerns regarding public water supply. As comparable

to the south shore coastal area, the New York State Department of Environmental Conservation has required monitoring or alternate locations whenever wells near the shorelines were suspect of interference in the natural salt water - fresh water balance.

From Riverhead east, however, due to the narrowness of the North Fork, the fresh water supply and balance is much more sensitive than any place else in Suffolk County.

On the North Fork salt water lies much closer to ground surface than on the South Fork. A county test well program revealed a clay layer existing in the north fork Cutchague community. Rapid salt water intrusion occurred in a test well which penetrated the clay layer. It is believed the clay layer acts as a basin for recharged fresh water. This test demonstrated the need to keep wells on the North Fork above the clay layer. There are only a limited number of wells on the North Fork which penetrate the level of this clay. Sufficient data are not available to determine the extent of the clay. If it covers a large area of the peninsula, it would serve to protect the overlying wells from upward salt water encroachment.

In the vicinity of Greenport, the salt water interface lies above the level of this deep clay. Public supply wells in this area are extremely susceptible to salt water intrusion since salt water is present close underneath the wells as

well as on either side. Extended heavy pumpage periods have caused the chloride content in one of the well fields to increase to about 500 mg/l. Efforts by the Village to minimize this problem and to increase the available fresh water supply by pumping stream or pond water to the well field for spreading and recharge have been successful in reducing and maintaining the chlorides to acceptable limits. Other Village well fields have experienced increases in chlorides but not beyond drinking water standard limits. Water development in this area has been with reasonably small capacity wells to reduce the local pumping cone of depression. This has reduced the tendency for vertical movement of the salt water interface. The natural yield of the immediate area of the Village is nearly completely developed and the water system has been extended to outlying areas for additional supply.

Recommendations

Any further extensive water supply development in the eastern North Fork would have to be done cautiously. The area could not tolerate larger populations without jeopardizing the fresh water supply and the neighboring ecological effects unless water was imported or other alternate sources were made available. Land use regulation could also be used to protect this existing supply.

Conclusion

The coastal zones of Suffolk County excluding the North and South Forks do not appear to be in danger from current water supply practices or those that will occur with growth in the foreseeable future. Future supplies can be distributed from wells outside the coastal zone. Both the North and South Forks, however, will not tolerate large increased water supply withdrawals without salt water encroachment and accompanying ecological changes. Importing or other alternate water sources can relieve any consequences of

overpumping as can land use regulation which would prevent large population and industrial expansion.

The water supply management problems within the subregion and the contiguous areas is also intertwined with water quality and all the ramifications that water management programs have on the quality aspects. Suffolk public water supply needs are expected to be met through expansion of existing water supply systems or the construction of new facilities as required all utilizing the ground water source. There will be impact on this source as development occurs and more waste water has to be disposed of. The major contributors to ground water quality degradation are nitrate and detergents primarily attributed to the existence of cesspool and septic tank systems. Other contaminants are the nitrates used in fertilizers for lawns and agricultural purposes, pesticides, petrochemicals and other contaminants in storm water drainage from roads and parking lots, heavy metals from various industrial processes and leachate from solid waste disposal operations.

Although septic system contamination of ground water is of primary concern, the efforts to provide sewerage which lessens the groundwater contamination also decreases the recharge of the groundwater reservoir. With decreased recharge the balance of the salt water - fresh water interface would be changed and any resulting reactions would affect the coastal zone areas.

The on going PL 92-500 Section 208 wastewater management study for Nassau-Suffolk Counties being conducted under the Nassau-Suffolk Regional Planning Board, is scheduled to investigate effects of sewerage and various recharge proposals using computerized model studies. The results of the 208 study should be of great value in making water management decisions benefiting the coastal zone area.

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