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The following report on groundwater quality/quantity problems in the Nassau-Suffolk area is based upon: LIRPB 208 study, NYPRIG "Toxics on Tap", Geraghty and Miller Inc., "Water Supply Philosophies and 208 Planning", "Groundwater Management", and "The Current Status of Groundwater Investigations for Organic Chemicals in the Nassau-Suffolk Area" and various USGS reports.

Numerous studies have concluded that Long Island does suffer from a water quality problem. However, the extent of the quality problem is not known. According to NYPRIG's "Toxics on Tap" many factors influence water quality. Among these factors are the locations of the recharge basins, placement of commercial and industrial areas (industrial discharges and landfills), disposal methods for toxic chemical and wastes (sewage treatment plants, accidental spills, process and incineration wastewater, cesspools), population growth and urbanization. Rainwater and storm-water recharge are also important sources of contaminants of groundwater in Nassau and Suffolk Counties.

Equally diverse as the sources of contamination are

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the materials contributed by each source. Inorganic and organic contaminants, nitrogen-nitrates, halogenated hydrocarbons, heavy metals, pesticides, herbicides, deicing salts, bacteria and viruses are contributed by the aforementioned sources. According to all the studies reviewed, nitrates and organic chemical contamination are the two major sources of groundwater pollution on Long Island.

NITROGEN-NITRATE

Nitrogen/nitrate is a parameter that is common to almost all public health and natural resource concerns. Control of nitrogen-nitrate levels will in many cases lead to the reduction or elimination of other pollutants. There are some specific exceptions, coliform bacteria, organic chemicals and viruses. The New York State public health standard for nitrate-nitrogen concentration in groundwater is ten milligrams per liter. There are various sources of nitrogen-nitrate contaminants, human and animal waste, sewage, cesspools, septic tanks, wastewater and fertilizers. Groundwater quality problems in the Nassau-Suffolk area has been characterized by a significant rise in nitrogen-nitrate levels in portions of the recharge area of the Magothy aquifer. Recent USGS reports have shown that nitrate-nitrogen levels in groundwater in some portions of east-central Nassau County

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is moving from shallow to deep aquifers "at a rate of as much as 5 to 25 feet per year." Based upon several statistical studies, the data show a net lower nitrate concentration in Upper Glacial aquifer groundwater in sewered areas as opposed to unsewered areas. "The mean difference in groundwater nitrate levels between sewered and unsewered areas is 1.3 milligrams/liter for a 6.8 persons per acre difference in population density."(208) Between 1972 and 1976 median concentrations of nitrate-nitrogen exceeded eight milligrams/liter in water from nineteen of 127 selected upper glacial wells in Nassau County. In western Suffolk, nine of 85 selected upper glacial wells yielded water with median concentrations above eight milligrams/liter. On the north fork, water from six of seven selected wells had nitrate levels exceeding eight milligrams/liter and on the south fork, water from thirteen of 92 selected wells had nitrate levels greater than eight milligrams/liter." (208) Generally, the area in Nassau County with greater than .20 milligrams/liter nitrate-nitrogen levels includes almost all of the central and northern parts of the County. In Suffolk County, a similar pattern of nitrate-nitrogen levels is present. The two major nitrogen-nitrate sources in Nassau and Suffolk Counties are agricultural and home fertilizers

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and cesspools. Nitrogen-nitrate from human waste and fertilizers annually contribute approximately 14,000 and 13,000tons respectively. In Nassau County the average nitrogen-nitrate level is 4.5 milligrams/liter compared to 2.3 milligrams/liter in Suffolk. Studies by USGS indicates a general upward trend of nitrogen-nitrate levels in most Magothy wells. In Nassau, trends of nitrate in most Magothy wells showed statistically significant increasing trends. There is a zone of high nitrate concentrations in the Magothy aquifer in the areas of Westbury, Hicksville and Plainview. This may be a result of past large scale farming and fertilizer use in the Hicksville and Levittown areas.

Degradation of ground water quality by nitrogen-nitrate contamination has occurred to a significant degree in both Nassau and Suffolk Counties. Studies estimate that approximately 46 billion gallons of wastewater is produced annually in Nassau and Suffolk. Nearly, 60 percent of this wastewater is treated by some type of on-site disposal system, such as cesspools and septic tank systems. Nitrogen-nitrate contaminants from individual domestic disposal units is therefore a major component of Long Island's nitrogen-nitrate budget. It has been recognized that the cumulative effects

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of the many sources of nitrogen-nitrate levels created by man's activities must be identified and controlled in order to preserve Long Island's valuable water resources.

ORANICS

There are many sources of organic contaminants, industrial discharges, landfills, accidental spills, cesspool and septic tank cleaners. The most common and frequently observed volatile organic contaiminats in Nassau and Suffolk County's groundwater are: trichloroethylene, chloroform, carbon tetrachloride, 1,1,1-trichloroethane, di-n-butyl phthalate, tetrachloroethylene and vinyl chloride. At present, the New York State Department of Health interim guideline for any individual organic chemical for drinking water is 50 parts per billion. The total allowable organic chemical concentration in any one sample can not exceed 100ppb. The substances trichloroethylene, chloroform, 1,1,1-trichloroethane, and tetrachloroethylene have been found in at least 50 percent of the wells tested in both Nassau and Suffolk Counties. Of these tested wells, over 4 percent contained 50ppb of these contaminants. Many of the affected wells were located in the glacial aquifer. However, statistically significant levels of these contaminants were found in Nassau County Magothy wells. In other study

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of the glacial wells over one third of the sixty wells tested were significantly contaminated by volatile organics. Over ½ were contaminated by methylene chloride extractables. In the Magothy aquifer volatile organics are present in statistically significant levels. Also occurring at statistically significant levels in the Magothy were: 1,1 dichloroethane, bromodichloromethane, and phthalates. The results of various studies indicate that high levels (greater than 50ppb) of volatile organic compounds are found in Long Island's upper glacial and magothy aquifers. This is especially true in industrial areas.

SOURCE	# of plants	Usage gal/yr
1,1,1-trichloroethane	129	561,451
tetrachloroethylene	440	373,979
trichloroethylene	59	196,050
methylene chloride	47	153,017
* 208	Total	1,284,497

Furthermore, high levels of organic contaminants may be considered a potential public health risk. In response to resident complaints in East Patchogue several private wells were tested for toxic organics. The concentrations of all organics found was as high as 23,000 ppb. The implication

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of organic chemical contamination such as this is serious. The reason organic chemical contamination is a serious threat to groundwater quality is that once it reaches the potable drinking supply it is not extractable. Additionally, the drinking supply will be rendered unsafe for human consumption for decades.

Although nitrogen-nitrate and organic chemicals are the two major sources of groundwater contamination on Long Island. There are also many other sources of contaminants which contribute to the overall degradation of groundwater quality. These include pesticides, but there is no evidence to suggest that pesticides pose a serious threat to groundwater quality. However, certain pesticides containing aldicarb have been found to pose a threat to groundwater quality in eastern Suffolk County. Leachate from landfills, septic system cleaners and other household products have also been identified as possible sources of contamination. Additionally, groundwater is impacted by subsurface oils and gasoline storage tanks. There are 2100 stormwater recharge basins on Long Island which also constitute a major threat to groundwater quality because the runoffs are contaminated with highly toxic synthetic organic chemicals and heavy metals. Detergents, heavy metals and solids are also possible sources of con-

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tamination. Because of the many sources of contaminants that affect groundwater quality, it is very difficult to ascertain the full implications for Long Island's water resources.

All the studies reviewed indicate that a water quantity problem does exist to a certain extent in Nassau and Suffolk Counties. The sources that contribute to the water quantity problem are: salt water intrusion, sewering, heavy pumping in highly dense population areas and droughts.

The concept of safe or permissive yield is normally defined as: "the amount of groundwater which can be withdrawn from the system and used consumptively on an annual basis without producing undesired results." (208) The total amount of water in storage in Long Island aquifers is 60 trillion gallons. Groundwater is taken from storage, and underflow to streams and the sea is reduced as consumptive use increases. This results in groundwater level declines and saltwater encroachment. It is estimated that the mean permissive yield for Nassau County is 151 million gallons per day and 466 mgd for Suffolk County. A principal effect of increasing consumptive use of groundwater is a continuing

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decline in groundwater levels. Statistically significant decline of the water table has occurred over the last few decades. This is particularly true in Nassau County. For the period 1969-1973, the average consumptive loss in Nassau was computed to be 133mgd. In Suffolk the average consumptive loss was 40 to 50 mgd for the same period. Groundwater withdrawals in the Long Island area is presently 350mgd. Pumpage in the Nassau-Suffolk region was 105mgd in 1940 and 330mgd in 1965, This increase is due to the rise in population and urbanization. Groundwater pumpage is characterized by uneven distribution because wells have traditionally been located near the user in order to minimize costs. As a result, concentrations of groundwater withdrawal has developed in densly populated areas.. Consequently, there are areas of over utilization and areas which are under utilized.

In addition to stresses caused by increases in withdrawal rates, fluctuations in natural recharge and urbanization, the groundwater table is also affected by sewering. Sewer outflows to the sea contribute to the overall decline in the water level in Nassau County. Groundwater level decline attributable to sewering in western Nassau County ranged from 3.6 to 19.1 feet. Between 1953 to 1972 the average water level decline in southwestern Nassau County was 11.8

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feet of which 4.9 feet was caused by pumping in Queens County. Recent studies indicate that water levels will continue to decline in Nassau County and to a lesser degree in Suffolk County under the present system of water management. The future of Nassau County's water quantity supply is dependent upon the heavy pumping in Queens County creating significant underflow from western Nassau to Queens. This bi-county common water level decline shows the insignifance of political boundaries when dealing with a resource that is common to the entire Island. Several water management plans have been proposed for dealing with this problem in the Long Island area. One particular plan calls for the installing of a regional well field in Suffolk County and pumping water into Nassau County. At this time, there is little natural exchange of groundwater between Nassau and Suffolk Counties. However, if groundwater levels are allowed to decline in Nassau County, natural underflow of groundwater will occur maybe eliminating the need for a regional well field.

There is general agreement among the reviewed studies that over the long term water quantity does not represent a serious threat to Long Island's water supply. However, water supply from the standpoint of water quality degradation resulting from man's activities will be the principal constraint

in terms of groundwater avaliability.

RECOMMENDATIONS/ SOLUTIONS

Among the reviewed studies there are many recommendations and solutions proposed to solve Long Island's groundwater quality/ quantity problems. As equally diverse as the quality/quantity problems, so are the recommendations and solutions. However, there is general agreement among the studies on several recommendations and solutions, with regard to the concept of centralization. The 208 Study specific recommendations include the concept of contralization. Options include:

1. In Nassau County - creation of a county-wide authority or department that would have the sole responsibility for the production, quality control, and distribution of water. This would mean the absorption of the county's 46 existing companies.

2. Similar to the first for the production of water, location and operation of wells, control over pumping rates and sole responsibility for water quality monitoring and control. The 46 existing companies would remain for the purpose of local distribution and sale of water.

3. Water production can be assigned to the Department of Public Works. Production of water and construction of a county-wide distribution system would be assigned to the department with monitoring and quality control assigned to the Health Department.

It is important to note however, that the NSRPB believes "that all management agencies required to implement this water quality management plan are currently in place, and have adequate legal and administrative jurisdiction."

Geraghty & Miller Inc., recommendations also include the concept of centralization. "The recent suggestions and proposed legislative action to regionalize water supply development in the Bi-County area,

have some merit. This may be the only option available that would provide feasibility to such conservation techniques as optimum pricing, large scale interconnection of the island-wide distribution system, and the shifting of patterns of pumping to undeveloped aquifer areas." Geraghty & Miller also sited: " A long range policy of water supply development and distribution is virtually non-existant. With the exception of several stated quidelines, most decisions are made on the basis of local impact. This is primarily due to the political structure of water supply units in Nassau and Suffolk Counties.

It was recommended that the water supply for both Nassau and Suffolk Counties be managed on a regional basis. The report suggests a plan be formulated by the Nassau-Suffolk Regional Planning Board. Existing water utilities would retain ownership of facilities until such time as the county or some other regional agency may take over operating functions of the various districts. There is a need for a county-wide agency to efficiently manage water resources. The first priority of a consolidation program should be the acquisition of all the private water companies in the county." Furthermore, the key element in the development of any regional water management plan should be Land Use Planning.