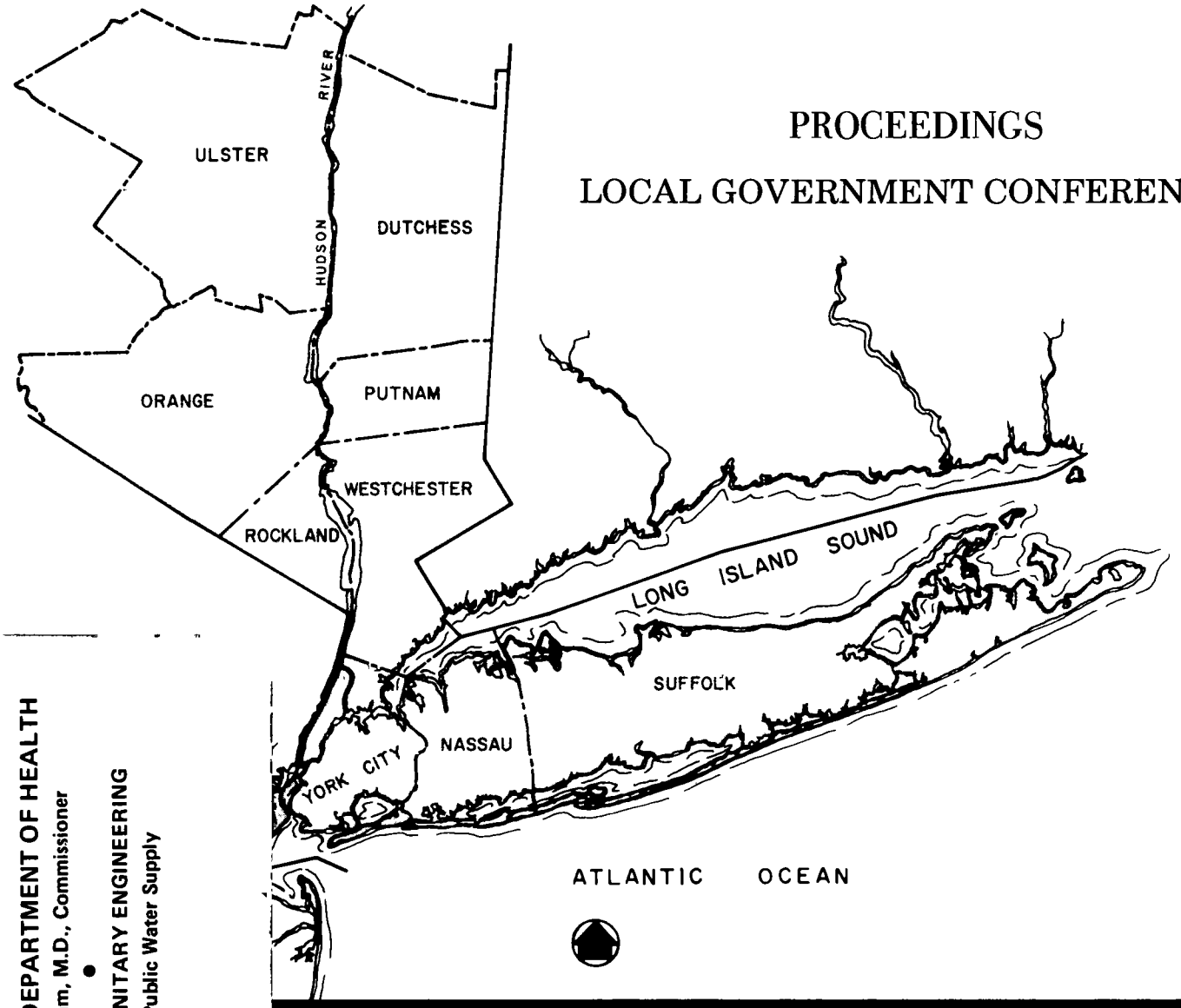
Temporary State Commission on the Water Supply Needs of Southeastern New York

PROCEEDINGS

LOCAL GOVERNMENT CONFERENCES



NEW YORK STATE DEPARTMENT OF HEALTH
Hollis S. Ingraham, M.D., Commissioner
•
DIVISION OF SANITARY ENGINEERING
Bureau of Public Water Supply

December 1, 1972

Albany, New York

Temporary State Commission
on the
Water Supply Needs
of
Southeastern New York

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TEMPORARY STATE COMMISSION
ON THE
WATER SUPPLY NEEDS
OF
SOUTHEASTERN NEW YORK

PROCEEDINGS LOCAL GOVERNMENT CONFERENCES

DECEMBER 1, 1972

NELSON A. ROCKEFELLER
Governor

EARL W. BRYDGES
Temporary President of the Senate

PERRY B. DURYEA, JR.
Speaker of the Assembly

December 1, 1972
Albany, New York

SOUTHEAST WATER SUPPLY COMMISSION

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H. Clark Bell, *Vice Chairman*

Neil H. Anderson
Herman Forster
Benjamin A. Gilman
Anthony B. Gioffre
James C. Harding
Thomas J. McInerney
Jess J. Present
Anthony M. Quartararo
Gerald R. O'Brien, Jr.
Jay P. Rolison, Jr.
John J. Santucci
William J. Schickler
Robert C. Wertz

Robert D. Hennigan, *Executive Director*

FOREWORD

As part of its program, the Southeast Water Supply Commission scheduled a series of meetings with local officials. The meetings were organized on a county basis, except for New York City which was treated as a single entity. The meetings include all the counties within the Commission service area.

The meetings were planned as relatively informal conferences with local officials concerned with water supply matters. The meetings were not public hearings since attendance was by invitation. Arrangements were usually made by local people.

A verbatim record was made of the conferences. This publication is an edited version of the transcripts. All participants have had an opportunity to review the minutes and make corrections.

Without the active cooperation of local officials, these meetings could not be held. The Commission greatly appreciates the fine spirit of cooperation of the local officials and their continuing assistance. They are making a real and substantial contribution to the program of the Commission.

E. Virgil Conway, *Chairman*

COMMISSION STAFF

Robert D. Hennigan, *Executive Director*
Emanuel Bund, *Special Counsel*
Irene W. Baker, *Public Affairs*
David A. Duffy, *Administrative Assistant*
Karen M. McMahon, *Secretary*
Kathryn L. Barrette, *Stenographer*

Paul W. Merkens, *Director of Engineering Studies and Analysis*
Stephen C. Lackey, *Assistant Director of Engineering*
Harold F. Breon, *Water Resources Engineer*
Jane E. Josiah, *Stenographer*

David E. Buerle, *Director of Management Studies and Analysis*
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Robert C. Hansen, *Research Assistant*
Robert W. Redmond, *Staff Attorney*
Evelyn E. Ruffinen, *Secretary*
M. Eileen Campbell, *Stenographer*

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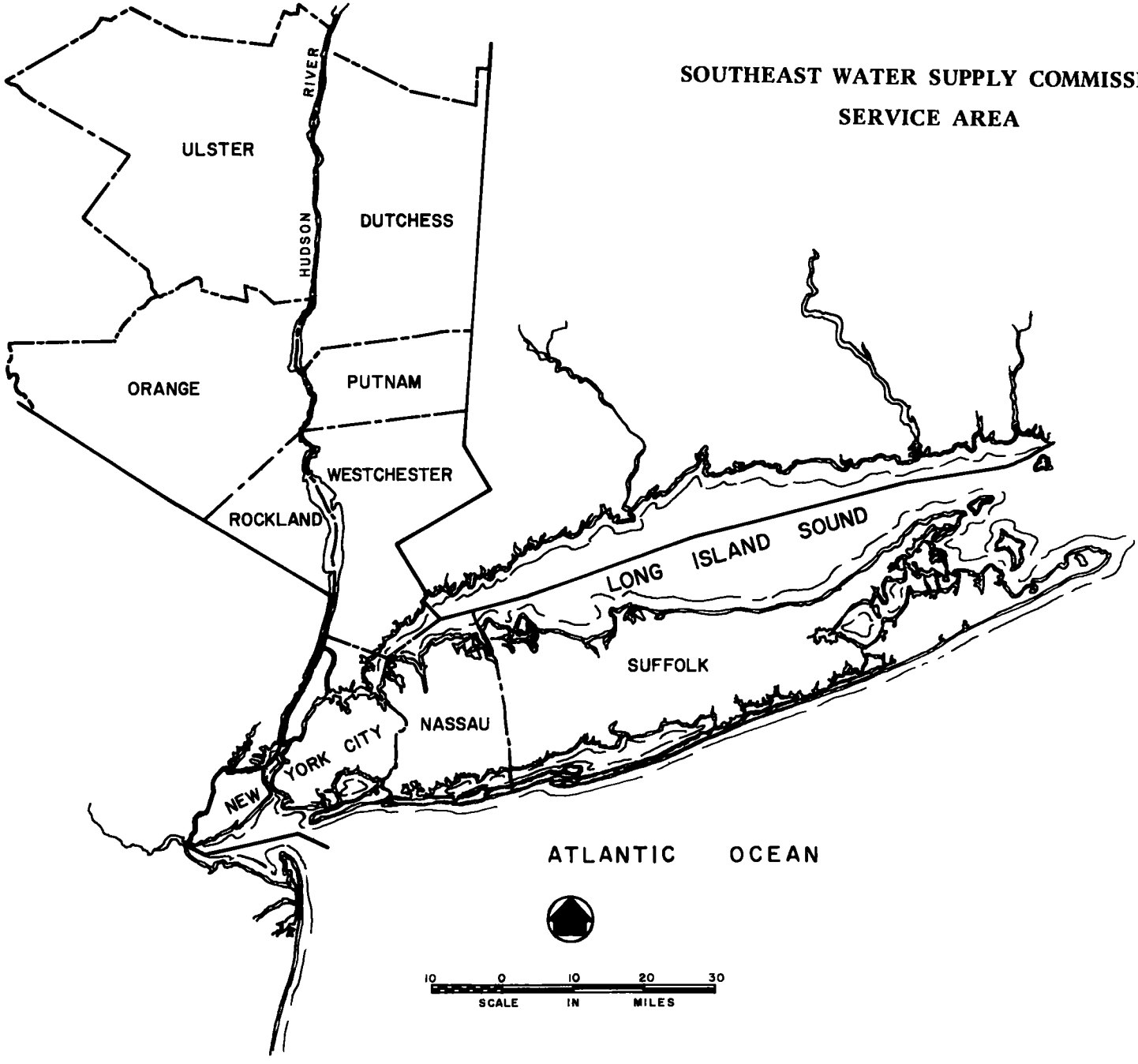
SCHEDULE OF CONFERENCES

Area	Date	Place
Suffolk County	3/12/71	Hauppauge, New York
New York City	4/23/71	New York City
Ulster County	5/26/71	Kingston, New York
Westchester County	6/25/71	White Plains, New York
Dutchess County	7/7/71	Poughkeepsie, New York
Putnam County	10/29/71	Carmel, New York
Rockland County	10/20/71	Nanuet, New York
Orange County	11/29/71	Goshen, New York
Nassau County	1/18/72	Mineola, New York


SOUTHEAST WATER SUPPLY COMMISSION
SERVICE AREA
ULSTER
DUTCHESS
HUDSON RIVER
ORANGE
PUTNAM
WESTCHESTER
ROCKLAND
LONG ISLAND SOUND
SUFFOLK
NASSAU
NEW YORK CITY
ATLANTIC OCEAN
10 0 10 20 30
SCALE IN MILES

DUTCHESS COUNTY

June 7, 1971

Poughkeepsie, New York

DUTCHESS COUNTY CONFERENCE

OPENING REMARKS

Mr. E. Virgil Conway, *Chairman Southeast Water Supply Commission,* opened the meeting at 9:45 a.m. He introduced members of the Commission present, taking particular note of the participation of Senator Rolison and Anthony Quartararo, both of whom are from Dutchess County. Senator Watson Pomeroy (retired) was recognized for his distinguished legislative career and his interest in conservation. Mr. Conway then noted that this was the fifth in a series of meetings with local officials and commented as follows:

The concern of this Commission is with water supply facilities and services for the southeastern region, comprising the city of New York and the eight metropolitan counties. The Commission is charged with identifying the needs and proposing a program to meet these needs. These meetings with local officials are being held to give the Commission an opportunity to meet with local officials and to hear what the problems and issues are from the people charged with the responsibility for providing adequate water service. These meetings will help form and shape our conclusions which will come later in the study. We would like to express our appreciation to County Executive Dave Schoentag and Commissioner Henry Heissenbuttel for organizing this meeting and making these fine arrangements. These meetings are by invitation but they are in no sense closed. I realize that we have members of the press here and you are welcome. I see that Mr. Vincent Terenzio, Chief Engineer of the New York Board of Water Supply is here and we are delighted to have you with us. I would now like to turn the meeting over to Dave Schoentag.

Mr. Schoentag, *County Executive:* It is with great pleasure that I welcome the members and staff of the Commission to Dutchess County. I am delighted that the Commission has decided to work with local government. It is evidence of a willingness to account the views of local officials. The Commission on Water Supply Needs has been assigned the task of recommending how water demands in the metropolitan area should be met now and in the future. I am also vitally concerned about this question and realize that the Commission's recommendation will have an impact on Dutchess County. I felt so strongly about local representation on the Commission that I fought against the original concept of a six man Commission consisting of two representatives from the city of New York, two from Westchester County, and two from the state at large. I requested the Governor and the legislature to provide for a Commission that was broadly representative of the entire New York metropolitan area. I was pleased that the Commission developed as it did and that Senator Rolison and Attorney Quartararo from Dutchess and Assemblyman Clark Bell from Ulster were appointed to represent local interests.

The need is for an adequate water supply for Dutchess County and New York. A successful solution will depend on the cooperation of the Commission and local governments. Assembled here this morning are the key people in Dutchess who have knowledge about and concern of the development of local water resources in this county. All of us are willing to work with you for the development of a plan that

recognizes and meets these needs. I assure the Commission and its staff of our full cooperation. The people here from Dutchess County include Mr. Henry Heissenbuttel, Commissioner of Planning, Dr. Vernon B. Link, Commissioner of Health, my summer intern, Bob Englehart, Supervisor Roger Golden from Hyde Park, Supervisor Edward C. Schueler from the Town of Poughkeepsie, County Representative William H. Bartles from the Hyde Park District, Mr. Scott Warthin, Chairman of the Water Conservation Agency, Henry Scoralick, Engineer from the Dutchess County Health Department, and Mr. Ken Pearce, City Engineer of the city of Poughkeepsie. Now I would like to turn the meeting back to Chairman Conway.

Chairman Conway: Thank you very much Mr. Schoentag. Now I might comment that there is evidence of the long-time interests of Dutchess County in the original New York City Water Supply Act. It is the only county in the area of our study where New York City was prohibited from developing a water supply. That certainly does make Dutchess County unique.

Mr. Robert D. Hennigan, *Executive Director:* First of all I would like to express my appreciation to Henry Heissenbuttel for his aid and assistance in setting up this meeting. He did all the work and we certainly appreciate it. As the Chairman said, Dutchess County is somewhat different than the other counties and that must have a long history. I got involved with water supply here about ten years ago and came out of it slightly bruised but hopefully, a little wiser.

We have started the program by meeting with local people for two reasons: (1) to give us an understanding and feeling about the water supply situation from your point of view; and (2) to establish a good working relationship with the people who are directly concerned with providing water supply in this metropolitan region. This is the fifth such meeting and the previous meetings have been excellent. A lot of information has been developed and an excellent foundation has been laid for the future work of the Commission.

PRESENTATION

Henry Heissenbuttel, *Commissioner of Planning, Dutchess County:* Thank you very much, Mr. Conway. What I plan to do is to use charts and diagrams (appended) and present an overview of what has been happening in Dutchess County, particularly population growth and land development. This will give you some idea of what the county is like from the point of view of land use and topography and relates it to the water supply problems in the county. When we talk about the water supply region, it has been defined in your mission as Suffolk, Nassau, New York City, Westchester, Rockland, Putnam, Dutchess, Orange, and Ulster Counties. In a newscast yesterday, reference was made to the Corps of Engineers NEWS Study which suggests using the Hudson River as a supply for the metropolitan region, defined as 22 counties in New York, Connecticut, and New Jersey. Dutchess is included in this, but it is also part of the mid-Hudson region which at times competes with the counties closer to New York City.

When I speak of Dutchess County I will concentrate to a great extent on the Core area. The Core area (Generalized Land Use figure appended) includes the towns of Hyde Park, LaGrange, Poughkeepsie, East Fishkill, Fishkill, the cities of Beacon and Poughkeepsie, and the incorporated villages therein. This is the urbanizing area of the county. It contains 3/4 of our population and is expected to continue to contain this portion of the population in the foreseeable future.

The county has some 816 square miles of land, consisting of alternating hills and valleys which divides the county into many watersheds. The most important ones are Wappinger Creek, Fishkill Creek, Tenmile River and the Hudson River (Drainage Basins map appended). Wappinger Creek and Fishkill Creek drain the central portion of the county. The western edge of the county drains directly into the Hudson River, while on the east the Tenmile River Basin flows eastward into the Housatonic River in Connecticut. Stream flows vary seasonally but on the average have a total daily discharge of 537 MGD. In 1966 during the height of the drought, flows dropped to 380 MGD. We need water for a population of over slightly 300,000 people. There is enough water flowing in our inland streams to meet the needs of Dutchess County. However, none of these sources are developed. It would require storage and distribution. Some attempts have been made to do this. One was a proposed reservoir at Pleasant Valley on Wappinger Creek. However, no serious attempt was made to follow through. The development of local water resources would be difficult but from my point of view it is something that needs to be considered. We have water everywhere in Dutchess County. It is flowing out to the sea via the Hudson River and Housatonic River and in the sense that it is not being used, it is being wasted. Hardly any of this water is used for municipal water supply purposes.

The surface supply that is used is the Hudson River. Major points of taking are by the City of Poughkeepsie which has a system that serves the City of Poughkeepsie and shortly will serve most of the Town of Poughkeepsie, and also the Village and Town of Rhinebeck.

The groundwater resource is shown in the appendix as Ground Water Occurrences. There are certain high yield sand and gravel deposits and also a considerable amount of limestone. The actual yield from these supplies is open to question. For example, the Village of Rhinebeck is located on a sand and gravel deposit. When the village exhausted that supply a few years back they went to the river. We have similar experiences in other locations. Another problem is the question of water quality because we are putting water back into these deposits in the form of sewage which will gradually destroy this water resource. A major possibility for groundwater development is the Fishkill-East Fishkill area.

Summing up then, we have good surface water resources but they are undeveloped and the probability that they will be developed in the future is slight. The amount of groundwater is limited and is threatened by pollution because of a lack of sewage collection and treatment. This means that in Dutchess County we have become dependent on the Hudson River for our major sources of water supply.

The 1970 census showed a population count of 222,295 people. That is less than what we expected but within a predicted range. This compares with 176,000 in 1960 indicating a growth of 26.3% in that decade. We were the sixth fastest growing county in the state of New York. It has taken 280 years to build from zero population to 222,000. We expect to double that population and add another 280,000 people in 1/10 that time. In the next 30-40 years we will have added as many people as now live in the county. Historically we have been growing in and around the City of Poughkeepsie. The city and the surrounding town have the densest population which then radiates out in fairly concentric patterns (Population Distribution appended). During the '50's and '60's another focus of population growth developed. This was in the southern part of the Core area. We now have a sprawl population growth within the Core area between the cities of Poughkeepsie and Beacon and slightly to the north of the city of Poughkeepsie and extending to the Hudson River on the east, and to the Taconic State Parkway on the west. So we have a scattering of population and a scattering of demand for utility services. Because of the scattering many of the people cannot be economically reached with water supply extensions. Likewise, it becomes extremely difficult to provide for the collection and treatment of sewage.

Land use (figure appended) further illustrates this urban sprawl situation. We have even experienced a situation where industry is moving out from the cities and immediately running into problems of water supply and waste disposal. The new IBM plant in East Fishkill is remote from the view of water supply and sewer service. The residential developments in this county do not compare with the large developments on Long Island. Most of the subdivision developments are small, 40-50 lots, with some going as high as 200-400. Since there are no utility services the problem of developer-owned water systems and sewer systems has arisen. This has resulted in multiple systems all along the inland waterways. At the last count we have 98 individual water systems. Seventy of these had their own water supply. The Town of Poughkeepsie has been constructing a town-wide transmission system which will cover the whole community and consolidate many individual supplies into a single system. However, we do have the continuing problem in the outlying towns.

Some 10 years ago the county had a plan to create an area-wide water system for the suburban Core area. A study was made in 1961 and recommended that we create a part county water district to serve the Core area. It proposed that the county buy the City of Poughkeepsie water treatment plant and system, and then expand it to serve the Core area. This became a major political issue. The city didn't sell the system to the county. An alternate proposal was developed whereby the county would build a water treatment plant just north of the city and serve the same area excluding the city proper. This proposal was presented to the public in 1965 and passed overwhelmingly. Subsequently it was discovered that the proposal was presented to the public on the basis of a cost of $40 per year per unit when it should have been $80-100 per year. This became politically sensitive and the project was put on the shelf.

Since the need for better service could not be denied, the Town of Poughkeepsie successfully negotiated a contract with the city and proceeded with their town-wide system. To a great extent the original concept has been put through on a piecemeal basis. Eventually, it can be expanded to serve the Core area.

Since we have committed ourselves to the Hudson River for future water needs, we are greatly concerned about the plan to develop another taking point for regional use. The New York City-Westchester Study proposed withdrawals at Hyde Park with a conduit running through Dutchess County to connect with the City system in Westchester County. One question which should be investigated is the feasibility of the county making use of the proposed new system. In looking at the New York City-Westchester Study we noted that the projected population for this area is 470,000 by the year 2020. We feel that this figure is conservative and will be closer to 525,000. Our estimate of future water supply needs indicate an 84 MGD peak daily demand for Dutchess County in 1980, with an average demand of 42 MGD rising to 103 MGD average daily demand in the year 2020. These are substantially higher than estimates in the New York City-Westchester Report. This discrepancy between these estimates should be investigated by your Commission.

I think it is fair to say that there is plenty of water. The questions are how do we develop it and how do we administer the system. I personally believe that county and local officials have the responsibility to develop adequate distribution systems. This is our local role and is best done by local people. The further development of the Hudson River as a water supply source is indicated and it might be desirable for the state to assume this role and distribute the water to the communities in the county. This again may have to be a state role since local government finds it very difficult to undertake such a task. The state has jurisdiction over all water resources anyway and could probably resist certain local pressures against the development of the local county resource.

DISCUSSION

Chairman Conway: *Thank you very much. What portion of your future needs can be met by local surface or groundwater supplies and how much will have to come from the Hudson River?*

Mr. Heissenbuttel: In terms of the whole of Dutchess County we will rely to a great extent on the Hudson River supply. About 75% of the total demand would be in the Core area. Another 10-20% would be for Rhinebeck. Both of these areas will probably be dependent on the Hudson supply. An upland development is a possibility but so little progress has been made in this direction that I don't think we can give it much value. Groundwater resources will probably serve the remainder of the total demand in the county. The county planning policy is to discourage developments out in the rural areas with limited water resources and try to get developments linked into existing systems.

Mr. Bell: *How much water do you need for the entire county right now?*

Mr. Heissenbuttel: I don't have the current figures available but will get back to you with that information in a minute or two.

Mr. Bell: *You take out of the Hudson at Poughkeepsie and at the Village of Rhinebeck. The remainder of the county is served by a combination of local groundwater and surface supplies. Is that correct?*

Mr. Heissenbuttel: That is correct. I would note that the city of Beacon is also served by local supplies.

Mr. Bell: *What I am trying to determine is how much your present demand is and how this is being met by the Hudson River, local groundwater, and local surface water. Then I would like the same information on the projections for 1990 and 2020. I would also like to know how much water would be available if the political barriers with respect to surface development and groundwater use were non-existent?*

Mr. Heissenbuttel: The present demand for water across the county is about 31 MGD. The population that was served by central water systems in 1968 was 105,000 with a demand of about 21 MGD. So we have about 10 MGD of demand being met by individual wells.

Mr. Wertz: *You mentioned 98 separate systems. Are most of those private small water companies or are they municipal systems?*

Mr. Heissenbuttel: They include both but most of them are municipal systems.

Mr. Wertz: *How about sewer systems? How much of the county is sewered?*

Mr. Heissenbuttel: Very little. Some of the hamlets and villages have sewer systems, otherwise the only other sewer systems are in the larger cities. Would you like the number of people served?

Mr. Wertz: *Yes, I am curious as to how endangered your groundwater supply is because of sewage disposal.*

Mr. Heissenbuttel: There is a difference of opinion here among ourselves. From my point of view the groundwater supply is endangered. We have a lot of suburban housing being built with private systems.

Mr. Wertz: *What are your health department requirements?*

Mr. Heissenbuttel: Each system is designed for each particular lot based on a percolation test and usually consists of a septic tank and tile field.

Chairman Conway: *Since most of the county is not a good aquifer, likewise it probably wouldn't be good for individual sewage disposal systems, since it is mostly rock or clay?*

Mr. Heissenbuttel: That is substantially correct.

Mr. Schickler: *I have one question. You mentioned that local surface sources could supply 537 MGD. Is that an average figure and is it being utilized now?*

Mr. Heissenbuttel: It is an average figure and is not being utilized to any extent.

Mr. Schickler: *I think you also mentioned a minimum yield. Would you please repeat that figure.*

Mr. Heissenbuttel: 380 MGD was the low figure for 1966. I now have some information on the public and private systems. Of a total of 98 water systems, 49 are public serving 85,000 people and 49 are private serving 20,000 people. The remaining 49% of the people are on individual wells. These figures are for 1968 population.

Mr. Bell: *Just one further thing that Bob Wertz was talking about concerning sewerability. How much of the county in your estimate is geared to municipal sewer systems other than the Core area? Are you going to go outside the Core area at all?*

Mr. Heissenbuttel: The City and Town of Poughkeepsie are sewered or in the works to be resewered. We have a few villages that have sewer systems. On the whole all the rest of the county is not sewered. The Core area that needs a central water supply system also needs a central sewer system. We have a plan for such a system. Unfortunately, it is on the shelf. The plan calls for a part county sewer district, the integration of some existing systems, and the providing of collection and treatment service to the Core area. We are trying to discourage development that is based on small subdivision water and sewer systems.

Mr. Bell: *Do all the towns have zoning and land use control that are east of the Taconic Parkway?*

Mr. Heissenbuttel: Three towns out of 20 do not have a zoning ordinance.

Mr. Bell: Well if you are going to protect the quality of the groundwater you need to have strong land use controls east of the Taconic with a plan for sewering at some future date.

Mr. Wertz: *What sort of coordinated plan do you have between the county and the town planning officials? Is there a joint council or a county coordinating unit?*

Mr. Heissenbuttel: The county planning board has a professional staff and also a citizen advisory group for the whole county. Each municipal subdivision has its own planning board comprised of lay citizens. Only two municipalities have a staff in addition to the county. The City of Poughkeepsie and the Town of Poughkeepsie have a one man staff. Local planning is limited and when they need technical advisory services they turn to the county unit.

Mr. Wertz: *Is it a very cooperative effort? Can you get the cooperation of the outlying towns? I am from Suffolk County and we have had some difficulty with some of our towns. They jealously guard their own prerogatives.*

Mr. Heissenbuttel: Contrary to some beliefs we find it is easier to get cooperation from the outlying towns than from some of the suburban ones. Generally speaking though, we have good cooperation from most of the municipalities.

Mr. Hennigan: *If the Hyde Park proposal went through with the development of additional water supply for the region and an aqueduct was constructed through Dutchess County what would be the impact on the county in terms of development? Do you think it would have much of an impact?*

Mr. Heissenbuttel: I don't see where it would stimulate any more development than would an area-wide system provided locally. What it would do is to encourage development in the vicinity of the aqueduct providing that taps could be made along the aqueduct. In this regard it might have a substantial impact.

Mr. Harding: *Mr. Chairman, may I speak on that?*

Chairman Conway: Yes.

Mr. Harding: I think the Hyde Park proposal would be very beneficial to the county because you would have filtered water available generally in the county. On the same basis it would also be beneficial to Westchester and Putnam county. In line with this proposal New York City is considering whether to have a filter plant at Hyde Park or in Westchester County at Grasslands. If the filter plant were at Hyde Park this would maximize the benefits to the upstate counties. If it were located at Westchester the benefits would be substantially less since local treatment facilities would have to be provided. In view of this I would like to emphasize that a filter plant at Hyde Park would be much more preferable than one located further south.

Mr. Heissenbuttel: *I agree but would we get anything out of a plant at Hyde Park that we don't*

get out of the plant at Poughkeepsie?

Mr. Harding: Hyde Park would have the additional benefit of providing local revenue from the assessed valuation of the facilities.

Mr. Pearce, *City Engineer, City of Poughkeepsie:* If I may speak here concerning the Hyde Park proposal and aqueduct, I don't have any idea exactly where the aqueduct would be located and I don't suppose anybody else does. However, we know that the water would be available in that Core area that Mr. Heissenbuttel has talked about. An extension of the water system of the city of Poughkeepsie to the Core area means that we would have to carry the water some 15 miles. That would be very expensive. If the regional development occurs, the aqueduct would be there and the water would be available. Furthermore, as exemplified by the Rupert Brewery situation, if you don't have water, industry won't locate here. If we do have the water it will bring in industry.

Chairman Conway: *As I understand it further development in most of the counties has been tied to availability of water from the New York City systems and this has required accommodation with the water supply act and the City of New York. An accommodation that has been fraught with some conflict. Dutchess County does not have this particular problem. Consequently, am I correct in understanding that development of Dutchess has not been restrained from lack of water, but rather from lack of development of the water that is already here?*

Mr. Warthin: Lack of money.

Mr. Heissenbuttel: Our main problem is in southeastern Dutchess where public systems are really needed. There are two major drawbacks to promoting industrial development. One is water supply and the other is sewage disposal. If we are to be successful in promoting controlled and desirable development, we must meet these needs.

Chairman Conway: I think it is important to determine whether it involves financing or the lack of water itself. These are separate problems which this Commission will have to consider.

Mr. Hennigan: *There is one question that I would like to raise. What would the general attitude in the county toward the development of a regional water supply be?*

Mr. Heissenbuttel: I would think it would be an uphill battle.

We have representatives here from county, town, city, and village governments in the county. Scott Warthin and Bill Bartles are prepared to make some comments from a county point of view. Scott Warthin will speak first. He has been associated with the county water conservation committee for a long period of time and is the man responsible for instituting the stream gaging program in the county. He is a former professor of geology at Vassar College and has a great deal of experience and knowledge about local water resources and land development.

Mr. A. Scott Warthin, *Dutchess County Water Conservation Committee:* Being a geologist I like to think in terms of millions of years but it is getting late so I will reduce that somewhat. All of the water needs in Dutchess County depend on estimates of population growth, and the Commission will determine needs based on estimates of population growth and per capita usage. We all recognize that this is not confined to a single county but a large metropolitan area. I hope that in your deliberations you will include that part of the metropolitan area in Connecticut and New Jersey. This is a unified area in terms of needs for water. Although you are a state commission it is important that the entire New York metropolitan area be kept in mind. As Henry indicated, there is a great deal of local feeling about water supply. One important feeling is that to meet future water needs we are going to have to make careful and proper use of all the available water. We are going to need every drop that is available. I think that the majority of people in the Hudson Valley are quite resentful over the lack of metering in the New York City system. New York City has got to be metered. I don't think that the rest of the metropolitan area will go along with any plan if it does not consider this as one of the first requirements.

Locally it was proposed that we attempt to develop our local surface water resources. This has proved to be almost impossible. So it might be necessary for the state to move in and undertake some such development. At the present time I think it is beyond the capability of the localities. They can't stand up to the political pressure.

Another factor that is coloring our attitude is the present conservation-ecology enthusiasm among the people. In many cases this is purely based on improper information or knowledge. Nevertheless, it is a fact of life which makes any development difficult. This was demonstrated with the Gooley Dam situation. This probably means that construction of any impoundment will not be possible for a number of years. However, some years in the future we may have to proceed with water resources development as the greater good. There are about three good reservoir sites in Dutchess County for water supply impoundments. Some way to save this land for future use would be very desirable. When we say we have 385 MGD available in Dutchess County this only means that it is present. Trapping it, holding it, and delivering it is another matter. I prescribe to a great degree to what Commissioner Heissenbuttel has said but I do want to emphasize the need for a larger overview. Not just one county, not just southeastern New York, but the whole metropolitan area. Frankly, I don't envy your job.

Chairman Conway: Thank you very much Mr. Warthin.

> **Mr. Bell:** *Mr. Warthin, I think that all of us realized as soon as we got our appointments that there weren't going to be any easy answers. It seems to have become progressively more complex as we have gone from one county to another. The scope of the problem in each county is slightly different as are the possible alternatives and attitudes of local officials. In your presentation you made a strong pitch for a state overview or role in this situation. The NEWS Report of the Corps of Engineers has raised the issue of an interstate compact. Is this what you had in mind as a possible alternative?*

Mr. Warthin: I don't think there is any chance of achieving an interstate compact like that within the life of his Commission. Nevertheless, I hope you will keep in mind that New Jersey and Connecticut are

going to be fighting for water too.

Mr. Bell: *In other words, your initial recommendation is that the Commission should focus its primary attention on operation at least state-wide in focus or just covering the southeastern area.*

Mr. Warthin: Mainly covering the southeastern area since this is the power that you have under your act. But at the same time keep an eye on the marginal areas.

Chairman Conway: *There have been several basic proposals already made including the use of the Hudson as a source of 500 MGD with a major impoundment somewhere in the north country and a modification of that proposal, a flood skimming operation on the Hudson. If the flood skimming operation requires storage areas in the Dutchess-Ulster areas do you think it possible to develop such facilities in this county?*

Mr. Warthin: In Dutchess County any such offstream storage would be at least 120 feet above river elevation. This would be very expensive and we have limited possibilities. One possibility that has not been investigated sufficiently is to recharge groundwater with streamflow during periods of high streamflow. This would be relatively inexpensive and would insure maintenance of groundwater levels, and make use of subsurface water storage.

Mr. Heissenbuttel: Next I would like to call on Mr. William Bartles. He is a member of the Board of Representatives and is Chairman of the County Water Agency. Bill also represents the Hyde Park area. He is the former supervisor of the town of Hyde Park and is familiar with the proposed site for the Hyde Park regional development.

Mr. William Bartles, *Chairman County Water Agency, Hyde Park:* I agree with Scott Warthin on what he said and that the people in Dutchess County think that New York City should meter their water and stop their waste.

There is hardly anybody in Dutchess County who disagrees with the need for a central water supply with a county water district or part county water district. The major problem now is the economic plan. We are so loaded down with taxes that even though we need water badly, the need to survive is even more important. If we could find a decent way to fund such a project it would eliminate the political problem of trying to get something off the ground. When the proposal about tapping the Hudson at Hyde Park was first mentioned, I publicly came out in favor of it. I saw it as a means for getting a supply of water for Dutchess County with somebody else paying part of the cost, like New York City or the state of New York. There was a lot of local opposition to the proposal but I felt that there are so many people in New York City that they just can't be ignored and public need is what gets things done. So I came out in favor of a treatment plant, not just a pumping station, but a treatment plant pumping potable water down through the center of Dutchess County and making that water available to the communities on both sides of the aqueduct especially in southern Dutchess. Southern Dutchess County is the fastest growing area locally and has immediate water needs. Hyde Park itself would receive only limited benefits since it would be south of half the town. I still think it would be in the best interests of Dutchess County. I firmly support the regional idea of development of water resources as I see our salvation

along these lines. We need water and sewers. However, under the present system of taxation where property tax pays most of it, it is questionable whether it would ever go through in Dutchess County.

Mr. Wertz: *What do people pay on the average for water per year per dwelling?*

Mr. Heissenbuttel: On the average, annual costs in 1968 and 1969 to people on a central water system ranged from a low of $19.63 per year for the average single family dwelling to a high of $276.29. The low cost is where the capital cost has been charged as part of the cost of the house. If we average out all districts, costs would range between $90 and $106 per year and the privately owned systems would be about $70 per year.

Mr. Wertz: *What would be the real property tax in Dutchess County?*

Mr. Schoentag: I appointed a tax structure committee which has this type of information and we will furnish members of the Commission with its report.

I learned about a report of the Army Corps of Engineers for this area recently. Does the Commission have this report and is it available to us?

Chairman Conway: You are referring to the Northeast Water Supply Study or NEWS Study. It is in draft form and the Commission has a copy. The Congress authorized the Army Corps of Engineers to make a study of water supply for the northeastern area of the United States. The draft report identifies sources of supplies and has developed a set of technical alternatives for supplying more water. This draft report specifically ignores financial, political, and management aspects of the possible alternatives. This Commission must address itself not only to the technical side of this question but to the political, fiscal and management side also. We do not intend to repeat what has already been done, and the technical studies that have already been made, including the NEWS Study, have pretty much identified the technical or engineering alternative. The issues we face include the much more difficult question of how do you put any of these plans into operation, how do you fund them, and how do you operate them.

Mr. Schoentag: *The report isn't available yet. Is that correct?*

Chairman Conway: Not in its final form.

Mr. Hennigan: The report was put out as a draft for review purposes and the final document will probably be available within 4-6 weeks. The report will not make recommendations, rather it will present alternate possibilities. In addition to the engineering report, there will be a second report. This report will cover institutional arrangements, and financial issues. The preparation of this report was done under contract by the Institute of Public Administration in New York City. This latter report won't be available for six months to one year. Based on the past experience with Corps projects, implementation is anywhere from eight to ten years in the future. As a matter of fact, we are meeting with the NEWS group on a regular basis so that we can maintain close relations. We wish to maintain this close relationship so that all our work will be complimentary in working towards a solution.

Dr. Vernon B. Link, *Commissioner of Health, Dutchess County:* I assume from the name of the Commission that it is larger than the New York City-Westchester Study. I would hope that your responsibilities would extend even further because in my opinion the area involved here is practically the eastern half of New York State, not just New York City-Westchester County or even southeastern New York. I think that the final plan for supplying water to the New York metropolitan area would gather great support from New Yorkers in general, if the plan included the entire eastern half of the state of New York.

Mr. Harding: I would like to comment on that if I may. The reason that the original report was made for the New York City-Westchester area was due to the mid '60's drought. In 1965 New York City and Westchester County along with other municipalities had a severe water shortage. New York City applied to the state for funds for a water study but requirements were that such state funding would be available only if more than one municipality was involved. We did but this was merely for the purpose of getting state funding. The report actually did not cover just New York City and Westchester. It included as a practical matter many upstate counties in the service and source areas. The Commission's role is broad. It takes in southeastern New York, not just New York City, Westchester, and has no limits as far as the source area is concerned.

Chairman Conway: We fully realize that what we do affects many counties beyond the study area including the New Jersey and Connecticut areas.

Mr. Hennigan: I might add that the existing legislation differentiates between source and service area. The service area is defined as the city of New York and its eight suburban New York counties which include Nassau and Suffolk on Long Island and the six counties upriver from New York, namely, Rockland, Orange, Ulster, Putnam, Dutchess, and Westchester. The source area is not restricted at all. That is the present situation.

Mr. Heissenbuttel: I think the point that Dr. Link was making is that you have got to deal with the whole Hudson Basin. In order to do this properly some type of state agency involvement is required. I would like to point out some interesting statistics about the service area as defined in the legislation. We are talking about almost 70% of the total population of the state in those eight counties and the city of New York. But the water has got to come from other than the service area to a great extent.

I think Mr. Scoralick might like to comment.

Mr. Henry Scoralick, *Dutchess County Department of Health:* We have been discussing the potential source of water. There is an adequate source of water. It is available in the Hudson particularly if we have upland storage. However, that is of no help to New York City until it arrives in the city. It is the same problem we have in the county except that we are on a much smaller scale.

We have talked about groundwater resources in the county. In the Core area that Mr. Heissenbuttel referred to particularly in Fishkill and the town of Wappinger and Poughkeepsie, there are no adequate groundwater supplies. There is about 1,000 acres just above Beacon and attempts are being made to develop it for residential and industrial purposes. Some 35 wells have been drilled in the area and they produce on the average, 5-10 gallons per minute which is not sufficient for the need. In other words we have very limited groundwater resources in the county. Another point that I would like to stress and I

am sure the Commission is aware of is the tremendous increase in per capita usage of water. It has doubled in the last twenty years. This has upset our basis of design and has made private water supply systems inadequate in a short period of time.

Chairman Conway: That is a very important point and has been brought to our attention before. We not only have the growth in people and facilities but the actual absolute increase in water use for various purposes.

Mr. Warthin: As an example of the groundwater problem there is a proposed development in the town of Wappinger. The developer has drilled wells. The amount of water that he takes from those wells is four times the amount of recharge within the tributary area. It is not going to be very long before those wells go dry.

> **Mr. Hennigan:** *There is one question that I would like to raise. At almost every meeting the issue of small private water companies has been brought up. It was discussed in Suffolk, Ulster, and New York City, mainly from the point of view that these private companies presented difficult control problems in terms of service and rate setting. I would like to ask Dr. Link and Henry Scoralick their opinion. Do these small companies present real problems? Henry has already talked about people running out of water and the fact that the systems are frequently underdesigned. I would be interested in any comments they would have about these small subdivision water systems.*

Mr. Scoralick: Yes, we have the same problem that every other growing county in the state has. It has been our policy for a number of years that any large subdivision (75 or more lots) have a central water system installed. We have done this because of the difficulty in developing individual systems and the need to protect the public. This was further mandated by the fact that local governments have not been interested in forming municipal systems and this became our only alternative. Fortunately, the units of local government are beginning to become more concerned in attempting to provide needed services for developing areas. Many of these privately owned systems have run into serious problems. The developer loses interest when the property has been sold. Many are willing to give the systems away to relieve themselves of the responsibility. We have had many people call up and complain that water pressure has dropped, no water is available, water is rusty, and it is impossible to get the owner to make corrections. However, when the facility is municipally owned there is always an attempt to respond to legitimate complaints. Generally speaking the privately owned public systems have been unsatisfactory.

Mr. Heissenbuttel: As Henry pointed out the Health Department has been trying to pressure local government into providing needed utility services. However, it is a slow process and not too successful. We have been attempting to reach the same goal through the zoning process which relates land use to services available to service that land. We discourage commercial or industrial development in remote locations. We have been discouraging such development in areas where water and sewer facilities will not be available within a reasonable time in the future. Developments that need water and sewage facilities on a centralized basis should not be allowed to go to areas unless they can be served by central systems. Specifically if the development cannot be served by these systems in five years I think it should be prohibited.

Chairman Conway: *Doesn't that put you in somewhat of a bind though? You haven't got the facilities because of lack of tax base and you can never get the tax base since you can't get the development.*

Mr. Heissenbuttel: It does and it makes planning very difficult. We tend to get the image of being negative all the time. Our intentions are good but it is difficult to make people understand.

Mr. Pearce: I would like to point out that there are many areas that are so short of water that the city is now doing a big business on selling tankloads. Every milk hauler I know of is lining up at our hydrants today. Last week two men showed up using 5,000 gallon tank trucks and they are hauling water 24 hours a day to apartment developments and little systems that have run out of water. We sell the water for $1 a thousand gallons; they are reselling it for 1¢ a gallon. A man gets a 5,000 gallon tank load, pays us $5 and sells it for $50. They have built up a substantial business that indicates to me there is an awful lot of unsatisfactory small water systems in the county.

Mr. Scoralick: I suppose that much of that water, some 60% or more, probably goes for use in swimming pools.

Mr. Pearce: I don't think that it is mainly for swimming pools. I think if you look into it you will find out that a lot of small systems are not producing enough water to meet the needs.

Mr. Scoralick: There is a point that I would like to bring out. Mr. Heissenbuttel noted that there are 97 water systems in the county. Now these are what we call public water supplies serving mainly residential areas. This doesn't include individual systems serving factories, central schools, trailer parks, which add significantly to the number of systems in operation.

Mr. Wertz: *Is there any county plan for developing a water authority or water commission for consolidating these small water systems?*

Mr. Heissenbuttel: I have made reference to the unsuccessful attempt to form a county water district in 1961. The plan was to develop a county water system using the city of Poughkeepsie system as a basis. This act was unsuccessful for a number of reasons. A number of alternative schemes, all aimed at developing an area wide county system, were developed but for one reason or another never came to fruition, either due to a political conflict or poor financial analysis. The county water agency was created and an attempt to set up the county system. Most alternatives are less attractive than the original concept so sometime I would expect that the county will return to the original plan.

Mr. Wertz: *How about the towns or counties taking over the private water companies and making them all a municipal service?*

Mr. Heissenbuttel: Mr. Ed Schueler can address himself to that question particularly the role of town government. As you are probably aware the county operates under some tough limitations on what it can do involving any function, including water supply.

Mr. Schueler: One of the difficulties under the original plan was that without the city of Poughkeepsie the county would not have enough customers to make it pay. The city wouldn't join in and the proposal collapsed.

Mr. Wertz: It must be brutal to live in these towns on a private water system that is not meeting your needs. In my town if they didn't, the local supervisor would hear about it. The poor guys around here must be getting beat over the head.

Mr. Quartararo: Some of the towns have tried to alleviate the problem by requiring developers to put in water and sewer systems. This has been done on a unilateral basis but they are not part of a big system. Eventually it becomes self-defeating since the systems are under no effective regulatory control either locally or by the state.

Mr. Rolison: The town of Poughkeepsie has made tremendous strides in this direction. Ed Schueler will point some of the things out and he can take pride in the fact that the town has shown the leadership and responsibility that it has.

Mr. Edward C. Schueler, *Supervisor, Town of Poughkeepsie:* My first recommendation to you is to outlaw private water companies simply because, from my personal experience they seem only to exploit the public from the view point of the prices they charge and the low level of service given. I really don't care how the system operates, they cause problems to the town and inconvenience to the public. A privately owned water company is an outrage.

Chairman Conway: *What would you do as an alternative?*

Mr. Schueler: Well I can't speak of what every town in Dutchess County can do, but I can tell you what we have done. You are looking at a fellow who is operating 38 separate water districts. We developed a town-wide transmission system, a system that cost $8.4 million. This has been a huge success. Within ten days or two weeks we intend to throw the switch which will provide water on a large scale basis for all the town of Poughkeepsie.

Thirty-eight water districts have been consolidated into a single system even though they may be fiscally separate. We are buying water from the city of Poughkeepsie on a de-escalating scale. It is beneficial to the city since it guarantees them half a million dollars in revenue a year that they might otherwise not enjoy. The town could have built its own plant and intake. The city saw that and entered into an agreement with the town. This allowed us to focus our capital expenditures on the transmission system to bring water to remote areas.

In our agreement we have a clause that the city and town must and I emphasize *must,* sell water to a third party if they want to buy it. This allows for continual extension of service, and was a substitute for the county plan. It takes the load off the county. However, I believe it really is a county responsibility, but the county water district failed and our approach was the only alternative. Towns bordering on our town have already made overtures to us for the purchase of our water. This is most of the Core area that Mr. Heissenbuttel has referred to. *Dutchess County should be able to provide all its water needs for the next fifty years, if it could overcome political and financial problems.* As far as the Hyde Park regional

proposal is concerned, I frankly don't have a hard or soft opinion on this except to note that Dutchess County should be allowed to tap on to any aqueduct along the way. This is a must if local approval is expected.

Chairman Conway: *Now that you have built your transmission lines are you still utilizing these small systems that were consolidated, or did you just abandon them?*

Mr. Schueler: The systems are being utilized but they are all interconnected under a single administrative head with a single source of water.

Chairman Conway: *How about well supplies?*

Mr. Schueler: That is a good point. There are seven or eight groundwater supplies and they are unsatisfactory. They fail mechanically, electrically, and in yield. Well supplies have been totally unsatisfactory in the town of Poughkeepsie. In the drought we had very difficult problems with wells going dry and becoming polluted. The old home well is the horse and buggy days in this town. We take water from the river, purify it, and distribute it, and it can be done inexpensively. Water doesn't cost much as a matter of fact. Mr. Pearce can produce water for 2¢ a hundred cubic feet and sell it to the town for 37¢. That does not include capital investment, only operating cost. Presently in the town we are charging 70¢ per hundred cubic feet of water. On January 1 when the whole system is in operation we will sell water for 50¢ per hundred cubic feet. This will produce sufficient revenue to retire part of the bond issue, to maintain and operate the system, and to put away something for future exchange and capital reserve. It is a money making proposition. We are not interested in making money but only in staying in the black.

Mr. Wertz: *Ed, is the rate the same for everybody in the county?*

Mr. Schueler: Yes.

Mr. Wertz: *So that in other words you made one municipal district out of all the little districts?*

Mr. Schueler: Right. We have a town-wide improvement area. One district with 36 subsidiary districts. They all pay the same price.

Mr. Bell: *Could you absorb private companies in this program?*

Mr. Schueler: We bought one company out. They were selling water to the public for $1.40 per hundred cubic feet. We acquired the company for $38,000 and immediately reduced the price to 50¢ per hundred cubic feet. They get the same water and far better service.

Mr. Bell: *So in your town wide improvement district you don't have any private water companies functioning?*

Mr. Schueler: None right now.

Mr. Gilman: *Mr. Schueler, do you have any outlying areas where it might be difficult to supply a new community or subdivision?*

Mr. Schueler: Not really. We are now negotiating with the town of LaGrange to sell them water. There is one point I would like to bring up and that is that there is no state aid for water. There is for sewers because of two reasons: (1) they are so darned expensive and (2) people want water before they worry about sewers. I think the two things need to be done on the same level. Try to find some money for state aid for water districts and there isn't a penny except for planning. We are trying to implement water and sewer districts to the public and we need help.

Mr. Gilman: *You mentioned state aid for the water district. Isn't the bonding supposed to be comprehensive and include the cost of capitalization of the water district?*

Mr. Schueler: Yes. But that is raised by benefit assessment from local taxes. There is no state aid as there is for sewers. Under present arrangements the local costs would be 40% for sewers and treatment and 100% for water.

Chairman Conway: One of the reasons for this that I would mention is that water is a revenue producing activity. Sewers may be but have not been historically.

Mr. Pearce: I would like to mention one problem that Ed probably doesn't know about. The town bought a private water company that was charging $1.40 per hundred cubic feet and he reduced the price to 50¢. In going over our books I discovered that the Coral Water Company pays for three times the amount of water it sells, which is an indication of the condition of their mains and the leakage.

Mr. Schueler: He is telling you that we have lots of pirates in the town of Poughkeepsie.

Mr. Pearce: We charge for sewer service on the basis of 50% of the water bill. In other words if you are paying $10 a quarter for water, you are charged $5 a quarter for sewer service.

Chairman Conway: *How does anybody hook onto a water system without being metered?*

Mr. Schueler: At midnight. This goes back many years when people here were encouraged by town officials to tap out onto the line out in the stream. This came about because it was city water and there was bitter rivalry between the city and the town of Poughkeepsie. Today we are real lovers but in those days they were bitter enemies.

Mr. Bell: *How much of you system is metered?*

Mr. Schueler: All of it, except for the Coral Water Company. It must have a lot of unmetered taps.

Mr. Bell: *What percentage does that represent of your total system?*

Mr. Schueler: The very minor part, 125 families I think. This compares sith a total system population of 40,000 people. Our projections are that by 1985 we will be using about 8-10 MGD. We are presently using 2½ MGD.

Chairman Conway: *Are you the only town in Dutchess County that has a town-wide system?*

Mr. Schueler: Yes, I think we are. My suggestion to your Commission is that the county be asked to address itself to the complete take over of city and town facilities. I think it should be a part county water district. We now have the nucleus. We have the users that didn't exist when the project was first turned out. Now we have got the users, we have got the lines in the ground. It is just a matter for the counties to make proper financial arrangements with the city and town of Poughkeepsie.

Mr. Quartararo: *Ed, the metered rate doesn't pay the entire cost of the bond issue, does it?*

Mr. Schueler: No, it helps but you still need a benefit assessment. Ours will average $125 per year for a single family dwelling.

Mr. Quartararo: *So actually it isn't too much different than sewers. In other words the annual charge for water doesn't cover all of the debt service.*

Mr. Schueler: That is right. We still need a benefit assessment.

Mr. Heissenbuttel: *You are talking about a total cost of about $100 per year. Just for distribution?*

Mr. Schueler: The total cost includes water cost, distribution line and transmission line. The transmission line is $21, water cost $40-$50, and local distribution $100. For total cost it is $160-170/annually.

Mr. Heissenbuttel: When we advanced the idea of a part county sewer district the reason it was shelved was because costs would be in the areas of $200-$250 per year. So really we have two closely related problems, water and sewer. The cost is somewhat similar which would mean a charge of $400-$500 per annum for an average single family dwelling.

Ken Pearce the city engineer for the city of Poughkeepsie could probably add to our enlightenment. Ken, do you have anything you would like to say?

Mr. Kenneth Pearce, *City Engineer, City of Poughkeepsie:* I would say if you want to undertake county operation you have got to get the support of the people concerned. The people in the city of Poughkeepsie at this point in time would never agree to sell their water plant or water system. We have been through this battle two or three times. At one hearing a man talked against it for five solid hours. You are not going to get the city of Poughkeepsie to sell its water plant as long as we make $200,000 a year profit, which is $3 on the average tax bill. If we sold the plant and system we would have to raise our tax rate at least $3 a thousand.

Mr. Schueler: *Would you consider selling water to the county?*

Mr. Pearce: We tried to make a deal with the county unsuccessfully but finally made a deal with the town of Poughkeepsie. We calculated the cost to produce the water that we are producing today, and calculated what it would cost to produce additional water. The cost to produce water used by the city is 20¢ per hundred cubic feet. To produce additional water we wouldn't need any more people. There is no capital cost, all we need is some additional chemicals and some more power. We can produce surplus water for 2.73¢ a hundred cubic feet. We are then selling the surplus water to the town of Poughkeepsie for 4.66¢ per hundred cubic feet. This represents a substantial profit on the surplus water. For the first two million gallons that the town uses they are paying some $3,000+. This is approximately 12¢ per hundred cubic feet. After that they buy water at the surplus rate which is the extra which we can produce. This has been beneficial both to the city and the town.

The town has done something in designing their transmission system which is very progressive. Instead of putting in a transmission main only large enough to serve their area, they have installed a 36" main from our plant to their town line. This was done in order to provide transmission capability to towns bordering on the town of Poughkeepsie. Furthermore, we have an agreement that we will sell water to the town of LaGrange for not less than 40¢ per hundred cubic feet of which the city gets 20¢ and the town gets 20¢ to pay in part for the town investment in the oversized water mains. It has been a very good proposition for everybody. Our plant has a hydraulic capacity of 32 MGD. We are now processing 12 MGD and plan to go to 16 MGD as soon as the state approves. This means with a hydraulic capacity of 32 million gallons we can expand our plant for a relatively modest capital investment in order to take care of other communities. The city first went to the Hudson in 1867 so we have a pretty good idea of what we are doing.

It has been pointed out that there could be a serious saltwater problem in the river. However, the only time that we have noticed it at all was during the combination of low flows and a severe hurricane or tidal wave condition. It is the only time when the salt content goes up above 250 parts per million. We have not been too concerned about this issue since when salt content went up on the flood tide we shut the plant down until ebb tide and the salt would go down river.

Mr. Hennigan: *Is that what you did during the drought?*

Mr. Pearce: We didn't have to, we had no trouble during the drought. The salt flow never bothered us. We figure that we put back through our sewer plant more water than we are using. We are adding water to it.

Mr. Hennigan: *Is the volume that goes out of the sewage plant compare pretty much with the water you are pumping out of the river?*

Mr. Pearce: We are putting back more than 4 million gallons a day through the system and are using only 2½ million gallons. We have serious infiltration of the sewers and the combined systems which accounts for this.

Mr. Hennigan: *Is the city water system completely metered?*

Mr. Pearce: The city system is completely metered. However, we do have a peculiar situation that I would like to bring to your attention and that is that we only account for 58% of the water that we put into the system.

Mr. Hennigan: *Do you mean that your meters only register 58% of the water that is pumped into the system?*

Mr. Pearce: Yes, we have 42% unaccounted for water. We have had the pitometer people in to check the system out at various times and after a lot of investigations we still have 42% unaccounted for.

Mr. Hennigan: *Can you explain this?*

Mr. Pearce: No.

CONCLUSION

Chairman Conway: I would like to express the deep appreciation of the Commission for the presentations made today. It continues a high level of discussion and information that has taken place in our other meetings and certainly was a great benefit to the Commission and the Commissioners. After lunch, arrangements have been made for field visits to the Poughkeepsie Water Treatment Plant, the New York City Chelsea Pumping Station, to the Hyde Park Proposed Regional Plant Site and to the Poughkeepsie Transmission System. Again, many thanks to all for your cooperation and assistance.

After luncheon the afternoon field visits were made, terminating at 5:00 p.m.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
H. Clark Bell, *Vice Chairman*
Herman Forster
Benjamin A. Gilman
James C. Harding
Jess J. Present
Anthony M. Quartararo
Jay P. Rolison, Jr.
John J. Santucci
William J. Schickler
Robert C. Wertz

Staff

Robert D. Hennigan, *Executive Director*
David A. Duffy, *Administrative Assistant*
Richard F. Estes, Jr., *Director, Management Studies & Analysis*
Paul W. Merkens, *Director, Technical Studies & Analysis*
Irene Baker, *Public Relations*
Harold Breon, *Water Resources Engineer*
Karen McCarthy, *Secretary*

DUTCHESS COUNTY

County

Honorable David C. Schoentag, *County Executive, Dutchess County*
Robert Englehart, *Intern to the County Executive*
Henry H.J. Heissenbuttel, *Commissioner of Planning, Dutchess County*
Vernon B. Link, *M.D., Commissioner of Health, Dutchess County*

William H. Bartles, *Chairman, Dutchess County Water Agency, Hyde Park*
Pat Davis, *Dutchess County Planning Department*
Martin Gold, *Dutchess County Planning Department*
Caroline F. Raymond, *Dutchess County Planning Department*
Allen Schwarte, *Dutchess County Planning Department*
Jeffrey Toeny, *Dutchess County Planning Department*
Henry W. Scoralick, *Dutchess County Department of Health*
A. Scott Warthin, Jr., *Dutchess County Water Conservation Committee*

City and Town

J. Roger Golden, *Supervisor, Town of Hyde Park*
Edward C. Schueler, *Supervisor, Town of Poughkeepsie*
Kenneth E. Pearce, *City Engineer, City of Poughkeepsie*

New York City

Vincent G. Terenzio, *Chief Engineer, New York Board of Water Supply*
Arthur Leiper, *Division Engineer, New York Board of Water Supply*

Other

Ronald Lukas, *New York State Public Service Commission*
Albert A. Natoli, *New York State Public Service Commission*
R. Watson Pomeroy, *Retired, formerly New York State Senator from Dutchess County*
George Bernstein, *Poughkeepsie Journal*
Kenneth Bloome, *Beacon Evening News*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

DUTCHESS COUNTY MEETING

Date: July 7, 1971

Time: 9:30-12:30 – Conference and discussion
1:30- – Facilities inspection

Place: Camelot Inn, Route 9, Poughkeepsie, New York

Tentative Program

9:30 OPENING REMARKS

Mr. E. Virgil Conway, Chairman
Honorable David C. Schoentag, County Executive, Dutchess County
Mr. R.D. Hennigan, Executive Director

9:45 PEOPLE, LAND, WATER

Summary presentation re the growth and development of Dutchess County, the existence of central water service, and the future needs for water resource development by representatives of the Dutchess County Department of Planning.

Henry Heissenbuttel
Commissioner of Planning, Dutchess County

10:30 COFFEE BREAK

10:45 PEOPLE, LAND, WATER (cont'd)

Presentation of additional information re population growth and distribution, physiography and land use, local water resources, central water supply facilities, proposed water systems, and future service needs by other representatives of County and Local Government.

Mr. A. Scott Warthin
Water Conservation Committee

Mr. William Bartles, Chairman
Board of Reps Water Agency

11:15 ISSUES, PROBLEMS, NEEDS

Discussion of local concerns, views, recommendations re lack of water metering by New York City, pre-emption of Hudson River resource for Downstate use, maintenance of River's salt front, creation of a regional water supply system, use of Hudson Basin supply by New Jersey and Connecticut, establishment of a treatment plant along the Hudson in Hyde Park, intergovernmental responsibilities for meeting future demands, etc., by representatives from Dutchess County.

Kenneth E. Pearce, City Engineer
City of Poughkeepsie

Edward C. Schueler, Supervisor
Town of Poughkeepsie

Louis D. Diehl, Supervisor
Town of Wappinger

12:30 LUNCHEON

1:30 FIELD TRIP

Visitation of following local water works by all who are interested:

City of Poughkeepsie Water Treatment Plant
Hyde Park Site for Proposed NYC Plant
Poughkeepsie Transmission System
New York City's Chelsea Pumping Station

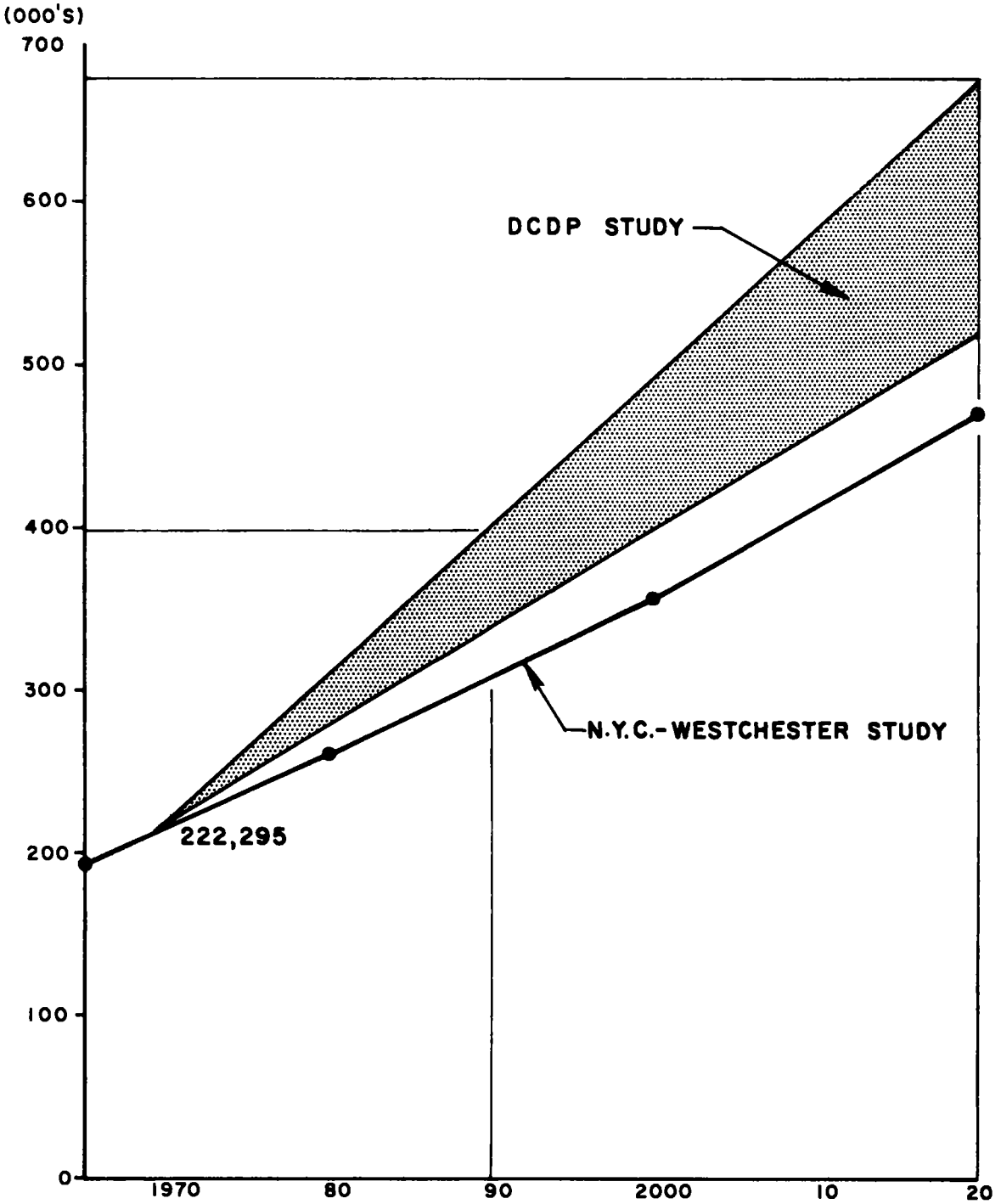
APPENDIX C

FIGURES

Figure 1 . . . . . Future Population
Figure 2 . . . . . Future Water Demands
Figure 3 . . . . . Population Distribution
Figure 4 . . . . . Drainage Basins
Figure 5 . . . . . Ground Water Occurrences
Figure 6 . . . . . Generalized Land Use
Figure 7 . . . . . Central Water Systems
Figure 8 . . . . . Programmed Water Systems
Figure 9 . . . . . Proposed Water Systems

FIGURE 1

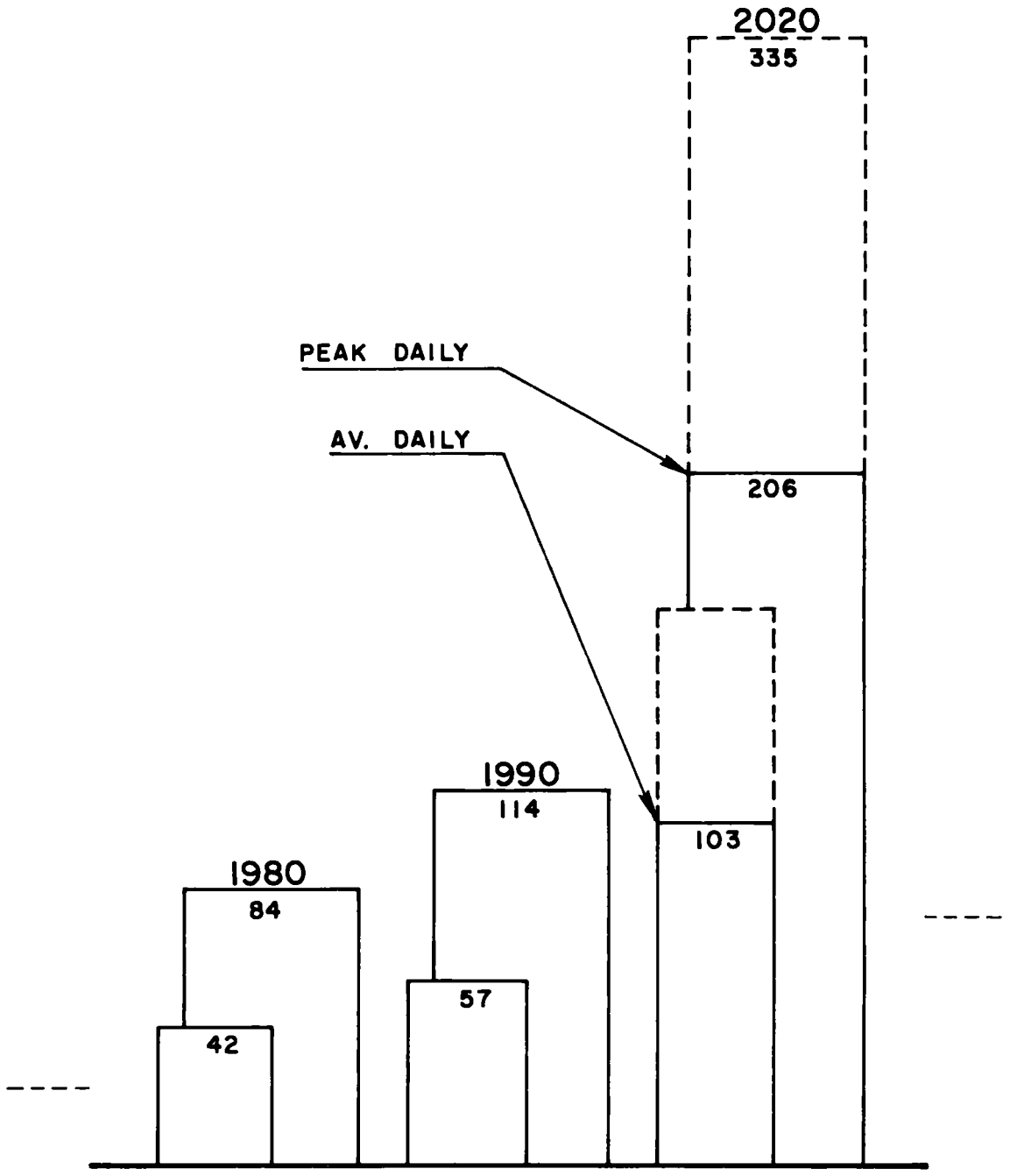
FUTURE POPULATION



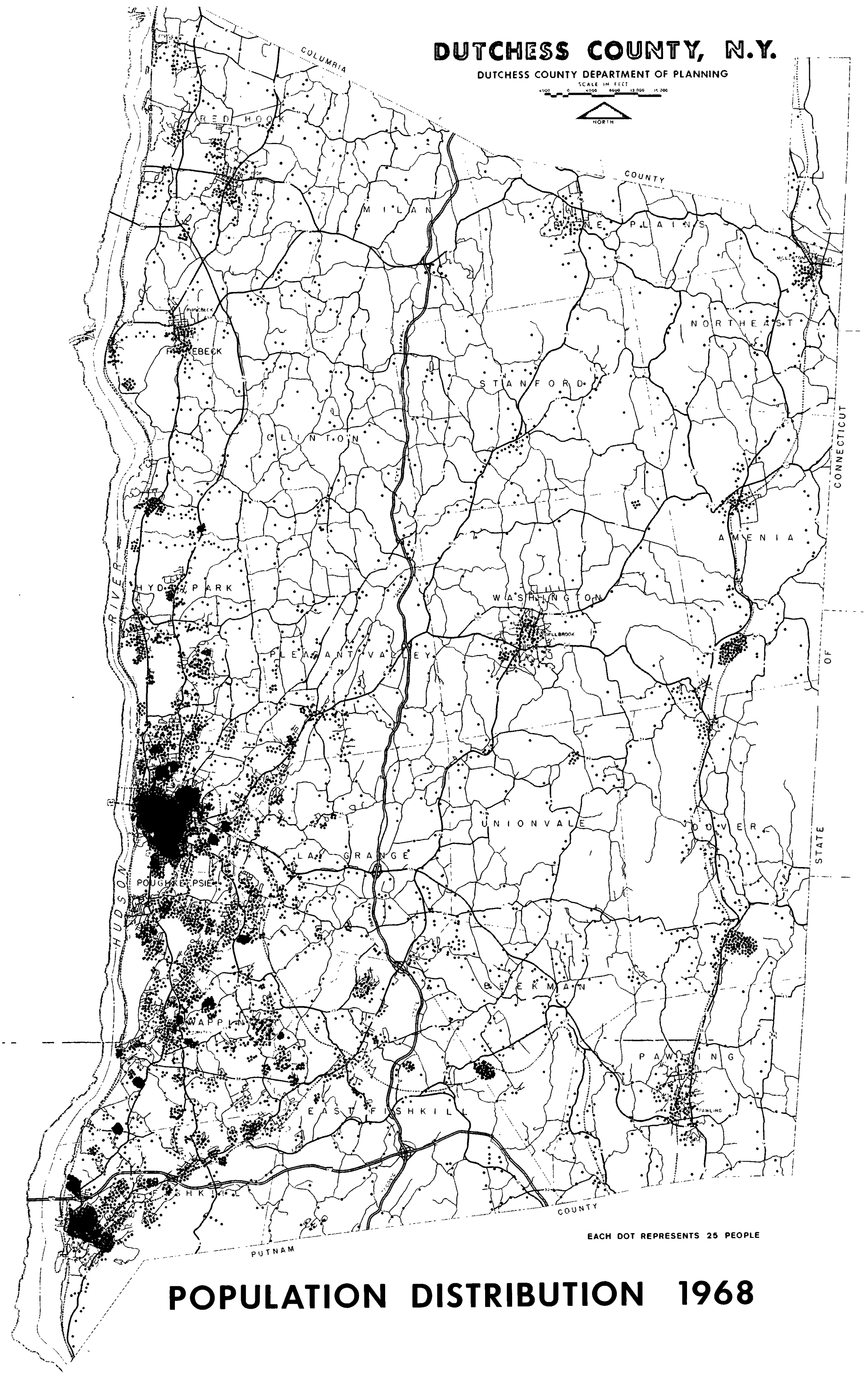
DUTCHESS COUNTY, NEW YORK

FIGURE 2

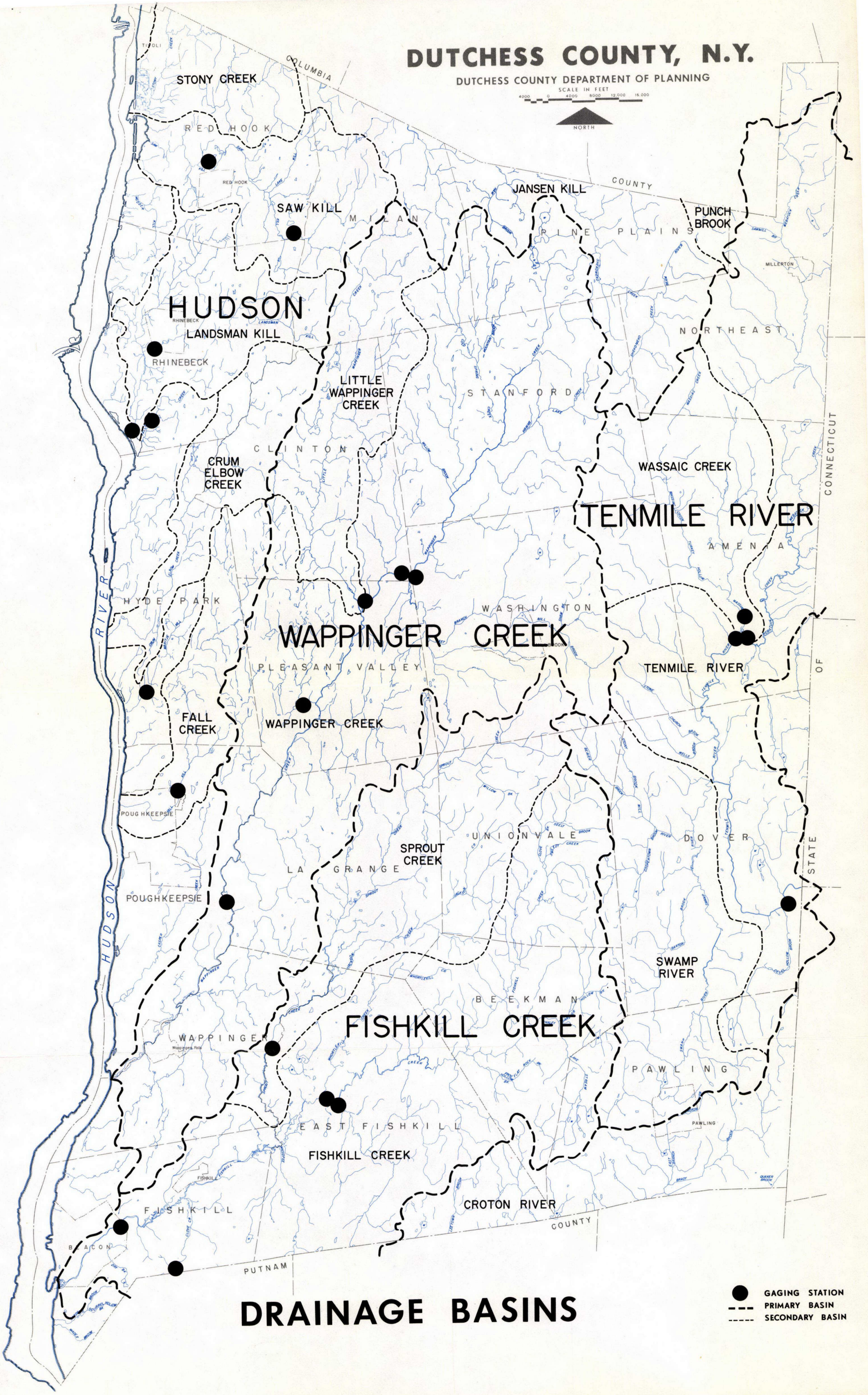
FUTURE WATER DEMANDS



DUTCHESS COUNTY, NEW YORK

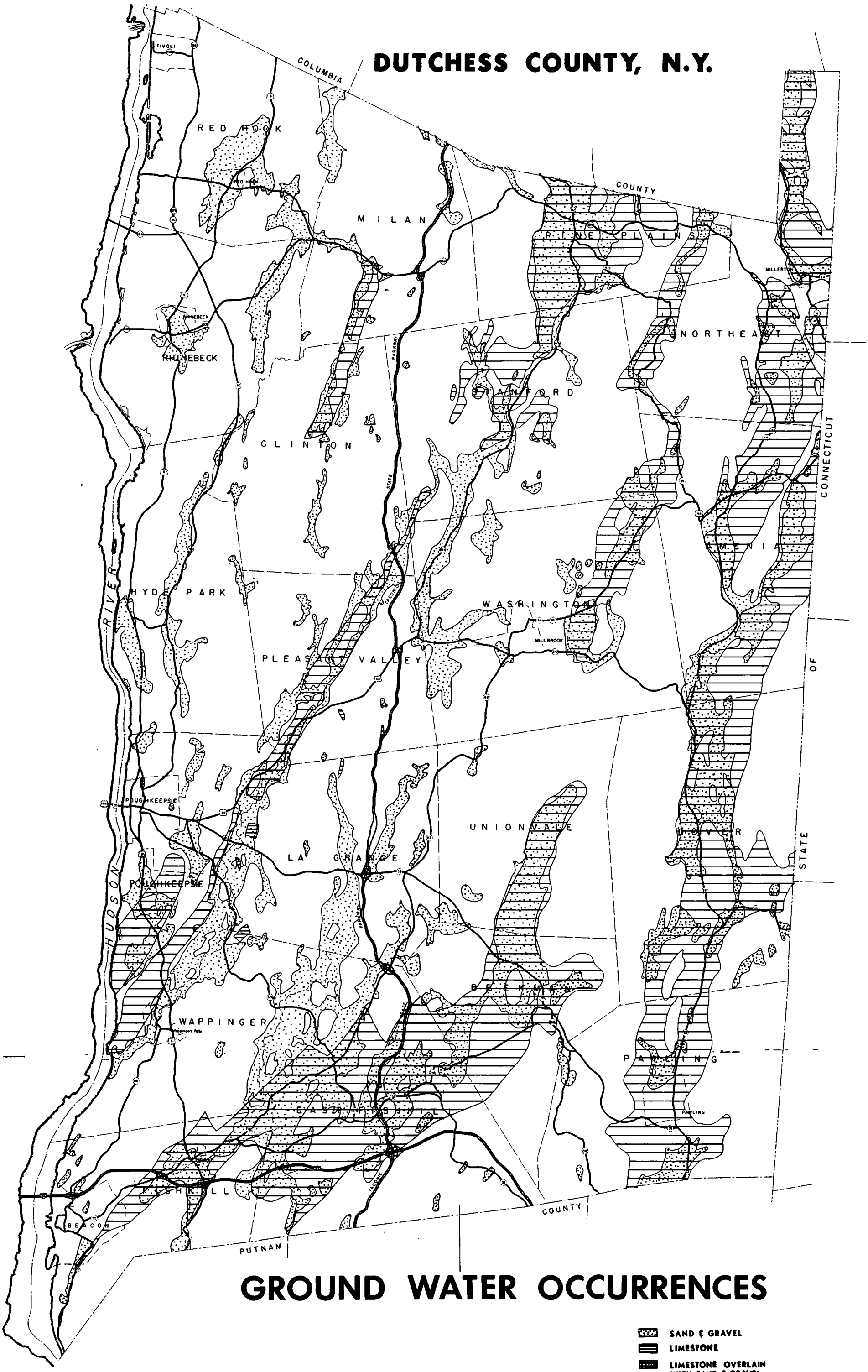


POPULATION DISTRIBUTION 1968



DRAINAGE BASINS

DUTCHESS COUNTY, N.Y.

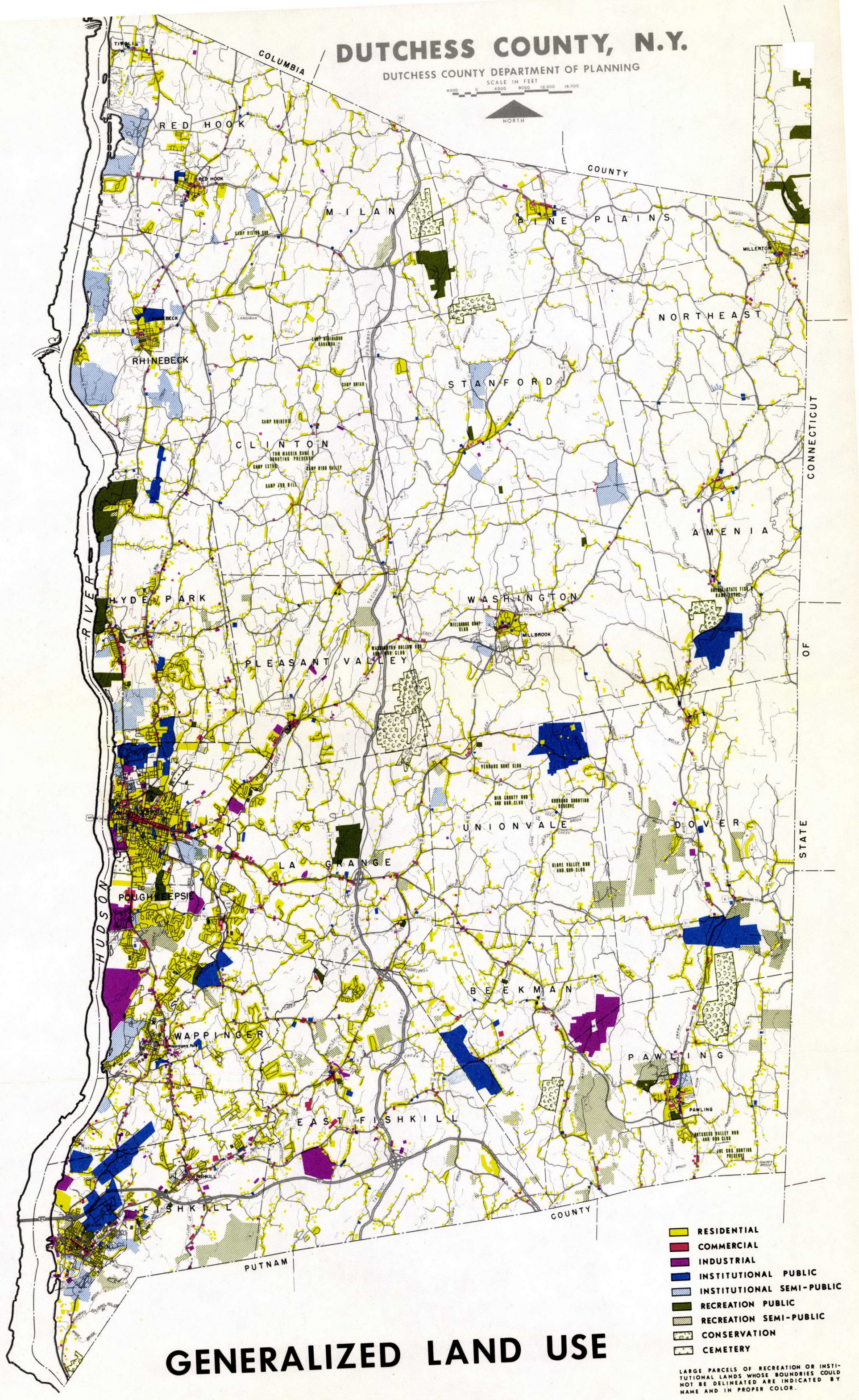


GROUND WATER OCCURRENCES

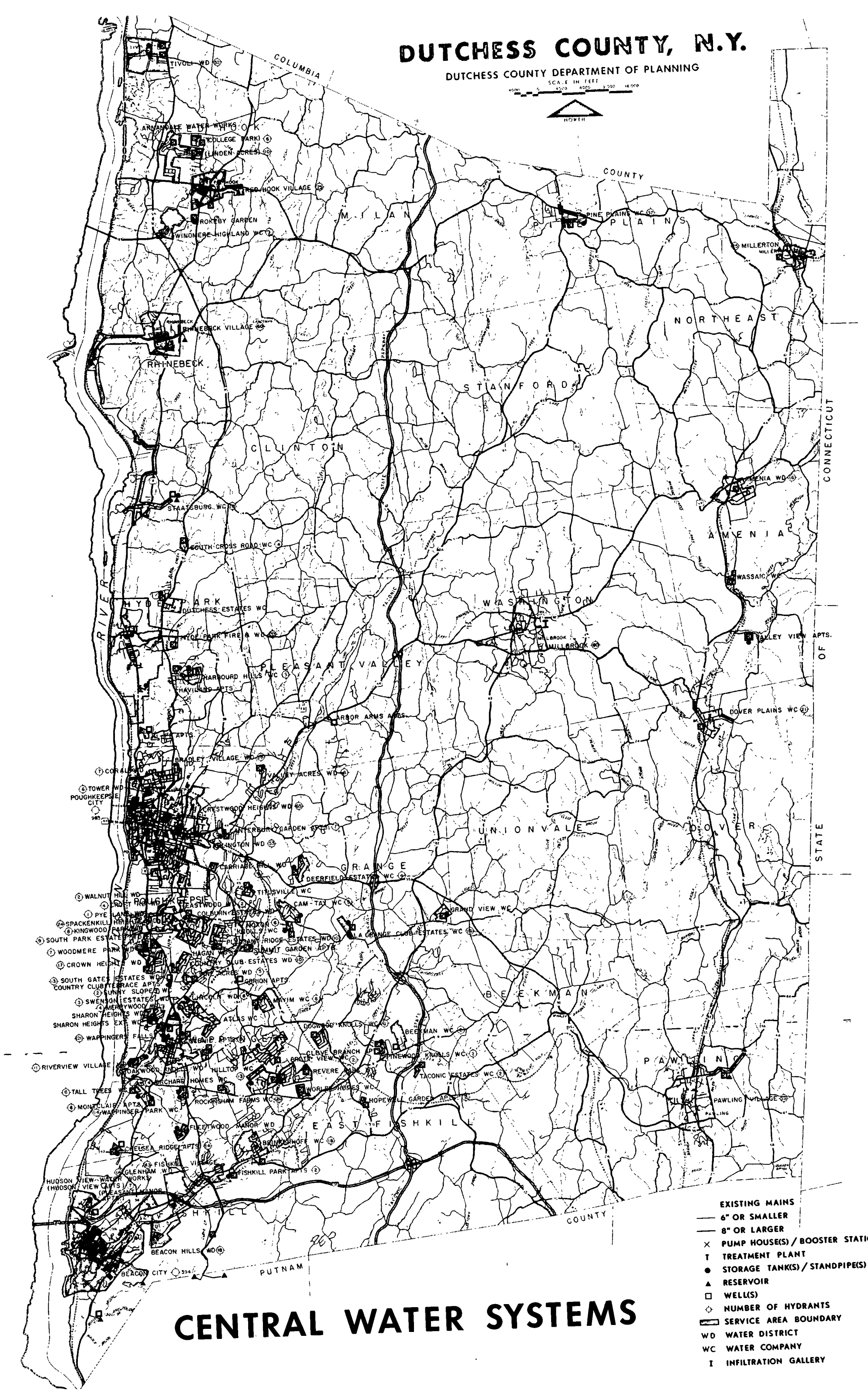
SAND & GRAVEL

LIMESTONE

LIMESTONE OVERLAIN WITH SAND & GRAVEL



GENERALIZED LAND USE



CENTRAL WATER SYSTEMS

DUTCHESS COUNTY, N.Y.

DUTCHESS COUNTY DEPARTMENT OF PLANNING

SCALE IN FEET

NORTH

COLUMBIA COUNTY

CONNECTICUT STATE

PUTNAM COUNTY

HUDSON RIVER

RED HOOK

MILAN

PINE PLAINS

NORTHEAST

STANFORD

CLINTON

AMENIA

WASHINGTON

HYDE PARK

PLEASANT VALLEY

UNIONVALE

DOVER

LA GRANGE

POUGHKEEPSIE

BEEKMAN

PAWLING

WAPPINGERS

EAST FISHKILL

FISHKILL

TIVOLI

REDHOOK

WINDMERE HIGHLAND WC

SPORTS CITY WC

MILLERTON

RHINEBECK

AMENIA WD

MILLBROOK

GREENFIELDS WC

POUGHKEEPSIE WATER TRANSMISSION DISTRICT

RIVERSIDE EAST APTS

GRAND VIEW WC

LA GRANGE CLUB ESTATES WC

SUTTON PARK WD

DOVER RIDGE WC

MAYIM WC

MERRYWOOD

BEEKMAN WC

ORCHARD ROMES WC

ROCKINGHAM FARMS WC

CHELSEA RIDGE APTS

BRINKERHOFF WC

HUDSON VIEW WATER WORKS

PAWLING

BEACON

PROGRAMMED MAINS

6" OR SMALLER

8" OR LARGER

× PUMP HOUSE(S) / BOOSTER STATIO

● STORAGE TANK(S) / STANDPIPE(S)

▲ RESERVOIR

□ WELL(S)

SERVICE AREA BOUNDARY

WD WATER DISTRICT

WC WATER COMPANY

EXISTING

▲ RESERVOIR

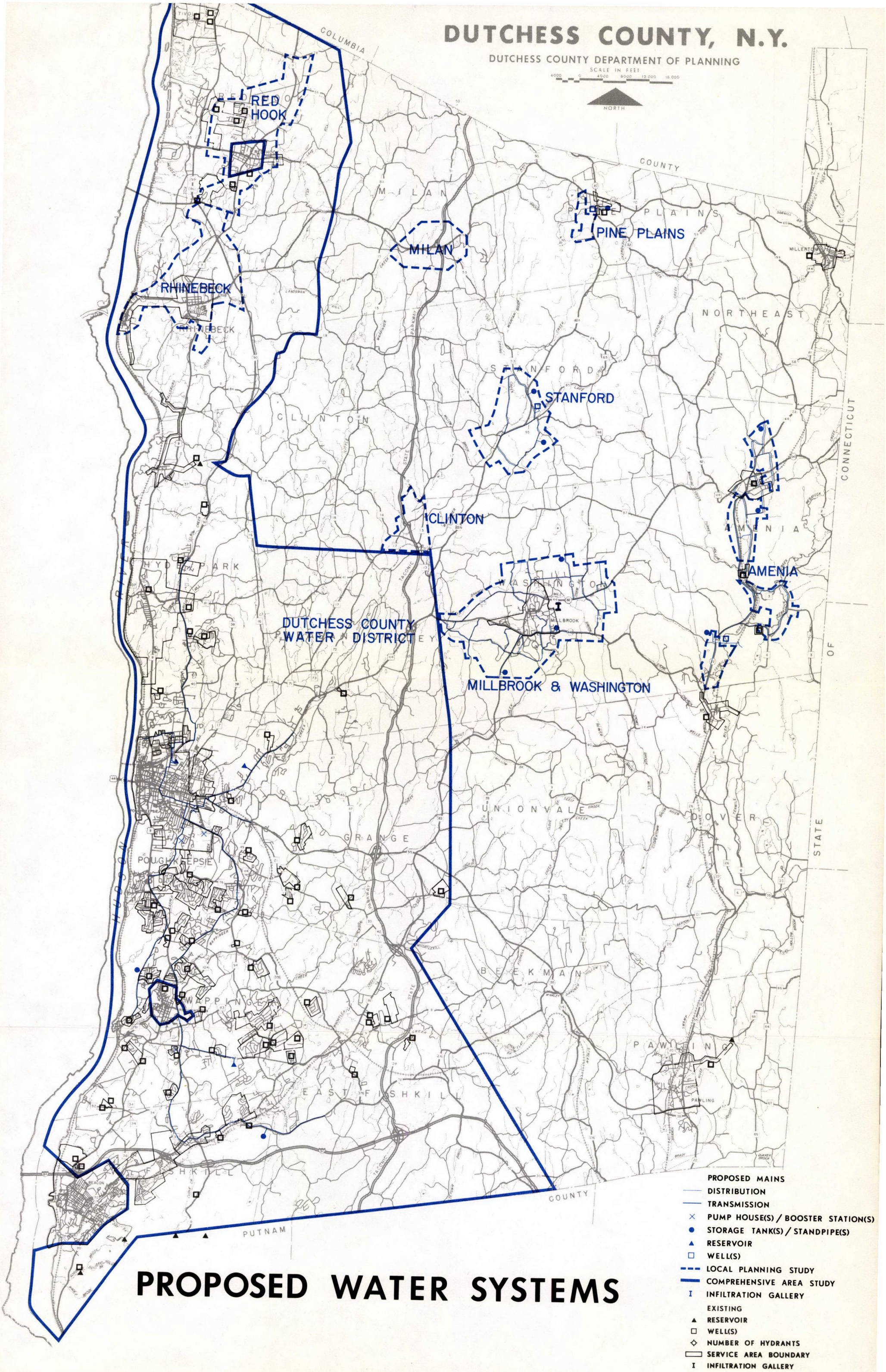
□ WELL(S)

◇ NUMBER OF HYDRANTS

SERVICE AREA BOUNDARY

I INFILTRATION GALLERY

PROGRAMMED WATER SYSTEMS



PROPOSED WATER SYSTEMS

NASSAU COUNTY

January 18, 1972

Mineola, New York

NASSAU COUNTY CONFERENCE

OPENING REMARKS

Mr. Jim Gillen, *Moderator*: We welcome the Temporary State Commission on the Water Supply Needs of Southeastern New York. My name is Jim Gillen, and I am the Deputy Commissioner of Public Works in Charge of the Division of Sanitation and Water Supply. The Division of Sanitation has many assignments including studies, reports, design, construction, operation and maintenance of the major wastewater collection, treatment, and disposal facilities in Nassau County. Another important assignment is the undertaking of the comprehensive studies of water supply, leading to comprehensive management plans. So the Department of Public Works is delighted to be your host today. I will be your moderator of a program I think you will find very interesting and informative.

After lunch we have arranged for a field trip. Mr. Francis J. Flood will be in charge of the field trip and we have some very interesting things to show you.

Without further ado, I would like to introduce our first three speakers. Mr. E. Virgil Conway, Chairman of the Southeast Water Supply Commission, will speak first and offer some opening remarks. Following Mr. Conway, we will hear from Joseph Driscoll, who is the Deputy County Executive. Following Mr. Driscoll, we will hear from my boss, Commissioner of Public Works, John H. Peters. So, I will turn this podium over to Mr. E. Virgil Conway.

Mr. E. Virgil Conway, *Chairman, Temporary State Commission on the Water Supply Needs of Southeastern New York:* I'd like to welcome all of you to this meeting of the Temporary State Commission on the Water Supply Needs of Southeastern New York State. Those of you who are intimately acquainted with water will know the serious problems that confront us.

This is the last of a series of meetings the Commission has held with County officials within the study area. We felt it was very important to go into the jurisdictions in our study area and meet with the local officials; finding out first hand what their view of the local situation is with respect to water. Not only does this serve to educate the Commission as to your situation; but it also provides an important interface and opportunity to meet you, because this is not the end of our relationship as far as the study goes. We hope we will have your continued cooperation in providing the information that this Commission needs to complete its work.

I would like to express our deep appreciation on behalf of the Commission to Jim Gillen and Frank Flood who did such a tremendous job in organizing this meeting. I think it's only with this kind of cooperation that we are able to have these meetings in a local jurisdiction.

The meeting is not a public hearing. On the other hand, it is by no means a closed meeting. If any members of the press are here, they are more than welcome. We view these as informative and educational sessions.

Mr. Gillen: Thank you, Mr. Conway. Mr. Driscoll, may we hear from you.

Mr. Driscoll: Thank you very much and on behalf of the County Executive, I'd like to welcome all of you distinguished people to Nassau County.

We appreciate your interest in our problem. It is certainly a regional matter and one which needs the direction, guidance, and help of all who are involved, both in government and in all the various disciplines that can be brought to bear to solve the problem. We hope that in your meeting here that you will find some real positive approaches. I think you'll enjoy the field trip that has been set up and we hope in turn that we will be able to get some needed and valued direction from the experts.

Mr. Gillen: Thank you Mr. Driscoll. May we hear from Commissioner Peters?

Commissioner Peters: The Department of Public Works is the agency charged by the County Executive's Office to become actively involved in both the development of sewage facilities and the water supply field. This is an area that has been of grave concern to us.

As you well know, in order to protect the quality of the water we must construct and operate sewage facilities. At the same time, since we have only groundwater as a source of supply, this diminishes what you might say would be the natural recycling which has occurred to date; due to cesspools and septic tanks. So it's a case where you wind up damned if you do and damned if you don't. It is a problem. We have had a terrific increase in population and we are now trying to meet the challenge, which we see in the rather near future, being sure that all of the residents of the County will have a sufficient supply of potable water now and for the generations to come.

I certainly will be glad to cooperate with you in whatever extent we can. We also look for additional guidance from the State level since we know the powers of the State over the subordinate municipalities.

Mr. Gillen: Thank you. Now we will begin to get into the nitty-gritty of the tremendous water supply problem. You will hear some of the suggested recommendations as to how the problem can be solved. Leading off is perhaps the item or factor that is the root of all evil, and that's population. To touch on this, land use, and other similar factors in Nassau County, we have called upon Mr. John W. Follis, Jr., who is the Deputy Director of Planning.

PRESENTATION

Mr. Follis, *Deputy Director of Planning, Nassau County:* Land use, the economy, population, water supply and sewer programs are all closely interlocked. If Nassau County's growth remained stable, it is likely that the demand for water would increase. This is based on the fact that consumption in 1940 averaged 90 gallons per day per capita, while in 1968 it had increased to 122 gallons per capita per day. In Nassau, the use of water varies from 76 gallons per capita per day in the South Farmingdale Area to 292 gallons in Old Westbury.

Obviously Nassau is not going to remain stable and growth will occur. What will this growth be, in both type and magnitude; and where will it be located? Studies prepared during the last five years point out where Nassau has been and have indicated the likely course for the future. The key to the future of Nassau rests in its land availability or the lack of it.

In 1966, as a part of its studies, the Nassau Suffolk Regional Planning Board reported that a total of 15,281 acres, or seven per cent of Nassau's land was vacant. A great deal of this was in the Town of Oyster Bay (7,755 acres) and one third of the total vacant land was in 13 municipalities along the North Shore.

During the past five years, land has continued to be absorbed at a slower rate than in the 50's and 60's. During this period, about 2,700 acres or seventeen per cent of the land that was declared vacant in 1965 was developed. This land was utilized predominantly for non-residential purposes: 535 acres commercially, 630 acres industrially, 330 acres for public use and 1,201 acres for housing (72 acres of this for multi-family units). 1560 acres of this development occurred in Oyster Bay, reducing its supply of land by twenty per cent and the County's by ten per cent. North Hempstead lost 431 acres to development and Hempstead 705. The seven per cent vacancy of 1966 has been reduced to 6.2 per cent.

There is a quantity of land currently classified as utilized, sufficiently old, or deteriorated to be considered for redevelopment. This includes golf courses, driving ranges, nurseries, amusement parks, drive-in movies, seminaries, camps, sand pits, and urban renewal areas. These areas total 21,000 acres. This, when added to the 12,585 remaining vacant areas totals about 33,500 acres of 16.7 per cent of the land area of Nassau. In this, private clubs also represent over 8,000 acres and reusable sand pits another 1,100. On a town basis, Oyster Bay still leads with just less than 19,000 acres. Hempstead has 7,000 acres and North Hempstead has 5,600.

Redevelopment normally results in intensification of land use—a single family house is rarely replaced by another single family home. We have private clubs predominately in the Oyster Bay area. These are mostly golf clubs, tennis clubs and the like. We have a limited number down in the Town of Hempstead, some down in the five towns area, and really only one over in the southeastern quarter. We also have some areas of land for industry. We have the Grummand tract, the Sperry tract and the sand pits in Port Washington, which are potentially redevelopable sites.

Estates and farms are located mostly in the northeastern section. The largest piece of vacant land is Mitchell Field and again, scattered areas in the Town of Oyster Bay, particularly in the Syosett Woodberry area.

The available commercial land is really quite limited, with only the Sunrise Drive-in and a few areas scattered over in the Jericho area. The areas of deteriorated declining housing include the Inwood area, Long Beach, Elmont, Roosevelt, and Freeport. This all represents the potential in land for Nassau County in the future. Since more than one half of the vacant land has been utilized for non-residential purposes during the past five years, how has this land been used?

Since 1966, 96 major office buildings totaling almost six million square feet have been constructed. These buildings are becoming larger and taller. The majority of this building occurred predominately in three industrial park areas: Lake Success, Woodbury and Jericho, and three business districts: Garden City, Hempstead and Great Neck. It has been estimated that an additional 14 million square feet will be constructed between now and 1985.

While this office boom was taking place, industrial growth was continuing, although at a slower pace than during the first half of the decade. The absorbtion rate between 1962 and 1965 was 146.6 acres per year, compared with 103 acres per year between 1965 and 1969.

There is approximately 7,000 acres of industrial zoning in Nassau County. Fifty-three per cent of this is used for industry, 11.9 per cent for public purposes, 17.5 per cent for other uses—offices, residences, stores, etc. Only about 1,220 acres or 17.5 per cent of the land currently zoned for industry remains

vacant.

Bi-county projected a need of 4,100 acres of industrial land. It is unlikely that a great deal of additional land will be made available for industrial uses in Nassau County because of established land use patterns, topography and access. Instead, industrial job needs will be met in the westerns towns of Suffolk County.

It is projected that the population growth will be slight, particularly when compared with the past. The official census population as of April 1, 1970 was 1,428,538. This was some 67,000 less persons than we had anticipated. The internal changes of the population were even more significant. There were 37,536 less persons in the 0-4 age group and 18,171 more than we had estimated in the 65 and over group. Therefore, we are having less children and living longer. At the same time, the 20-44 age groups are also substantially lower, some 45,000.

All of the data is not yet available for a clear indication of what these changes will mean. There will be a lessened school need in the near future and there should already be increasing problems in caring for the elderly. The mid-age groups are more difficult to analyze and could be the result of military service, out of area schooling and some out-migration caused by high housing costs. The earlier estimates of bi-county of a 1985 population for Nassau County of 1,569,000 is still valid.

Land use and population to a great extent are determined by zoning restrictions. Seventy-two per cent of the county is zoned for single family homes. Only ten per cent for apartments, commercial and industry combined. The remainder is in water, islands and parkways. When these items are removed for computation purposes, 54 per cent is zoned for high density residential, generally and 6,000 square foot lots, which yield 4.5 dwelling units to the acre and results in a population of 10,000 persons per square mile.

On a composite zoning map of Nassau County we classify as high density a lot containing roughly 6,000 square feet. The commercially zoned land is concentrated along the main highways. The major areas of industry within the County are Sperry, the Plainview complex, Syosett, Woodbury, Underhill Boulevard area, Mitchell Field and Lake Success.

The remaining growth in the County will necessarily take place on land zoned for fewer dwellings generally one house on an acre or more. There will be some in-filling on vacant land with existing higher density zoning and, of course, requests to change zoning to more dense classifications, particularly apartments. Intensification will also occur as older areas are redeveloped. During the greatest period of growth from 1940 to 1960, 270,000 residential permits were issued with the highest number for a single year, 29,663 in 1950. During the period from 1967-1969, one family housing construction averaged only 2,000 units per year. In 1970, this was halved to 995. Only in 1949, when 3,212 multi-family dwelling units were constructed, has the annual total surpassed 3,000. In 1969, 2,099 multi-family units were built and 1,321 in 1970.

Development not only places additional demands on the water supply through increased usage for consumption, but it also prevents water from seeping into the groundwater table. Instead it runs off the acres of parking fields and streets and more and more will be carried to the sea through the sewage treatment plants as they are expanded.

The recently completed Greeley and Hansen study utilizes the studies of the Nassau-Suffolk Regional Planning Board. Bi-county's population numbers have been extrapolated beyond 1985 projections to the year 2020. These estimates reveal a deficiency of 92 million gallons per day in 1990 and 177 million gallons per day in 2020.

Water is a constraint on the future growth and development of the county as well as an important

consideration of the health and welfare of its current residents. This is a challenge that faces the county. Thank you.

Mr. Gillen: Thank you very much John.

We now will touch upon what is probably the most single important factor in our water supply make-up. As Commissioner Peters pointed out before, it is all down there, none of it comes from streams, and none comes from a mystical underground conduit running from Connecticut or Westchester County. So every drop we drink must come from rain, percolate through the ground into this fantastic storage reservoir we have down below. Consequently, where the water lies has been the subject of intense geological explorations. To assist us in this for many, many years, we have been fortunate in having on Long Island, the United States Geological Survey. They are the experts, and the man I'd like to call upon now to go into this geology, is Mr. Phil Cohen, who is the hydrologist in charge of the USGS on Long Island.

PRESENTATION

Mr. Cohen, *Hydrologist, United States Geological Survey:* Thank you very much Commissioner Gillen. Commissioners, ladies and gentlemen, I am very pleased to have the opportunity to speak before you this morning. I note on the program that I am the sole representative of the so-called Federal establishment who will present a formal talk this morning. One wonders why an agency such as the U.S. Geological Survey is represented here, and as Jim indicated, we have been actively involved in the water-resources study on Long Island for nearly 40 years now.

I would suggest that in addition to whatever attributes our work might have, perhaps one of the reasons that we are still actively involved and friends of most of the agencies involved in managing the water-resources on Long Island, is the basic premises with which our agency functions. We are sort of an unusual kettle of fish. We don't regulate anything, nor do we advocate or oppose any water resources schemes. This is an unusual thing to say. It is within that context that we have been actively engaged in water resources studies; impartial fact finding studies in Nassau County in formal cooperation with the Nassau County Department of Public Works, to collect the information and data, and present it to you for your considerations and decisions.

Specifically, we attempt to evaluate the nature and magnitude of the resources of the natural hydrologic system and commissions, changes imposed upon the system as a result of man's activities. We try to determine how the system will respond to any scheme that water management may develop. My remarks then will be to try to, within the framework of this policy position of my agency, describe very briefly the water resources situation on Long Island, with specific reference to Nassau County. I will touch on a few of the alternatives that are being considered and try to elaborate on some principles that I would suggest you may wish to consider in your deliberation.

This is a map of Long Island, which shows the physical size of the Island; about 1,400 square miles, with a population of somewhat more than seven million people. Germane to the subject at hand is the fact that the total amount of fresh water in the piping system of Long Island on a daily basis is roughly 1.1 billion gallons per day. Of this 1.1 billion gallons per day, about 600 million gallons per day is imported into Kings and Queens County by way of aqueducts tapping the New York City surface water system. The remainder of the water, roughly a half billion gallons a day, is groundwater withdrawn from the aquifers beneath Long Island and used and disposed of in one manner of another. In Nassau County,

the gross pumpage at the present time is probably on the order of 230 million gallons per day. The bulk of the remainder is withdrawn in Suffolk County, although there are still sizable amounts of groundwater pumpage in Queens County—somewhere on the order of 60 to 70 million gallons per day, and a small amount in Kings County.

This slide shows the aquifers underlying Long Island. (Appendix Fig. 1). The cross section is approximately at the border between Nassau and Suffolk Counties. The aquifers attain a maximum thickness of about 1,600 feet. The names of major units are not too important for this discussion. However, you may want to fix the term upper glacial aquifer in your mind as being the uppermost aquifer. It overlies the so-called Magothy aquifer. The Lloyd is the lowest aquifer resting on the bedrock.

I will not take the time to show a slide of the water level contours. However, such maps have been prepared and have been published. The gross configuration of the water-level contours in Nassau and Suffolk Counties indicate that they're closed contours. From this one can deduce that the source of all the groundwater must be precipitation on the Island.

The configuration of the water-level contours in Queens County is complex and reflects intensive development beyond what some people define as the "safe yield", "permissive sustained yield" or similar terms. Results of such development are cones of depression or sinks in the water table which extend below sea level and cause certain water management problems.

The next slide is a hydrogeological cross section (Appendix Fig. 2) along the Nassau-Suffolk County line. The aquifers are shown in outline. I call your attention to the small arrows. These arrows show the overall gross directions of ground water flow under natural conditions on Long Island—infiltration of precipitation moving down to the deeper aquifers somewhere near the central portion of the Island, sweeping down to the bottom and then moving seaward toward Long Island Sound and the Atlantic Ocean. You will note that the freshwater is bounded both on the north and south by salty groundwater. Positions of the boundaries between the fresh and salty groundwater, the so-called freshwater-saltwater interfaces, represent, under natural conditions, a very delicate balance between the total amount of fresh water flow in the system. It is this gross movement of water toward the sea that is responsible for the dynamic portion of the interfaces under natural condition.

The history of water development on Long Island is shown on this slide (Appendix Fig. 3). In the earliest stages of groundwater development on Long Island the groundwater is withdrawn from the upper glacial aquifer and the return of the bulk of the used water through cesspools and septic tanks to the shallow aquifer. Note that we have not shown any movement of the freshwater-saltwater interfaces in this slide. The gross quantity of pumpage is about equal to that which is returned into the system so the equilibrium is still retained, and the interfaces remain at their natural locations. Under certain parts of Suffolk County we still have this type of development. However, the quality of the shallow groundwater in the vicinity of cesspools and septic tanks deteriorates.

As the contamination spread laterally in the shallow aquifer, water management decisions were made to deepen the wells into the Magothy aquifer to try to avoid the shallow contamination. This second major stage of the development is the type that is characteristic of much of Suffolk County and substantial parts of Nassau County. Deep wells pumping water from the Magothy aquifer, and disposal of the waste water from the cesspools, septic tanks, similar structures.

The next major step in the development of the groundwater resources of Long Island has been characterized as the type of development that we have right beneath our feet today—for example in Sewer District 2 of Nassau County. Here (Appendix Fig. 3) the bulk of the withdrawals are from the Magothy

aquifer, but a substantial amount of the used water is now discarded to the sea. In this case, instead of returning the used water to the ground, a management decision has been made to discharge the waste water to the sea. This results in a decrease in the quantity of water moving toward the sea, and the disruption of the equilibrium positions of the freshwater-saltwater interface and *local,* I want to emphasize, *local* and slow landward movement of the interfaces.

This slide shows the results of some of the detailed research work of one of my colleagues, Nat Perlmutter. It is the result of the intensive aerial investigation in the southern portion of Nassau County, from the groundwater divide southward, detailing with some aspects of contamination of the upper glacial aquifer in Nassau County. You will note that in the light orange and dark orange areas, the nitrate content is more than 40 milligrams per liter as NO_3. These values exceed limits established by numerous public health agencies, including the United States Public Health Service and the local Nassau County Health Department.

This slide shows a series of cross sections from the northern portions of the mapped area on the previous slide, southward to the south shore. You can note the distribution in the third dimension, of the nitrate in the groundwater. It may be difficult for you to recall, but please accept the fact that these flow lines are very similar to what they were under natural conditions, despite the fact there has been intensive pumpage and local disruption of the flow system. In general, water is still moving in the same path toward the sea. We find that the nitrates in general—there are specific examples where this is not the case—but in general, the nitrate is following the regional flow system, so that the natural flow pattern which is moving the water seaward is carrying the nitrate downward and seaward.

I note that one of the stops on this afternoon's agenda may be one of the well fields in the central portion of Nassau County. This is a field in which the nitrate content has moved downward to the well screen in amounts roughly depicted on this slide.

There are a host of alternative methods of development that are being considered; all of which I am sure have been brought to your agency's attention in one manner or another. We've enumerated a number of them in publications and we have tried to anticipate how the system might respond to any one of the alternatives. These alternatives, as I have said, have been brought to your attention through the publications of numerous agencies. The newspapers are doing a fine job of publicizing all sorts of schemes that people are coming up with, some of them rather novel and have some interesting application. This (Appendix Fig. 4) is one that I bring to your attention simply because the way our society functions in some places. This is one of the most commonly accepted ways of doing business—to continue doing what we're doing right now. This will help you review the situation we have here in Nassau County. We've shown pumpage from shallow wells and discharge of wastewater into cesspools and septic tanks. We've shown the pumpage from deep wells, going through a little box marked "C", (denoting cooling) and return of the water used for cooling to the ground. This represents a long standing policy decision by the State Department of Environmental Conservation. A substantial amount of the industrial water is used for cooling in Nassau County and is returned to the ground. Therefore it does not impose a net draft on the system. We have also shown a deep well withdrawing water from the Magothy aquifer going to secondary treatment sewage plant and discharging to the ocean or to the south shore. One other item that I've shown is the small excavation which represents more than 500 recharge bases which are currently returning substantial quantities of storm runoff to the ground and augmenting the groundwater supply of Nassau County.

The consequences of this type of proposal, to continue developing groundwater and managing our

water resources as we're doing right now, involves principles that I have already enumerated. If you continue or increase the net withdrawals from the system by deep pumpage or pumpage for that matter from any aquifer and subsequently discharge the waste water to the sea, you will continue to impose an ever growing disequilibrium or imbalance on the system which, in turn, will result in the inevitable slow landward movement of the saltwater.

One proposal has been considered in great detail as an alternative, partial or complete, to continue with the present methods is the concept of barrier injection (Appendix Fig. 5). This proposal envisions taking the secondary effluents and upgrading the quality by means of a tertiary treatment procedure and then injecting some or all of the treated water back into the ground near the shorelines. This would increase the amount of subsurface flow to the sea and thereby stabilize the positions of the saltwater-freshwater interfaces. I'll qualify the word "stabilize." The position of the interfaces or for that matter, the extent of any one of the actions that I've told you about, are complexly related to the magnitude of the development—in this case the magnitude and the manner of injection. Theoretically then, if one understood the system and had a strong enough predictive mechanism, one could choose a position of the interface that is acceptable to society. One could tailor make this type of alternative to fix the position of the interface. If you inject more water the interface could be moved seaward; if you inject less water the interface would move landward. It would move landward to a new equilibrium position which would depend upon the magnitude and the rate of injection.

The next proposal is a modification of barrier injection. This proposal goes one step further: it says in effect, that we are going to upgrade the quality of the water through tertiary treatment to potability. This is technically feasible but the economics may be another question. Rather than inject the water into wells near the seashore in order to stabilize the saltwater-freshwater interface, we might inject the water into the ground in places that are perhaps more economically or otherwise desirable (Appendix Fig. 6). Putting it back in the ground would have the same gross effect on the system. It would tend to move the interface toward positions of equilibrium. We are, in effect, recycling water with the aquifers, serving a vital intermediary step.

To date I don't think there has been very serious consideration given to desalinization of the water prior to injecting it in the basins. However, unless such a course of action is taken, ultimately recycling of water—removing it, using it, and putting it back into the ground—will cause the dissolved-solids content of the water to increase to a point where the water is no longer acceptable for potable supply. On the other hand, a scheme of this sort might give you many, many years to evaluate other schemes before you reach this level of salinity.

Another alternative worthy of consideration is to permit wide scale saltwater intrusion. (Appendix Fig. 7). Why would one want to consider a proposal of this sort? Well, for one thing, as I indicated before, the positions of the saltwater-freshwater interfaces under natural conditions are related to a given amount of water being discharged to the sea. There are groups of people, although they're becoming more and more silent, who contend that the highest use of water in terms of the economic wherewithal of our society is for our potable water supply. This being the case, they consider the positions of the freshwater-saltwater interfaces as we found them under natural conditions as being wasteful. Hundreds of millions of gallons per day must be discharged from the sea to maintain these positions. One can take the point of view that a less wasteful position would be developed by withdrawing water, using it and then discharging to the sea. This would cause the interfaces to come to new stable positions. However a freshwater outflow to the sea, at least in the minds of many people, is not considered wasteful. This is the

water we see discharging into our streams, and this water helps maintain the present salinity of our south shore bays. It also is the water that fills our lakes and ponds. So a water management decision of this type is a very drastic decision, and in the present sociological-ecological framework I think that this water management alternative is one that's probably considered to be least acceptable. But this is the one that is going on right now.

In summary, one of the key decisions facing your Commission is what alternatives do you wish to advocate to prevent or minimize the type of cause-and-effect relations that we now see taking place on Long Island.

That just about closes out the twenty minutes allocated to me, but I'd like to make one closing remark. There are many ways to address oneself to how the system will respond to any stress. I would suggest that the responses that you're probably most concerned with are declining groundwater levels and the effects thereof; which on Long Island would be: (1) decreased streamflow; (2) decreased subsurface outflow to the sea; and (3) saltwater intrusion. All three of these effects of declining groundwater levels will have what is commonly defined as very severe ecological effects.

In order to address oneself to minimizing these negative effects, predictive tools are necessary. These tools should be employed with as much vigor as possible. I am happy to say that at least a half a dozen groups are now looking at predictive hydrologic tools very intensively; including the Geological Survey. Although we don't have time to discuss it today, I would urge you to look into the research that's being done in fields of analog modeling and digital modeling. These models are and will continue to be the tools you're going to use to try to predict quantitatively, not qualitatively, how the system will respond to stresses.

I will try to answer a few questions if we have some time.

Mr. Hennigan: *Phil, has much consideration ever been given to the possibility of importation of water external to Long Island into the area?*

Mr. Cohen: Many people talk about it, Bob. The decision of course, is fairly straightforward, as straightforward as a political decision can be. It's the type of thing that lends itself very easily I think to a straightforward engineering-economic analysis. From a political standpoint of course, it may not be straightforward. But one can import water for direct uses on Long Island. However, from the point of view of a groundwater geologist, we like to think about the economic value of the pore spaces beneath our feet. The interstitial spaces between the sand grains form a vast reservoir capacity. Most major water resources developments throughout the world depend upon large scale surface water reservoirs. Such reservoirs are used for several reasons. One reason is that subsurface storage isn't available everywhere. Well, it is available on Long Island. We can spend at least twenty-five minutes discussing how one can manage this reservoir as a true reservoir, not as something we just find in the ground and that we're going to withdraw water from. Although there are many problems associated with injecting treated sewage into the subsurface reservoir, your question implies a water-management scheme which should be given serious consideration.

Chairman Conway: *Would it be technologically feasible to recharge this natural reservoir with upstate water during high water conditions?*

Mr. Cohen: Yes. The key issue there probably would be a determination of whether or not you are going to bring imported water in on a sustained basis or whether you're going to take advantage of the very large fluctuations of the upstate supply. Upstate users would probably not object to exporting water which is of no use to them. The only time freshwater is of no use to them is when it's available in excessive amounts as during periods of flooding. If the economics are in favor of sizing the aqueducts to Long Island to carry these peak flows to Long Island's subsurface reservoir might be the place to put the water.

Chairman Conway: *This excess water goes out to sea?*

Mr. Cohen: It is discharged into the Hudson, and from there into the sea. From the standpoint of water supply, we might do a lot better by putting it into the ground. Can we afford to bring it onto the Island is another question.

Chairman Conway: *But it is feasible from a technological point of view, aside from the economic problem.*

Mr. Cohen: It would seem to me that additional research might be needed. I'll get bold and say that on the basis of all research that's gone on in the past, it would seem to me that the excess surface water supply that is not being used for the New York City Metropolitan System would be more amenable to direct recharge than the treated wastewater that is presently being considered for Long Island.

Chairman Conway: *If you didn't recharge wastewater and used the peak flow periods of the late winter and early spring, how delicate is this saltwater-freshwater interface?*

Mr. Cohen: It's very delicate, but fortunately in a very, very large time frame. One can demonstrate theoretically the effect of literally withdrawing water from one well and one could theoretically prove that the interface is moving. In terms of the real management decisions, however, it's extremely sluggish. One can withstand, for example, periods of drought of 10 to 20 years. One can also withstand discharging 50 or 60 million gallons per day through the Bay Park Plan for fifteen or twenty years without any real serious problems. This reflects the vast size of the reservoir and sluggishness of the interface.

Chairman Conway: Any further questions?

Thank you very much Mr. Cohen. This is the second time we've heard Mr. Cohen and on both occasions, he has given excellent presentations.

Mr. Gillen: Thanks also from myself Phil. Phil could have talked for another hour and we would have been held riveted to our seats with attention. He's that kind of a speaker; he has the facts at his fingertips and he knows what the heck he's talking about.

I neglected to point out particularly when Mr. Follis started speaking, that the Planning Commission, and of course, the USGS produced an important input into the CPWS-60 Water Supply Study. Now, also part of that input and a very large contribution was made by the Nassau County Department of Health. The Department of Public Works in the County and the Department of Health in the County work hand in glove on many water problems and on many waste water problems.

The next gentleman that I would like to introduce is the Assistant Commissioner of Environmental Health, Mr. George Sumner. George is a recognized expert in this field of environmental health.

PRESENTATION

Mr. Sumner: Thank you. I imagine there are some people here who don't know that Jim Gillen was a former Public Health Engineer, in fact, so was Frank Flood. They say that old soldiers never die; I don't know about that, but I know what happens to old Public Health Engineers; they transfer to Public Works.

One of the fellows who has not transferred yet is Shelly Smith, who is the Director of the Bureau of Water Resources in our Health Department. Sheldon's basic responsibility is watchdog of the quality of the drinking water supply of Nassau County. I did notice that Phil also touched lightly on water quality and if we do touch on the same points, forgive us. I think probably they bear repeating.

Mr. Smith: I'm just going to review briefly the status and highlights of water quality in Nassau County. The character of our natural water, although it's all groundwater, does vary quite a bit. It varies by the area from which the water is pumped, and consequently from our forty-four major water supplies, as well as geological formation. With respect to the major water supply formations, the three major ones are the Glacial, the Magothy and the Lloyd. The glacial formation, being the uppermost, is most susceptible to contamination, pollution, and cesspool discharges. The next formation, the Magothy, is actually our most important water bearing formation. It provides some eighty-five per cent of our water supply. It is now undergoing changes in water quality which Phil Cohen described. The third major aquifer is the Lloyd formation which is quite protected from pollution. As you can see, it's topped by a formation of Raritan clay. The Lloyd formation is used primarily by the water supplies along the north and south shore, where the upper formations are of poor quality or where salt has intruded.

Again, the natural water quality varies quite a bit as we approach the south shore. The water tends to have a higher iron content. This type of condition can cause iron sedimentation within the water mains. Because of this we have iron removal plants located in the southern portion of the County.

In the middle of the County, because of high dissolved oxygen, and an acidic water, we have a corrosion problem if the water is left untreated. We are concerned primarily with copper and lead corrosion. Many of the older homes in the County have lead service lines and we are finding out that this could be quite a serious problem.

The natural water in the County is of very good bacteriological quality. However, there are instances where contamination does enter the water supply through the distribution systems. The New York State Sanitary Code now requires that all water supplies provide chlorination by 1973. Already fifty per cent of the population in Nassau County receives chlorinated water.

The largest sources of contamination of our groundwater are the private sewage disposal facilities, the cesspools which serve some fifty per cent of our population. Looking at just some of the substances in the cesspools which affect groundwater quality, we have nitrogen mainly in the form of ammonia since the cesspool is anaerobic. Also there are chlorides, detergents and a rather high total solid content. The materials from cesspools have leached out into the glacial formation and during the 60's the detergents became quite a problem.

This shows the increasing quality deterioration at a typical well. Actually, since that time we have

found in similar wells that the detergent concentrations may have been on the decrease. The reason for this is subject to question. One of the reasons may be that the detergent industry brought out a new formulation for detergents during 1965 that is more biodegradable in the ground. Another possible reason might be increasing dilution during the latter part of the 1960's after the drought during the mid-1960's.

This (Appendix Fig. 3) shows the movement of the water and the contaminants which follow the water from the glacial into the Magothy. I just wanted to note two things on this diagram: (1) the very light numbers indicate in a very crude way, the number of years it would take for a point entering the water table to reach any point in those lines; (2) you can see we're talking about one hundred, two hundred and ultimately to be replaced completely from the formation, we're talking about five hundred years. In Garden City Park, we estimate that it took contaminants reaching the water table, approximately thirty to forty years to reach the bottom of the Magothy, or the top of the Raritan clay formation.

As of 1971 approximately twenty-seven per cent of the wells have proven to be affected by nitrates. An additional seventy per cent have no trend or we lack sufficient data for them. Also, a few do show some decreasing nitrate content. These are largely shallow type wells in areas which have been sewered for some period of time. Of the various sources of nitrate, sewage discharges are the largest.

There have been many proposed alternatives for water suppliers whose wells have shown nitrate content in excess of the drinking water limitation. Each of these alternatives has been recently investigated. We will talk about nitrate removal more when we visit Garden City Park this afternoon.

A pilot plant study was run to demonstrate the feasibility of nitrate removal for water supply. The test was run in Oak Ridge, Tennessee of a stock of water from Garden City Park and Bethpage and the process was shown to be very effective in reducing nitrates. Nitrate content went from 20 milligrams per liter to .23 milligrams per liter. The big problem though is the waste water. The chloride content is 72,000 milligrams per liter, which is due to the salt used in regenerating the ion exchange media. That concludes my talk.

Mr. Sumner: Thanks gentlemen. We were asked to come up with a few recommendations which I have prepared. They're available through the Commission.

I think probably the biggest water quality problem in Nassau County is the fact that there still exist several hundred thousand cesspools and septic tanks in tile fields which discharge their untreated waste into the ground horizon and it eventually seeps down into the water supply table. In the Health Department we have kept pressing Public Works in the County Administration to the point where their backs are being broken to accelerate the sewage construction program to a point where we may have the sewage problem licked by the middle 1980's. But we'd still like to press further. This is all a question of dollars and cents. It is just like so many of the things I think the Commission will have to deal with. The answer many times boils down to dollars. So we recommend that the State see what they can do about providing even more funds toward the construction of our comprehensive sewage program in Nassau County.

Although this is listed on our recommendations, it's already been touched upon. We believe that all of the so-called comprehensive water supply studies, including Nassau County, Suffolk County, New York City, Westchester, be integrated into a State Master Plan; with due consideration of water supply requirements on a regional basis.

This follows up on some of the questions that were made by Phil Cohen. I really don't recall who it was, but in talking about sharing water from one jurisdiction to another, one public official said, "over my dead body." This is the kind of attitude that has to be looked at very critically and on a regional basis.

We think that we ought to proceed to develop this nitrate removal that Sheldon Smith touched upon. We know it works from the Oak Ridge Pilot Plan Study. But I'm afraid it costs too much and the Garden City is not going to be able to settle for the cost of that particular operation.

> **Chairman Conway:** *What per cent of the County waste is handled through cesspools and what per cent through sewers right now?*

Mr. Sumner: Volume-wise, fifty per cent is handled by cesspools.

Mr. Gillen: Thank you very much George and Sheldon.

When Mr. Peters asked me to come and work for the Nassau County Department of Public Works about a year ago, he told me that I would have certain assistants. One of these assistants is Mr. Frank Flood who is the Superintendent of Operation and Maintenance. It seems that all the miserable and difficult jobs requiring a tremendous amount of technical expertise fall in Frank Flood's lap to solve. Frank is in charge of the operation of all of the County Water Reclamation Plants, and we will soon have our sixth plant in operation. Frank is also in charge of the maintenance of our sewer laterals, and by 1988 we will have approximately 1700 miles of sewer laterals. Without further ado, I would like to turn over the topic of water reclamation to Mr. Frank Flood.

PRESENTATION

Mr. Flood, *Superintendent of Operation and Maintenance, Nassau County:* I spent a lot of time preparing for the meeting. I did not spend a lot of time preparing the speech and for that I apologize. You get to the point on something like water reclamation projects where it becomes second nature to you. Up until the time you have to make the presentation to people that are not conversant with it, you treat it lightly and suddenly you say—what am I going to tell them? I think the best way to describe this particular situation is to go back to the 1963 Greeley & Hanson Report which is the basis for the forthcoming talk by Mr. Donald Newton on the updated report.

The 1963 G & H Report made a specific recommendation that Nassau County pursue a project on the injection of renovated wastewater into the ground. The purpose of injecting the water into the ground was to prevent or retard the intrusion of saltwater that was occurring in southeastern Nassau County. The information that was presented on this alleged saltwater intrusion was from data that USGS obtained over several years from observation wells that are located in that particular part of the County.

Following the G & H Report of 1963, the County engaged the Consulting Engineer Firm of Burns & Roc, Inc., and they prepared plans and contracts were awarded for the construction of a 400 gallon per minute (GPM) water renovation plant. Coupled with this 400 GPM plant is an injection well. The expertise on the injection well was supplied again through our cooperative agreement with USGS.

Going back to the 1963 report, it showed a line of injection, roughly along Sunrise Highway. The injection scheme as proposed at that time was for a total of 27 MGD along a route to be chosen at a future

date, 13½ MGD for Bay Park, and 13½ MGD from the plant that was then identified as Sewer District 3, and is now known as Wantagh Water Pollution Control Plant. The second part of the program was upland recharge. Now, keep in mind that the purpose of this proposed recharge system as presented in 1963 was to retard saltwater intrusion that was specifically occurring in the southeastern corner of the County. The USGS has numerous publications on the extent of that particular interface, both in the horizontal and vertical planes.

As it was conceived in 1963, injection wells would be constructed along the south shore and injected water would be placed into the Magothy strata and in effect, a hydraulic dam would be created. This would prevent the further intrusion of saltwater and allow additional water to be withdrawn from the Magothy aquifer for consumptive use by residents.

Certain restrictions were placed on the design of this particular renovation plant and the injection well that was developed. This information is also present in publications that have been prepared by USGS and the Department of Public Works. It was decided at the time ('64, '65, '66) that the renovated water that was to be injected into the ground would approximate as closely as possible the virgin water that exists in an area five hundred feet below the surface in the vicinity of Bay Park Treatment Plant.

An interesting point is that in the Nitrogen cycle, the total nitrogen varies between twenty-five to forty milligrams per liter and in the Bay Park effluent, that nitrogen is present as ammonia nitrogen. The scheme that was developed by the Engineers consisted of the following: an upflow clarifier unit in which alum and other coagulant aids are introduced at two hundred and ten milligrams per liter. The effluent flows up through a sludge blanket. Following the clarifier we have a dual media filter. Actually there are two of them at Bay Park; both capable of taking 250 GPM at a nominal loading. After this are four carbon columns, with each containing about 8,000 pounds of carbon. We add chlorine to the effluent prior to pumping it to the injection facility. At the injection plant the treated water is placed in a fifty thousand gallon storage tank. We also have a degasifier unit. A pump then pushes the water down into the injection well. There were also several pieces of equipment that USGS requested in order to observe the type of water going into the ground.

There were multi-pipes installed in the well and drilled down to an elevation of roughly five hundred feet. This includes the main injection well, observation wells, and recording wells. All part of the USGS input to this particular research project. There are papers that have been provided by USGS describing in more detail the characteristics of the well and its construction.

Here is an aerial view of what the well field looks like and the various units at the injection site. We have the building housing the equipment, the laboratory, etc. A fifty thousand gallon storage tank, degasifier unit, the twenty foot observation well, a hundred foot observation well and a two hundred foot observation well. The distance that the particular wells are located from the injection well play an important part in the determination as to when the injected water has passed or has reached these observation wells, and at that particular point USGS decides to terminate a test.

There is a connection to the Long Island Water Corporation, public supply well, in which we purchased water and USGS injected it into the ground in 1968. The purpose of this is to develop background information on the reaction of the particular well to receiving injected water. Several experiments were conducted on using public supply water and this data is used as a background for USGS to compare. How does that well react with public water supply water? How does it react with the water that we're supplying from the renovation plant?

I mentioned there are several tests that have been performed. I think that one that has been given the

most publicity and probably hurts the program the greatest is a test that was performed in May of 1970. It was the longest test that had been conducted to date and it lasted thirty-three days. It was intended to go to thirty-six days and there are reasons why it terminated at thirty-three. The initial injection started at 350 GPM. All of the injection tests have been run in that particular vicinity; 350 GPM, 360 GPM, or something of that nature. Around the eighteenth day the injection rate dropped from 350 GPM down to 200 GPM. At that particular day, the head build up in the well itself had reached about sixty-five feet, which for this particular project, was unacceptable. Now, there is a reason that the head loss built up at this particular rate, and it goes back to the clarifier and the sludge blanket that I mentioned before. The operation of the clarifier during this particular test was probably the poorest during any of the tests that we have run. So that the information I'm presenting here is good information. What it is showing is that here is the response of the well under conditions which were the poorest. Yet when you look at the water that we were supplying on the chemical data, it was excellent water, most of the time it was meeting US Public Health Service Standards. The break in the curve here was because we had a failure in one of the dual media filters that necessitated shutting that particular filter down and reducing input to 200 GPM.

The head build up and the accumulated turbidity up to the thirty-three days, parallel each other. The USGS people have in their analysis of the data shown definite correlation between head build up and turbidity.

Since May of 1970, several tests have been run with USGS. They have run one test without chlorination; they have run a test without the benefit of the carbon columns. For 1972, we have a series of three tests to be run with this particular well. Two ten-day tests, and then sometime during the year we would like to run this particular well for an extended period of time, hopefully six months and at that particular time, gain information on economic factors as to how much it's going to cost to redevelop the well, how much it will to operate the plant, etc. That prolonged test would really be the culmination of that part of the research project.

I have one last comment. The plant itself, as it is set up, was not designed and it cannot remove nitrogen compounds. It cannot remove ammonia as we receive it from the Bay Park plant. There is no provision at the plant at this particular time to convert 400 GPM of ammonia layden water to nitrates and remove it. I believe Commissioner Peters in his remarks will comment further on plans that we have. At this point I would like to stop and ask if there are any questions.

Chairman Conway: *Can anything be done to prevent the head build up?*

Mr. Flood: That particular head build up was due to the operation of the clarifier, and that's the key to this water renovation plant. We have changed that particular operation and have improved the withdrawal of sludge, or maintenance of the sludge blanket. Now, this in turn is the first unit in the water renovation plant.

From the clarifier we were not taking out all of the solids that we wanted to. What this did was to have a heavier loading on the dual media filters. That in turn required more back washing of the filters. All of this, causes minor plant upsets, bumping you might say, of the particular plant. In the operations that we have had since May of 1970, we have not experienced this particular head build up.

John Vecchioli is here and John is the USGS individual responsible for the injection well. John, if there's any comment or question that is raised that you would care to answer rather than myself, please

feel free to do so.

Mr. Vecchioli: Well, I'd like to elaborate a little on what Frank said. He indicated that during the thirty-three day tests we operated the well under perhaps the worst conditions that we might have. Since then, we have operated under perhaps the best water conditions that a tertiary plant can produce. Even with the best water, we find that this head build up, at least over a short period of time, continues at the rate of about half a foot per day. Now, one of the things we feel we can really gain from this extended period of projection is testing to see whether the head build up continues linearly throughout the six month period or whether it takes off exponentially and after a few weeks operation, accelerates, or whether we reach some stabilization of the head build up. With continued head build up this necessitates frequent redevelopment of the well which would be an expensive part of the operation. In other words, the injection would have to cease and immediate measures taken to remove the clogging material from around the well. Then we'd start the injection again.

> **Chairman Conway:** *Then you can't say at this point if the operation from a technological point of view would be successful, except on a temporary basis?*

Mr. Vecchioli: It was designed for experimental purposes in conjunction with Nassau County. They worked out certain duation of time for the certain test lengths based upon many factors. Among these was our ability and desire to remove the water from the ground after it had been injected, to evaluate some of the geo-chemical changes that had been affected during the injection. So we tried it first with short experiments of two days length. These were designed to get the water out to the closest observation well and from there we go back to ten day experiment to move out to a greater distance and also to evaluate head build up over longer periods of time. Then we had hoped that during the thirty-five day test we would get extended operation of the injection experiment with a relatively stable type of injection. But this was not the case because of the poor functioning of the tertiary treatment plant. So again our plans call for a couple of other short tests to try to further understand some of the changes in chemistry that are taking place in the formation and then into a longer term injection period to help to evaluate the long term head build up, frequency of build up that will be necessary, and the types of redevelopment which can be applied to the well.

> **Chairman Conway:** *Is this being done successfully anywhere in the United States?*

Mr. Vecchioli: Not to my knowledge.

Mr. Flood: Let me interrupt here. I mentioned at the outset of my remarks that in 1963 saltwater intrusion was one of our main concerns. Sheldon Smith in his remarks on the water quality with the Health Department, touched on the nitrate problem which is something we had no knowledge of in 1963. The problem did not occur and with the lack of saltwater movement, but with the presence of nitrates in the mid-island well, we have had to take a hard look at the particular research project that we have at Bay Park. Is this the future of Nassau County's reclamation project? We have been meeting on this thing and I suggest that we wait for the Commissioner's remarks.

Mr. Peters: I have one comment that I would like to add. Timing is extremely important n determining the feasibility of whether you inject along a barrier line; and whatever information you gain on injection along a barrier line, whether it's economical or technical, is a positive thing. Should you consider injection in the economics or from a technical point of view. If you learn ultimately that it is not practical from either aspect, then you can go into another alternative. So whatever you learn is definitely positive and I think from this point of view, what we have learned so far is definitely beneficial. What we'll learn with the subsequent tests will prove what this proves.

> **Mr. Hennigan:** *What happens to the well when you put clean water, that is, public water supply water, in it?*

Mr. Vecchioli: We did get clogging even with public water supply. This is contributed to the iron content.

Mr. Gillen: Thanks very much Frank.

The next item on the program is really the main part of the program. I think it is extremely important that you bear in mind as you listen to the description of the CPWS-60 Water Supply Study that it was not some report conceived by a technical expert sitting with his associates in an ivory tower. About the time that the CPWS-60 Report was to get under way, the Long Island Water Conference which is the unofficial representative of many of the forty odd water supplies for Nassau County, was anticipating undertaking its own study. So to help Mr. Peters and others, the two studies were combined. The principal consultant was Greeley & Hansen, an outstanding internationally known firm who had done earlier reports for the County. They employed to assist them in the preparation of the study, the firm of Holzmacher, McLendon & Murrell, who were designated by the Long Island Water Conference to represent their interest. During the actual development of this study, there were progress meetings held approximately once a month. During that time the best inputs available from an engineering, planning, health, USGS, and from the Water Conferences's standpoints were utilized in these meetings. They participated in and discussed various chapters in this report and I think that's the most important point.

I would like to now introduce Mr. Donald Newton who is a partner in Greeley & Hansen.

PRESENTATION

Mr. Newton, *Greeley & Hansen:* You have heard a great deal about the background, particularly on the management problems from Mr. Cohen and I'd like to just preface my remarks by saying that we, as Engineers, who are practicing, find the interface and the feed-in that we get from the organizations like USGS, one of the most interesting things we can run into. There is an outfit that is truly in an impartial way developing data upon which the engineers have to work.

Phil also mentioned something which I think is an interesting thing. He alluded to the development of predictive models that would make it easier and faster to predict what's going to happen. As practicing Engineers, we find ourselves put into the position of having to do that prediction before the models are ready to do it for us.

So, I think you have to bear in mind when we talk about numbers and so on, that they're in the context of best available knowledge, the application of rational judgment and the input data from everybody that has something that can be added to the field. We are by no means exclusive in knowing about it. We

take a back seat to Phil and his cohorts on the highly technical aspects. We then try to build into the physical facilities this judgment of what may happen. We take also the input from the Planning and Health Departments for instance.

As Bill said, it is a dynamic situation when you talk about a groundwater system like that on Long Island. It started to change the minute the first Indian boiled some tea, and it's been changing ever since. Where we stand in this sluggish change we are not absolutely sure. There are several things that I'd like to mention in way of terms and reiterate them.

You've probably heard these in the Suffolk County Hearing, and I'd like to also at this particular point, comment on one thing that Mr. Gillen didn't comment on. When Holzmacher, McLeondon & Murrell joined the Nassau County team, they combined the know how of two of the State financed county-wide studies into one study and brought that information to this study and it was most helpful.

The things I'd like to reiterate are that when we are talking about the groundwater system, it's source is precipitation. It produces the water which is available to Nassau County. The next word which I'd like to redefine for you is the term "accretion", which is that portion of the water that has reached the ground and actually gets down to the groundwater system. There are losses from the amount of precipitation such as evapotranspiration with a subsequent reduction of the amount which is available for accretion. The precipitation measured over the so-called water budget areas, which is the area which is effective in accomplishing accretion to the groundwater system, amounts to approximately 400 MGD. The losses from that precipitation leave an amount of accretion of about 200 MGD. So, in other words, only fifty per cent of the precipitation is available for recharge of groundwater systems to begin with.

The next thing that we were faced with was trying to determine what could be done with that accretion and this vast amount that's in storage, this dynamic system, and what could you take out of it without causing some undesirable result? There right off the bat, you have to make a judgment as to what is an undesirable result or to what extent can you go towards things which may be considered undesirable. In doing this, we then come up with an estimate of what we refer to as the permissive sustained yield. That is an amount of water which is the proportion of the accretion which can be continuously removed from the groundwater system without causing that dynamic system to go to some highly undesirable result. In our judgment, we concluded that a permissive sustained yield of about seventy-five per cent of the accretion could be sustained. This amounts then to about 151 MGD which could be continuously withdrawn in Nassau County without creating a situation where you have just a little bubble of freshwater resting in the underground sands and gravel.

Then how do we try to visualize that with respect to the need? In 1968, the data indicated that the pumpage was about 230 MGD, forecasts of population and water use indicate that this pumpage will increase to about 330 MGD in 1990 and to about 420 MGD in 2020. The water which is consumed out of that total pumpage is largely that water which is used by humans for human purposes and finally ends up in the sewers. In 1968, this was estimated at about 119 MGD or roughly fifty per cent. That is expected to grow to 243 MGD by 1990 and then up to about 328 MGD by 2020.

What have the factors of public use of the water done to the groundwater system? We've heard about the potentials of the saltwater intrusion and the lowering of the water table. I think the most dramatic effect of pumping out of this stored water occurred during the drought period between 1962 and 1966.

Just to give you a picture of what happened I'd like to show you one slide. This is pretty much the same as the one you've seen before of the saltwater wedges and the groundwater system itself.

Here is a slide which shows a number of groundwater profiles taken along one particular line through

the county. The highest line is the earliest one of record in 1903 and then you see successively coming down. From 1903 to 1943 there is not much of a change. In 1959, there still was not very much change, which is about the data that we had available to us when we were doing the '63 study. However the groundwater level of the lowest line occurred in April, 1967. In a matter of about eight years, there was a maximum draw-down of about fifteen feet. It's interesting to note though, as Mr. Cohen pointed out, that that draw-down that occurred during the drought period, did not produce a movement of the salt-water front in the wedges of the southwestern part of the County anything like what might have been expected. It's this slow disturbance of the equilibrium. It did probably move, but the evidence does not indicate conclusively how much it moved. This is also borne out by a study done for the Suffolk County study. This is the Hele-Shaw model which showed how slow in time the movement of the salt water interfaces were.

Now, I've quoted to you the figures on the permissive sustained yield estimate which, of course, is subject to a variation depending upon what you estimate in terms of evapotranspiration losses. I've quoted to you figures on the total pumpage and on the consumptive use which is the discharge to sea. These also are subject to some variations depending upon the rate of per capita consumption growth and on the rate of population growth. But on the average, those things can be illustrated. (Appendix Fig. 8). In the middle of that cross hatched segment is the estimate of the average permissive sustained yield showing a variation, plus or minus about twenty million gallons that might be occurring. The inclined line starting in 1965 slightly below one hundred million and increasing up to about two hundred and forty million is the estimated consumptive use or the losses to sea. You can see how on the average the consumptive use will reach the permissive sustained yield somewhere around the vicinity of 1973. Now, the only thing I want to bring out quickly right there is that is not a date upon which tragedy occurs. It simply means that now you start stressing this dynamic system more than in our judgment we feel it should be stressed. As you go on up then you see the point where you get solid red indicating a complete deficiency beyond those estimates of use which would indicate that by 1990 you have a deficiency yield of roughly ninety-two million and by 2020 a deficiency of about one hundred and seventy-seven.

How do you get water to meet those deficiencies? Renovation and recharge has been one way that has been looked at and we have considered reports. Another way of course, would be to use an area which has presently a surplus of water of good quality and import that to the extent that it can be. This is the idea of utilizing the groundwater system on a regional basis; Suffolk County, in other words.

The third way which is the other main way to get at it is importation from upstate. Any of these three methods are ways of going about limiting the stress upon the groundwater system.

To finish my presentation, I'd like to present this system in terms of a rain barrel. The groundwater goes up to about eighty feet. We see the outflow going to the ocean which is a leakage at the bottom, and then the consumptive use going out to sea through the disposal plant.

In 1990, if you continued to just mine without bringing any supplemental water in, groundwater has been lowered to an elevation of about fifty feet and the streamflows which are largely derived from groundwater outflow have been decreased to about 9 MGD and consumptive use risen to 243 MGD. If you import water in some fashion or another, this reduction of groundwater levels would be reduced. This is a situation which derives from one source, which is importing from Suffolk County, and this might be on the order of seventy feet instead of eighty feet. The streamflows are greater. Still, the outflow to sea is 196 MGD with some import. There is in effect a recharge being built into this thing in that situation.

Without further statements of the question about the yield and sources of water which could be elaborated on a great deal more, I would like to turn it over now to Mr. Robert Hall, who is a sanitary engineer and one of the Associates in our firm. He has been at the head of the team in developing this CPWS-60 Report.

Mr. Hall, *Greeley and Hansen:* Thank you, Don. Mr. Newton indicated that we think you have 151 MGD assured supply for Nassau County. At some point in the future you're going to exceed that demand and the additional water will have to be made available from supplemental sources. In our study we cover several supplemental sources, which I'd like to review.

The potential sources beyond the 151 MGD are:

(1) importing Suffolk County's surplus water;

(2) recycling through recharge basins or direct reuse of Nassau County's wastewater after it has been renovated;

(3) planned mining from the groundwater reservoir;

(4) purchase of water from New York City;

(5) desalinization of saltwater;

(6) weather modifications such as cloud seeding to increase the amount of rainfall on Nassau County and;

(7) converting Long Island Sound into a freshwater lake through a regional effort to meet the future needs of the region, including Nassau County. When I say regional, I'm talking about the northeastern part of the United States.

All seven of these supplemental sources have been studied both by us and others. So they are sources which have been considered.

Let me run down what our opinion of these sources are. Desalinization of saltwater, weather modification and Long Island Sound Lake sources are not presently feasible because of either a combination of political, ecological, environmental or technical difficulties or because of high costs. These sources should, however, be considered if and when they become feasible. The New York City source—number four which I mentioned—while technically feasible could not be developed before 1985 or 1990. Recycling through direct reuse is not considered to be a practical source now mainly because of lack of public acceptance and because of high costs.

When I use the words "recycle through direct reuse", that means treatment to the degree that wastewater could be taken from the treatment plant and put directly into the water distribution main for human consumption.

The three remaining sources are importation of water from Suffolk County, planned mining from the groundwater reservoir, and recharge of wastewater. These three sources are considered presently available, and were examined in detail in the report for the 1970 to 1990. All seven sources were considered

in general for application far beyond 1990 and into 2020.

A supply plan predicated on recycling of Nassau County's renovated wastewater through recharge basins is technically feasible, but renovation plants of the size required for this alternate have not yet been built. Recycling could provide a solution to Nassau's water problems if and when renovation is developed on large scale.

With respect to planned mining, this would involve the installation of wells on a county-wide distribution of the overdraft. The plan is technically feasible but its adoption is not recommended since it would have several unacceptable consequences. The levels of the groundwater would continue to decline. The rate of the salt water encroachment would be accelerated beyond that resulting from a stabilized permissive sustained yield condition, and land subsidence problems could develop. Mining would decrease the groundwater storage impairing its availability as a reserve against future drought.

The groundwater storage should be reserved for periodic droughts and seasonal fluctuations and not used as a long term supplemental source. We consider that mining would only be a stop-gap for interim measures of water supply.

The third supplemental source, a supply plan predicated on importation of Suffolk County's surplus water, would meet all of Nassau County's supplemental needs of 94 MGD through 1990. Continuing at that rate through the year 2010 and decreasing thereafter to 80 MGD in the year 2020, and then subsequently to zero as Suffolk's local demands increased. The plan would include spread withdrawal in Nassau County and western Suffolk County, treatment of the well water as required, and pumps and transmission mains to deliver the water from areas of surplus to areas of deficiency.

We estimate the project would cost 83 million dollars through 1990 at which time facilities must be developed for additional 97 MGD to provide water to the year 2020.

The recommended supply plan of Suffolk County is one that will meet the needs of Nassau County beyond its average permissive sustained yield of 151 MGD. The plan consists of the following basic units: wells and pumping, transmission facilities and the water surplus areas of Jericho and Old Westbury in Nassau County. We have some surplus water in those areas. We have distribution networks in Nassau County and we have wells and pumping and transmission facilities in Suffolk County. This plan would be constructed in four phases over the next fifteen or twenty year period, as illustrated.

We now get into the management and administrative part of this program. Inasmuch as Nassau County forms only a portion of the Nassau-Suffolk water budget area, which is an indivisible geohydrologic unit, the management of this area's water resources should be on a regional basis. The New York State Department of Environmental Conservation has the authority and responsibility for the equitable apportioning of water resources and as such, should ensure that the management is responsive to the available resources and to the people living in the water budget area. In this connection, we recommend that a management plan consistent with the laws of the State and the findings reported in CPWS-24 Suffolk County, and this report, CPWS-60, be formulated by the existing Nassau-Suffolk Regional Planning Board. Such an organization is shown on this slide. (Appendix Fig. 9). You can see that the State Department of Environmental Conservation is at the head, and formed your County Cooperative Organization through the Nassau-Suffolk Regional Planning Board. This is a Board that is in existence and has been working together for some years.

The implementation of a Deficiency Supply Plan Administered by a County Resources Board and a County Water Department will accomplish the objectives within the shortest period of time and at the

least expense, and is also recommended in our report.

The function of a Water Resources Board would be to advise the Department on matters germane to management of the resource.

The next slide (Appendix Fig. 10) shows how a Water Resources Board and a County Water Department Commissioner would fit into the Nassau County internal organization.

The function of the Water Resources Board would be to advise the Department on matters germane to management of the resources. Board members should be citizens possessing outstanding qualifications in the various disciplines associated with public water supply and related fields. A balance could be achieved by having representatives from the following: City water supply, incorporated village water supply, Commissioner operated water district. We have three types of water department or water utility operating in Nassau County now: Town operated water district; private water utility; industry and county water department.

The Water Resources Board reports to the head of the Water Department of the town. The people listed would serve as voting members of the Board. There would also be additional members who would serve by virtue of their position in County government as non-voting members. These ex-officio members would include the following: Commissioner of Public Works, Commissioner of Health, County Attorney, Commissioner of Planning.

It is envisioned that appointments of the voting members would be made by the County Executive and ratified by the County Board from lists of qualified persons submitted by local organizations having a capability of selecting the best qualified nominees. Several organizations having such ability are listed in our report, and include the Long Island Water Conference.

The operation of the recommended supply plan would also be under the County Water Department. The Department can be formed, under the existing County Charter with adequate powers to organize, construct, operate and administer a supplementary supply plan, including the financing. Such a Department would have the responsibility for county-wide planning and coordination; expand the existing renovation and recharge studies; and conduct, finance and execute a continuing program of additional research in connection with the resource. The existing water utilities would maintain present ownership of all facilities and would continue to serve their areas up to the permissive sustained yields, provide peak capacity, main extensions, distribution, storage and normal expansion. All average requirements in excess of the permissive sustained yield would be provided by the County Water Department from the supplemental source of supply.

I think the real significance of this entire chart is that it indicates what is and what isn't. It indicates that the Nassau County Water Department Commissioner should head Water Supply and Waste Treatment. This is a position which is similar to that now occupied by Commissioner Gillen. We indicate a County Water Resources Board, which would be new. We indicate a Water Supply Improvement section, which would include pumping, treatment, transmissions, wells, meters and recharge. Everything else on that chart is now in existence in the County Government. So you can see that to implement this and get in on an operating basis you would not have to expand the present County organizations very much.

That, gentlemen, concludes my part of the presentation, and I think Mr. Newton and I both stand ready to answer any questions you'd like to ask.

Chairman Conway: *You talk about a safe yield of 150 MGD. Are you talking about yield during the drought period or are you talking about an average over a period of years?*

Mr. Hall: That was an average over a period of years. It was demonstrated that during the drought period you could draw on these resources for this amount. The water table will respond and come back again. This is based on average rainfall over a number of years.

Mr. Newton: Actually, that is a yield which you could sustain continuously. It'll mean a change in groundwater systems. The resulting level of the groundwater table will be such that those things which do change can be lived with. The most obvious change is that streams are going to cease to flow at their present levels. Basically, most of the flow would be surplus runoff, or rainfall. There would be very little groundwater outflow in our estimation into the streams.

Mr. Hall: What happens is that you reach an equilibrium condition.

Chairman Conway: *You gave us a figure that 400 MGD gallons a day of rain falls on Nassau County. Two hundred of that goes into groundwater, from which you can safely take 150 MGD. Now, the Commission would like to know whether those figures are based on a ten, twenty, or fifty year period or on the three years that you had during the drought.*

Mr. Hall: It's based on an average rainfall of forty-four inches per year, from rainfall records that go back 75 or 85 years.

Chairman Conway: *And you feel that any interruption in the existing ecology would be restored over a long period, assuming that your forty-four inches held up as an average over that period?*

Mr. Newton: Yes, and this is actually what happened. The drought period illustrated that. There's been substantial recoverage from the lower water levels at the end of the drought. The whole objective of staying reasonably close to the permissive sustained yield over a long period of time is to maintain that fluctuating ground water level. By keeping as much as possible in storage, you can draw on the groundwater system for the water which is not coming in rain when you do have those periods of drought and low rainfall.

Mr. Hall: Keep in mind that your forty-four inches is an average. One year you might have forty inches and the next year you'll have forty-eight. And the year that you have forty-eight, you still only take 150 million a day out. You put water in the bank during that year, and the years you withdraw the average amount to maintain the same balance.

Chairman Conway: *How much water is being withdrawn at the present time?*

Mr. Newton: The pumpage was about 230 MGD in 1968. It would be in the vicinity of 240 or so right now.

Chairman Conway: *How much is being mined right now?*

Mr. Newton: At present about 100 MGD is being mined.

Chairman Conway: *Since there is one large aquifer, is there any reason if you're mining water from one end of that aquifer, that it will not restore itself from the rest of the aquifer? Just as if you took it out of one end of a pond, you don't necessarily reduce the level of that end?*

Mr. Newton: There is a realignment of the motion of the groundwater, but it's very slow.

Mr. Hall: I think a case in point is that Kings County, which was overpumped to well below sea level, a westward flow has been induced from Nassau County greater than existed before.

Mr. Newton: We don't have the data yet to be able to predict the rate at which these things respond to a stress or relief of the stress. One thing to point out is that the highest point in the ground water system as it exists at the present time is in Nassau County, and it takes a great deal of lowering of Nassau County's water table to start to induce an underground flow of any great magnitude westerly, for instance, from Suffolk. That would be the place where it would have to come from by natural forces. You'd probably reach the stage where you would have your ground water table so low you'd be finding other undesirable results from trying to induce the flow underground.

Chairman Conway: *Are there any studies as to the rate this would occur?*

Mr. Cohen: There are three or four models that are being worked on right now, which address themselves to the questions that you've posed. We can do it analytically and get some crude answers, but there are techniques being developed right now to get better answers.

Chairman Conway: This could be very important input into the Commission, obviously.

Mr. Newton: Well, Phil, isn't it true that the biggest problem in the models is that you can simulate the conditions but it's difficult to put time into the picture.

Mr. Cohen: When I say we I mean some of Sheldon's colleagues, ourselves, and several others are working on time dependent models.

Chairman Conway: *Is this information available?*

Mr. Cohen: These things exist right now. As a matter of fact, the results of the Hele-Shaw models have been published. The results of some of our models are being published. These things are available and hopefully will continue coming out.

Chairman Conway: *Is there a time-frame factor in them?*

Mr. Cohen: To some extent, yes. The Hele-Shaw model has great power, it adjusts itself to so-called transient conditions. The movement of the interface is a function of time and results have been published.

Chairman Conway: Well, I take it those results did not show that the underground flow would take care of the current situation to obviate the needs of the future, gentlemen.

Mr. Newton: Well, I think the answer is partly that the Hele-Shaw models tests that were available to us in those studies were directed more toward the movement of salt water inward into the water body rather than the lateral movement of fresh water within the body.

Mr. McClendon: Just one comment which may bear on Mr. Conway's point—the biggest item against, as I understand your question, underground movement of the resource is distance. The distance from where the excess water would be in Suffolk County to the point of most need in southwest Nassau, is so much further than the distance from any point in Nassau to saltwater that your extra flow quantity isn't excessive.

Chairman Conway: *Are there studies on that? What we're looking for is information.*

Mr. Newton: To my knowledge, I don't recall a specific study on that particular point. It's by analogy from basic hydrology of the underground strata. Is that right, Sam, is there a specific study to your knowledge about this movement of water westerly or laterally?

Mr. McClendon: No.

Mr. Newton: In our '63 study, we did do an analysis of what ways the water was moving under present conditions. The relative magnitude of the movement was maybe one-tenth moving under the generally existing groundwater slope that goes easterly. As compared to what goes out directly south into the sea, I think you can derive the kind of picture that you get. I think the problem you get into is that it's almost impossible to consider local stress on the ground water system. By doing that, a localized movement of the salt in could be induced.

Mr. Hall: We pointed out that the groundwater elevations are up around eighty in the middle of the County, and of course, they are zero at the sea. So you go from eighty to zero and you'd have to create that kind of a gradient, in an east-westly direction, if you wanted to achieve more groundwater flow.

Mr. Cohen: If one aspect of your question is the following: "has anything been done to evaluate what groundwater development in Nassau County will do to conditions in Suffolk County and vice versa?", to the best of my knowledge, there are no appraisals of these problems in the literature or anywhere else. Methodology and techniques are being developed to address themselves just to this question, but I don't think anyone has done it yet.

Chairman Conway: *No one's done it. The Hele-Shaw reports do not cover it?*

Mr. Cohen: The Hele-Shaw is a cross section model and does not look at this area of development.

Mr. Peters: I think there's a pretty simple answer. Even in the direction that the groundwater presently

moves, the rate of movement is between a half a foot and one and a half feet per day, on the subsurface natural gradient. So this averages one foot a day. You can see that in a year it moves only three hundred and sixty-five feet. So you can project how long it would take even if it did work. I think the answer is you could not look at this as a means of dependable water supply because of the time length.

Mr. Hall: In contrast, if you take it out in a well and pipe it over, we'd run it at five feet per second.

Mr. McClendon: Some consideration was given to the possibility of importing water across the line. A line of wells along the Nassau-Suffolk county line, for example, would be the most effective way of doing it quickly. But to try to take it through the whole formation from one county to the other, you wouldn't get enough to make a dent in it.

Mr. Cohen: A counter proposal, to protect Suffolk's interest, would be to build a parallel line along the Suffolk side of the county line; it makes an interesting problem in aquifer hydrolics.

> **Chairman Conway:** *How far is the nearest major main of the New York City System to where it could be put into the Nassau System?*

Mr. Hall: I'm not certain, but I know from the City's plans on the third tunnel that they will have something going into Queens, by 1985. I think it's sixteen feet in diameter. If you'd make that sixteen feet six inches in diameter, you've increased the capacity just about enough to take care of Nassau County. So a small change in New York City's plan would do quite a bit for Nassau County.

> **Chairman Conway:** *What is the closest location of an existing tunnel head that could be tapped?*

Mr. Newton: It's my understanding there is no tunnel closer than Manhattan that would have the capabilities of delivering this water. The tunnel that Mr. Hall mentioned is a proposed tunnel which reaches out into northeastern Queens in the communities of Douglaston and Bayside.

> **Chairman Conway:** *The ones that are currently furnishing the bulk of the population in Queens would not be large enough to provide any additional water?*

Mr. Newton: That's been the information we have received from New York's people. They don't even have at the present time, the capability of supplying water currently furnished by the Jamaica Water Company in central eastern Queens. There's nothing there for Nassau now.

Mr. Hall: But there could be if they started planning now. The third tunnel system is under construction—the very early phases of it.

> **Chairman Conway:** *And if it was made a little larger, could it take care of Nassau?*

Mr. Newton: When Bob says a little larger, he's talking about taking care of a deficiency of roughly one hundred and seventy-million. If you are attempting, as asked earlier, to recharge surplus water, it would

need to be a great deal larger.

Chairman Conway: *I was very interested in the political science end of your recommendations. You proposed that the present ownerships remain the same of these water systems. Does this have to do with the economics?*

Mr. Hall: We're trying to achieve a supplementary supply for Nassau County in the quickest time available from the best available source. Ownership of the present facilities has no bearing whatsoever on how you can develop this other supply.

Mr. Borghard: *You've listed seven different supply possibilities. Is there an order of priority? Is the importation of water from Suffolk your first recommendation?*

Mr. Hall: Yes, it is. The water is there and is available now. It is the only source of surplus water that you can go out and tap today; there is no other.

Mr. Borghard: *That takes care of it to 1990, what about beyond that time?*

Mr. Hall: You would have to start looking for an additional 97 MGD to take you through the next twenty or thirty year period.

Mr. Borghard: *Would that be importation from New York City then?*

Mr. Hall: You'd have to develop other sources, develop recharge methods, or look for technological advances, such as desalting. That point in time is so far in the future and those other possibilities are so nebulous at this stage of the game that it would be foolish to make a recommendation now which would take you through the next fifty years. If you sit back and think of what would have happened if a group like this had gotten together in the year 1918 at the end of World War I and said, "let's take care of Nassau County's water to 1970." How close do you think they would have been? Probably pretty far off. So we say the next twenty years will be the immediate present and beyond that you'd have to examine the options that are open as you approach that point in time.

Mr. Gillen: Thank you very much, Don and Bob for an excellent presentation.

I'd now like to call on the Commissioner of Public Works, John H. Peters, to comment on Nassau County's future plans.

PRESENTATION

Commissioner Peters, *Commissioner of Public Works, Nassau County:* Thank you Jim. I'd like to make several generalized comments concerning our progress in implementing the recommendations covered in CPWS-60.

Mr. Newton mentioned the Water Resources Advisory Board. We have received recommendations from the various groups and they are currently being reviewed. I believe within the next two or three weeks

the County Executive will appoint the membership of the Advisory group. So progress has been made in implementing the one recommendation.

As far as projected tertiary treatment plans, new criteria and guidelines are being established by the State Department of Environmental Conservation and the Federal Environmental Protection Agency. Within the next year, we hope to "plug into" the Bay Park Research Plant, which you will see this afternoon. This plant is equipped with nitrogen removal facilities, and other requirements which would upgrade tertiary treatment. Hopefully, by experimentation, within the next several years we will reach a point where it will be considered safe to recharge. This would include virology and all the aspects that go with it. We're a little bit behind now in the field of nutrient removal but hope to pass others nationally in this field within the next several years.

Thank you gentlemen.

Mr. Gillen: Thank you very much, Mr. Peters.

Last but certainly not least, we'd like to call on Mr. Lou Mirando, the Chairman of the Long Island Water Conference Planning Committee. In addition to that assignment, he is the Assistant General Manager and Chief Engineer of the Long Island Water Corporation, which happens to be one of the largest private water suppliers in Nassau County.

PRESENTATION

Mr. Mirando, *Chairman, Long Island Water Conference Planning Committee:* Thank you, Jim. On behalf of the Long Island Water Conference, I do appreciate the opportunity to be heard by the Southeast Water Supply Commission. Although there is little technical information that I can add to what has already been covered, I think the opinions of the Conference are extremely important as representative of the forty-four major public water suppliers in Nassau County, without whose support and cooperation any future water supply plans could hardly be implemented.

For those of you on the Commission who may not be familiar with the organization, the Long Island Water Conference is a technical and educational organization. Founded in the spring of 1951, the Conference's interests and influence touch all phases of water supply in the Nassau-Suffolk Area. Its member water utilities serve over eighty-five per cent of the bi-county population.

The membership, orginally limited to Commissioners, officials of Villages, Cities, authorities and private companies,was expanded to include the Water Superintendents. With the growth of water supply, the Conference enlarged to bring in attorneys, consulting engineers, managers, governmental and regulatory officials and others. Thus, each adds his share to the total water management picture.

High on the list of Conference priorities are the activities of the Comprehensive Planning Committee, which was organized to promote mutual aid among water suppliers and insure that there will always be an adequate supply.

As a result of its activities, we can report that every water supply system in Nassau County, and most in Suffolk, are interconnected with at least one other supplier and many of these interconnections have been utilized to the benefit of all the people in our two counties.

Jim covered this a little bit, but I think it bears repeating. Approximately three years ago, the Long Island Water Conference began participation in the New York State sponsored Comprehensive Public Water Supply study, known as CPWS-60. In doing so, the Conference was instrumental in securing addi-

tional State funds necessary to conduct essential phases of this study.

Holzmacher, McLendon and Murrell were designated by the Water Conference to work in conjunction with Greeley and Hansen on a sub-contract basis to supply the basic data necessary to other parts of the report and to prepare a Water Management Plan for Nassau County based on utilization of the existing local water districts and suppliers, whereas Greeley and Hansen would pursue the alternate of a Management Plan, utilizing a central form of control.

As work on the report proceeded and various alternates were discussed, both Greeley and Hansen, the prime consultant, and the Conference Engineers, Holzmacher, McLendon and Murrell, saw fit after considering a series of alternates, to recommend the use of an identical plan.

The Planning Committee of the Conference has reviewed the report and agrees with their recommendation for a deficiency supply plan administered by a Water Resources Board and a County Water Department wherein the existing water utilities would maintain present ownership of all facilities and would continue to serve their areas up to the permissive sustained yield. This same report states that inasmuch as Nassau County forms only a portion of the Nassau-Suffolk County water budget area, which is an indivisible geohydrologic unit, the management of the area's water resources should be on a regional basis. We also agree with this recommendation and believe that this should be on a mutually cooperative basis, not one of regional control.

In short, we think CPWS-60 is a sound report and we are hopeful that one of our longer range goals, that of installing large transmission mains to convey fresh water from areas where the water table was relatively high to other areas where the water supply table may be low and salt water intrusion a problem, will be accomplished through the implementation of some of the recommendations in the CPWS-60 report. We, therefore, urge the Commission to utilize the supply plan recommendations found therein in preparing any reports or plans for Southeastern New York which may come about as a result of this Commission.

Gentlemen, my statement is brief and I hope it has made the Commission aware of our organization and our deep seated concern that no future water shortages do occur in Nassau County. We would appreciate an opportunity to review any preliminary reports or findings eminating out of this Commission so that we may submit comments prior to a final report or plan. As I stated previously, I think it is important that the views of the Conference are thereby represented so that implementation of any plans would meet with full cooperation and support of the existing water utilities in Nassau County. I have some copies of a report that was presented before the New York State Legislator's meeting in November which I'd like to submit and I would hope that you would read them at your leisure.

CONCLUSION

Chairman Conway: I would just like to close by again expressing our deep appreciation to everybody that participated in this meeting. The presentations have been most informative and most helpful and maintained the very high standards of the previous meetings.

On behalf of the Commission, I would like to again add my very special thanks to Commissioner Gillen and Frank Flood for their work in preparation of the arrangements for the meeting and for the entire day.

Mr. Gillen: Thank you very much Mr. Conway for your kind remarks. Thank you ladies and gentlemen of the Commission, and to those who participated. I'd like to now declare this meeting recessed.

Thank you very much.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
William Borghard
William Schickler

Staff

Robert D. Hennigan, *Executive Director*
David Buerle, *Director, Management Studies and Analysis*
Paul Merkens, *Director, Engineering Studies and Analysis*
David Duffy, *Administrative Assistant*
Irene Baker, *Public Relations*
Leslie Van Derzee, *Research Associate*

NASSAU COUNTY

County

Joseph H. Driscoll, *Deputy County Executive*
John H. Peters, *Commissioner of Public Works*
James S. Gillen, *Deputy Commissioner of Public Works*
George H. Summer, *Assistant Commissioner of Environmental Health*
John W. Follis, *Deputy Director of Planning*
Frank J. Flood, *Superintendent of Operations and Maintenance*

Other

Phillip Cohen, *Hydrologist, United States Geological Survey*
John Vitielli, *Hydrologist, United States Geological Survey*
Robert Hall, *Greeley and Hansen Engineers*
Donald Newton, *Greeley and Hansen Engineers*
Louis Mirando, *Chairman, Long Island Water Conference Planning Committee*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

NASSAU COUNTY MEETING

Date: Tuesday, January 18, 1972

Time: 9:30-12:30
1:30- 4:00

Place: County Attorney's Conference Room (Room 4462)
1 West Street, Mineola, New York

Program

9:30 OPENING REMARKS

Opening comments by
E. Virgil Conway, Chairman, S.W.S. Commission

Welcome and remarks
2nd Deputy County Executive Joseph Driscoll

John H. Peters, Commissioner
Department of Public Works

9:45 LAND USE – ECONOMIC-DEMOGRAPHIC FACTORS

Nassau County Planning Commission,
W. Kenneth Chave

10:05 LONG ISLAND GEOLOGY – HYDROLOGY

United States Geological Survey
Phil Cohen

10:25 WATER QUALITY – HEALTH CONSIDERATIONS

Nassau County Health Department
George H. Sumner

10:45 **BREAK**

11:00 **WATER RECLAMATION PROJECT**

Nassau County Department of Public Works
Frank J. Flood

11:20 **REPORT ON COMPREHENSIVE WATER SUPPLY STUDY – CPWS-60**

Greeley and Hansen
Mr. Donald Newton

12:00 **FUTURE PLANS – NASSAU COUNTY WATER SUPPLY**

Commissioner John H. Peters

12:15 **RECOMMENDATIONS AND COMMENTS – NASSAU COUNTY WATER SUPPLY**

Louis Mirando, Long Island Water Conference
Chairman, Planning Committee

12:30-1:30 **LUNCHEON**

Caucus Restaurant, Old Country Road, Mineola

1:30-3:30 **VISIT TO WATER FACILITIES – FIELD TRIP**

(a) Garden City Park Water District
(Nitrate problems - typical well use)

(b) Brief stop - Nassau County storm water recharge basin (Garden City vicinity)

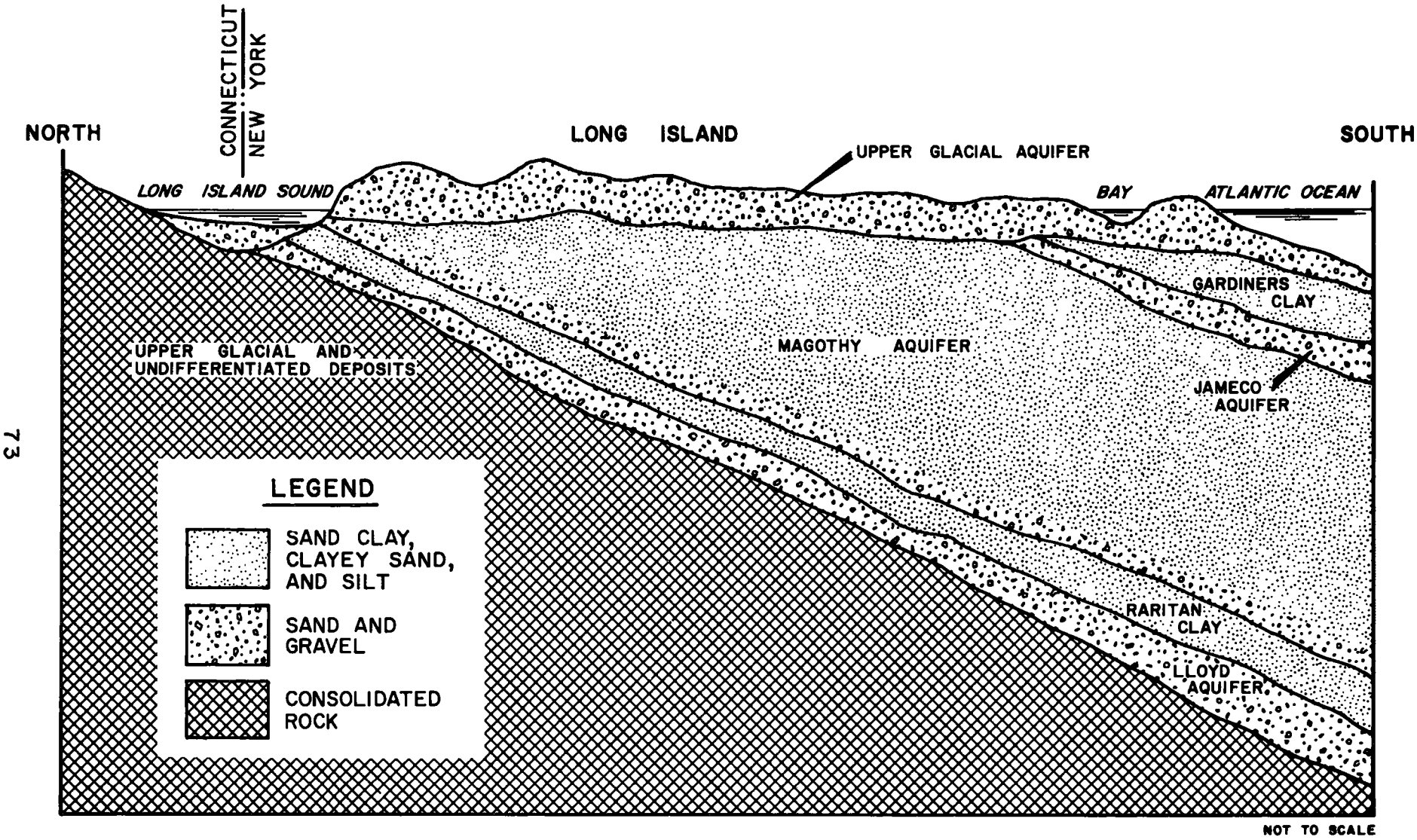
(c) Tour and inspection
Bay Park Treatment Plant
Renovation Plant and Injection facilities

(d) Return to Mineola

APPENDIX C

FIGURES

Figure 1 . . . . . .Aquifers underlying Long Island
Figure 2 . . . . . .Hydrogeological cross section along Nassau - Suffolk border
Figure 3 . . . . . History of water development on Long Island
Figure 4 . . . . . Continuation of present trend
Figure 5 . . . . . Barrier Injection
Figure 6 . . . . . .Advanced treatment
Figure 7 . . . . . .Mining
Figure 8 . . . . . Supplemental Supply from Suffolk County
Figure 9 . . . . . Recommended bi-county organization
Figure 10 . . . . . Suggested Internal Organization - Nassau County



NOTE: ADAPTED FROM NEW YORK WATER RESOURCES COMMISSION BULLETIN NO. 62, 1968

GEOLOGIC SECTION OF PRINCIPAL LONG ISLAND AQUIFERS

FIGURE 1

EXPLANATION

TYPES OF GROUND-WATER DISCHARGE

1 Seepage to streams
2 Subsurface outflow
3 Evapotranspiration
4 Spring flow

General movement of fresh ground water

Fresh ground water

Salty ground water

FIGURE 2

GROUND-WATER MOVEMENT AND DISCHARGE ON LONG ISLAND, NEW YORK, UNDER NATURAL CONDITIONS

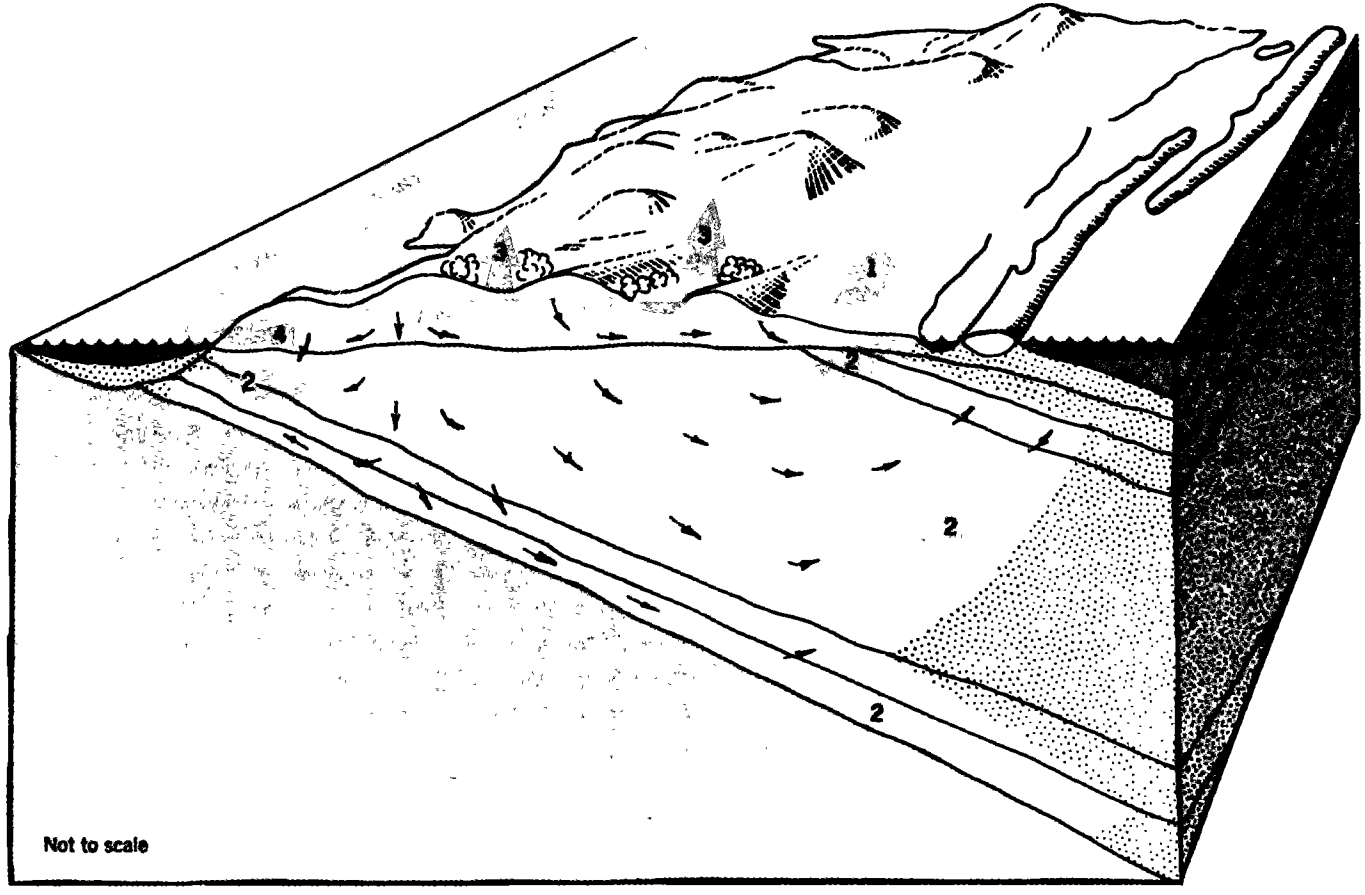


FIGURE 3
HISTORY OF WATER DEVELOPMENT ON LONG ISLAND, NEW YORK IN 1966
(After Heath, Foxworthy, and Cohen, 1966, figs 5-7)

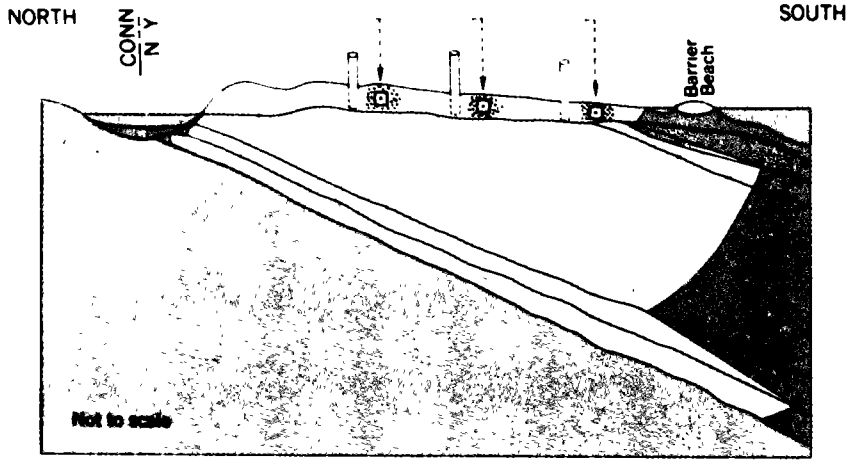


FIGURE 1. First stage of development

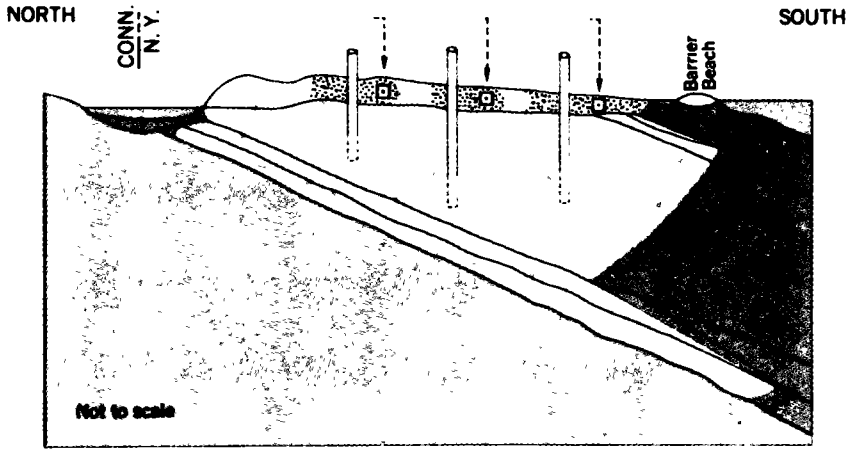


FIGURE 2 Second stage of development

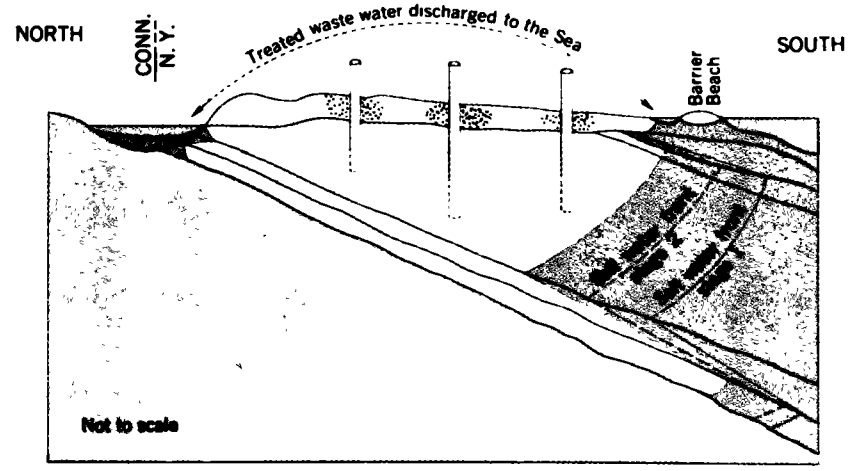


FIGURE 3 Third stage of development

EXPLANATION

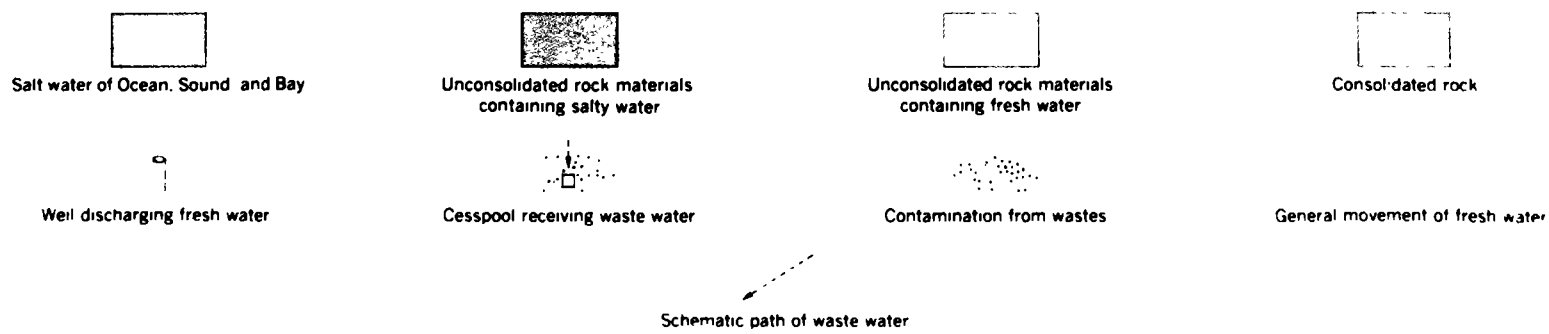
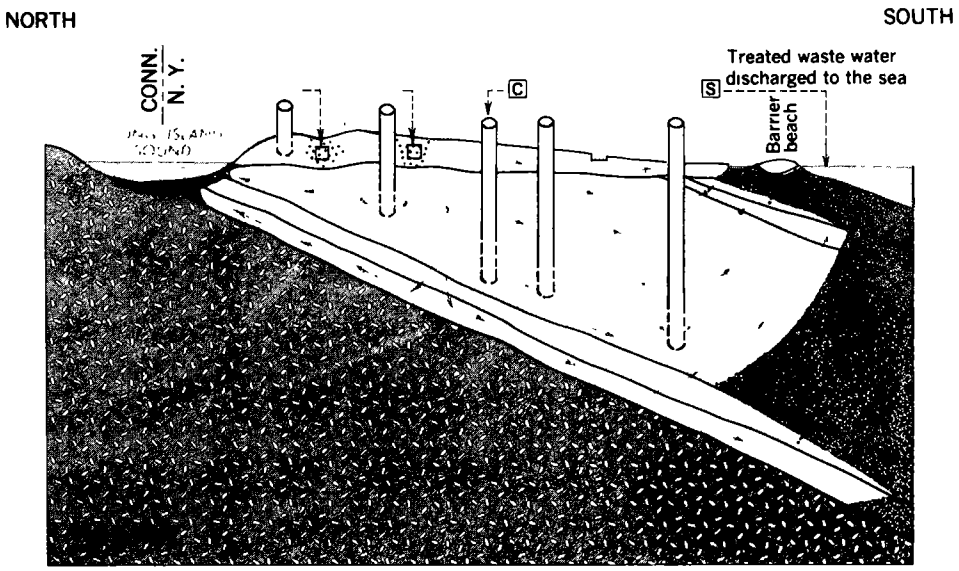


FIGURE 4

ALTERNATIVE METHOD OF MANAGING
THE WATER RESOURCE OF LONG ISLAND, NEW YORK

PROPOSAL TO CONTINUE WITH THE PRESENT METHODS OF DEVELOPMENT



EXPLANATION

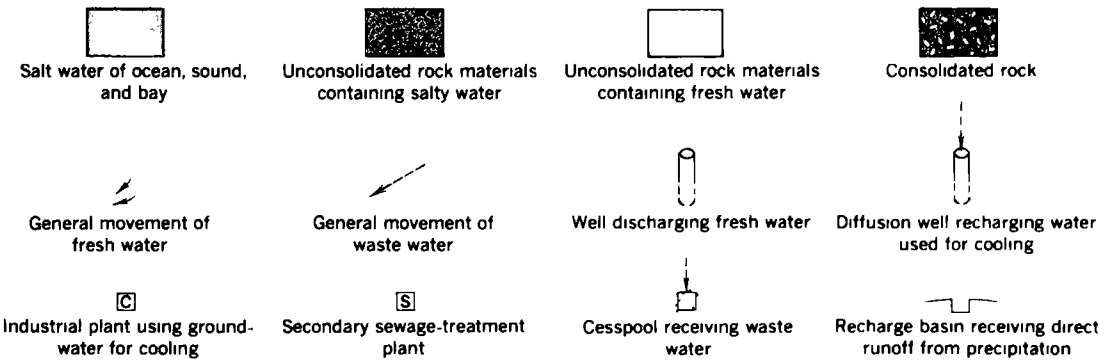
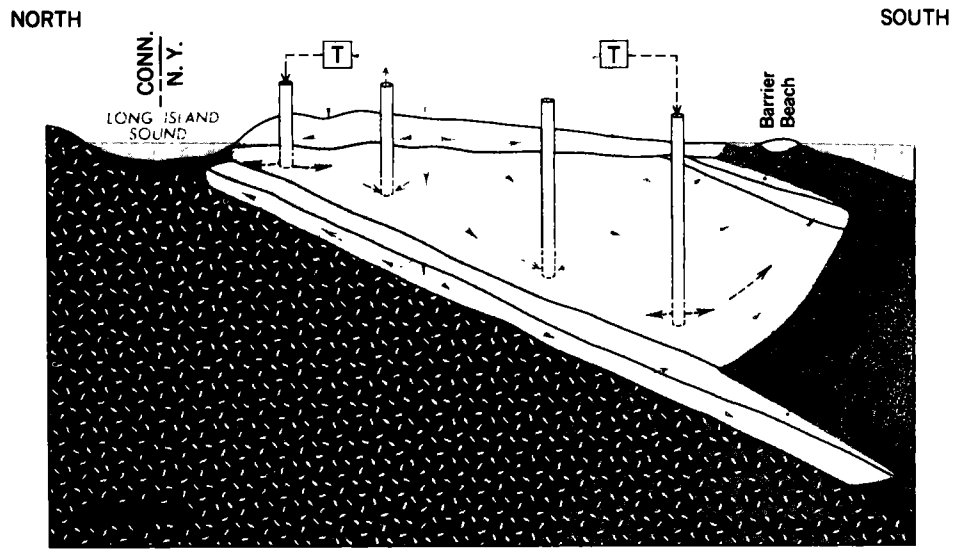


FIGURE 5

ALTERNATIVE METHOD OF MANAGING

THE WATER RESOURCES OF LONG ISLAND, NEW YORK

PROPOSAL TO DEVELOP BARRIER-INJECTION WELLS



EXPLANATION

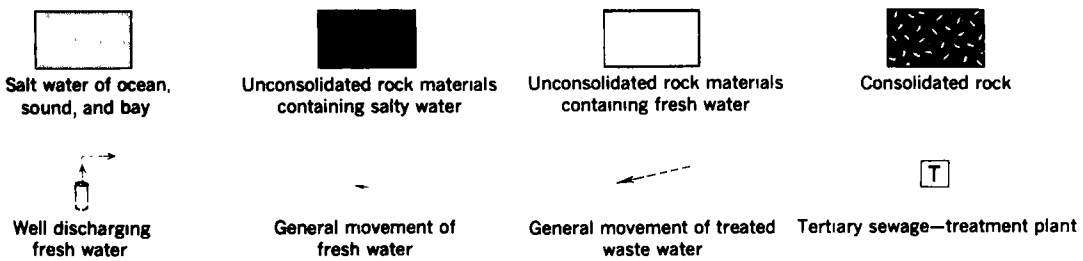


FIGURE 6
ALTERNATIVE METHOD OF MANAGING
THE WATER RESOURCES OF LONG ISLAND, NEW YORK

PROPOSAL TO INJECT TREATED WASTE WATER THROUGH RECHARGE BASINS

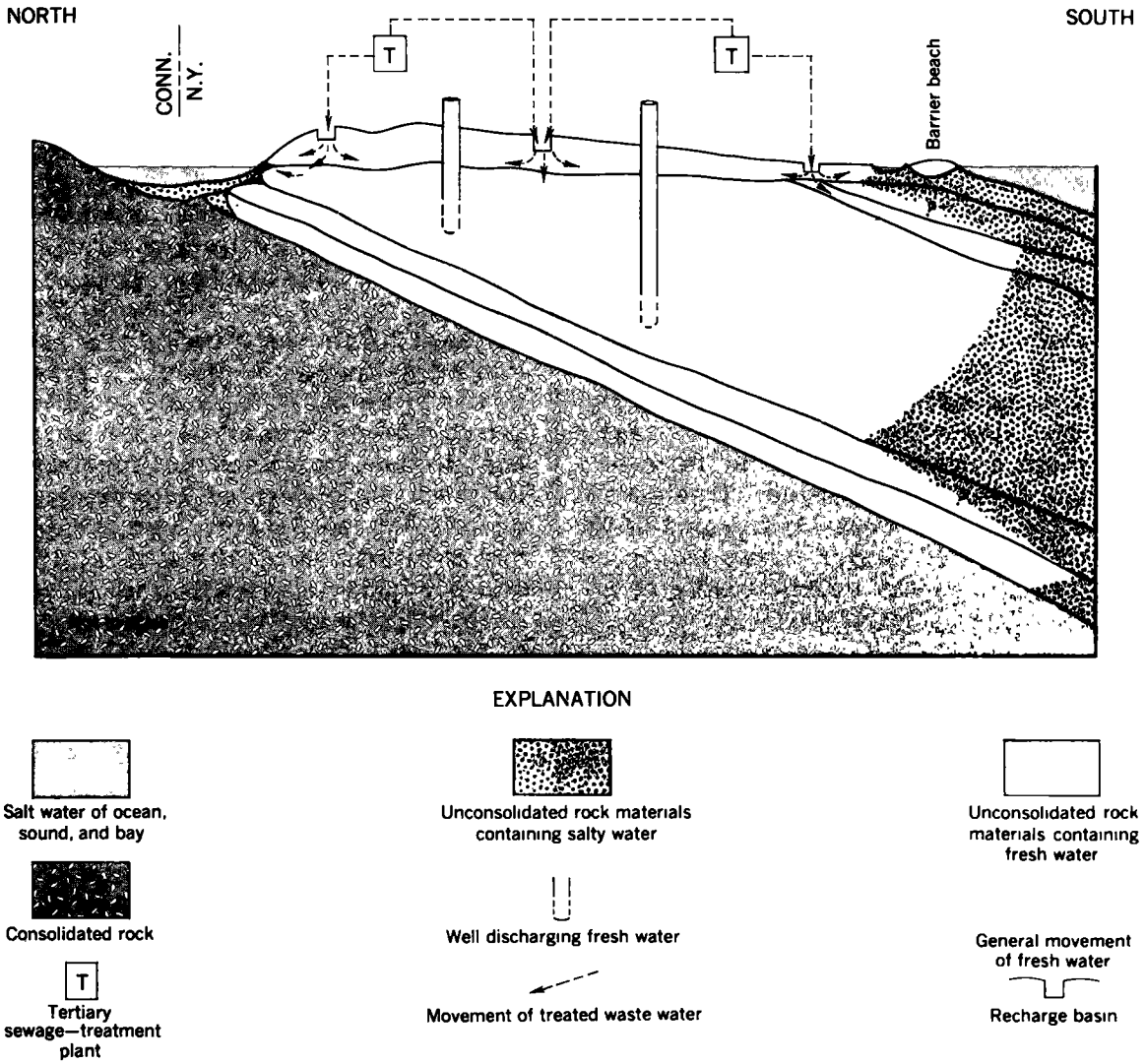
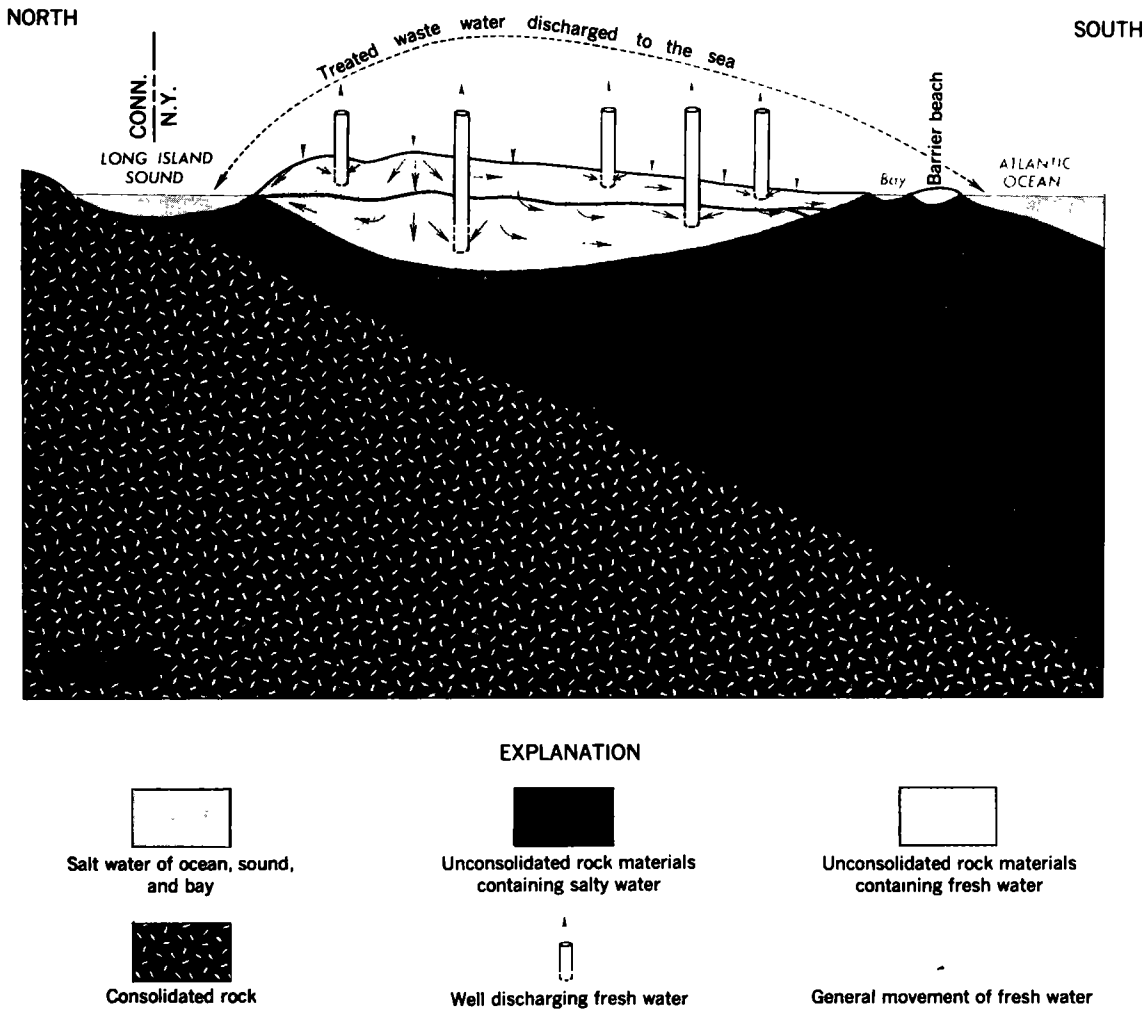
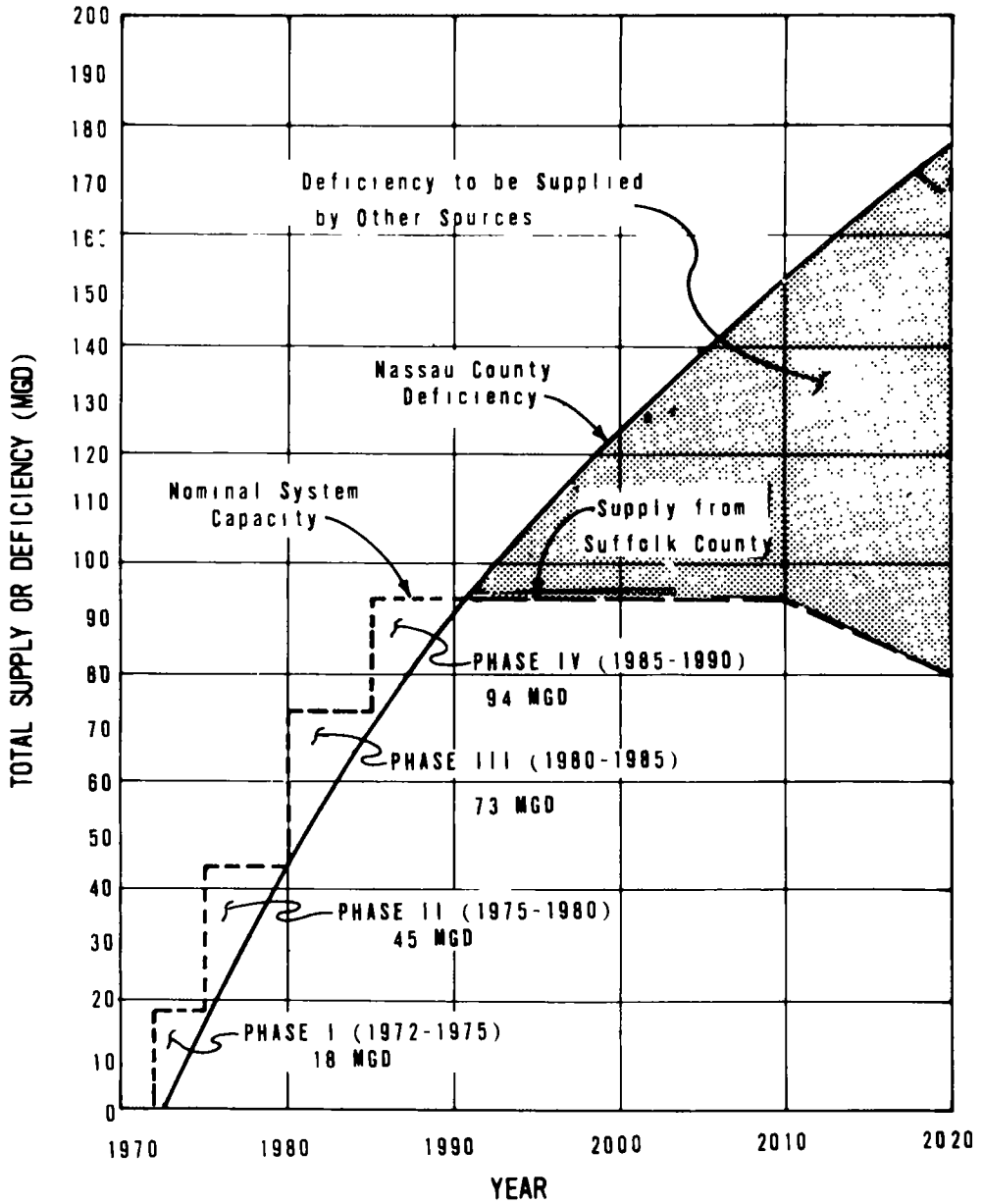


FIGURE 7
ALTERNATIVE METHOD OF MANAGING
THE WATER RESOURCES OF LONG ISLAND, NEW YORK

PROPOSAL TO PERMIT SALT-WATER INTRUSION



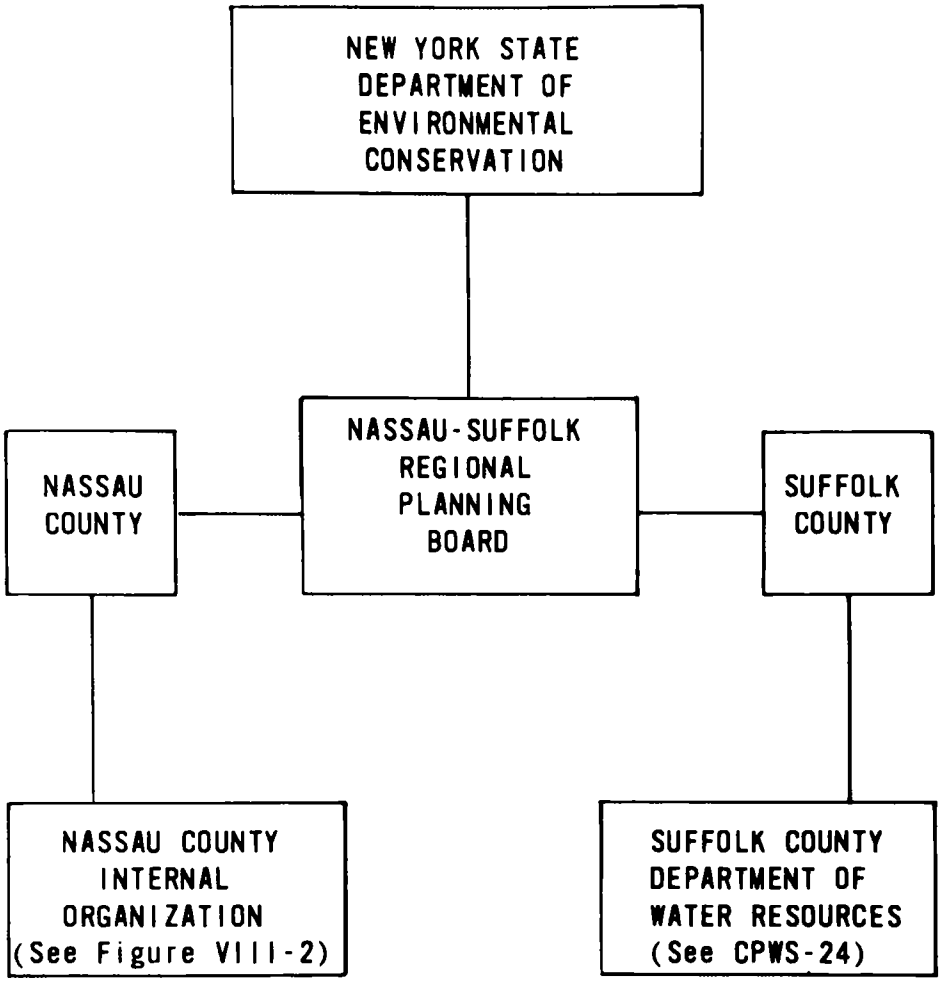


COMPREHENSIVE WATER SUPPLY STUDY
NASSAU COUNTY, NEW YORK
CPWS-60

SUPPLEMENTAL SUPPLY
FROM SUFFOLK COUNTY
FIGURE 8

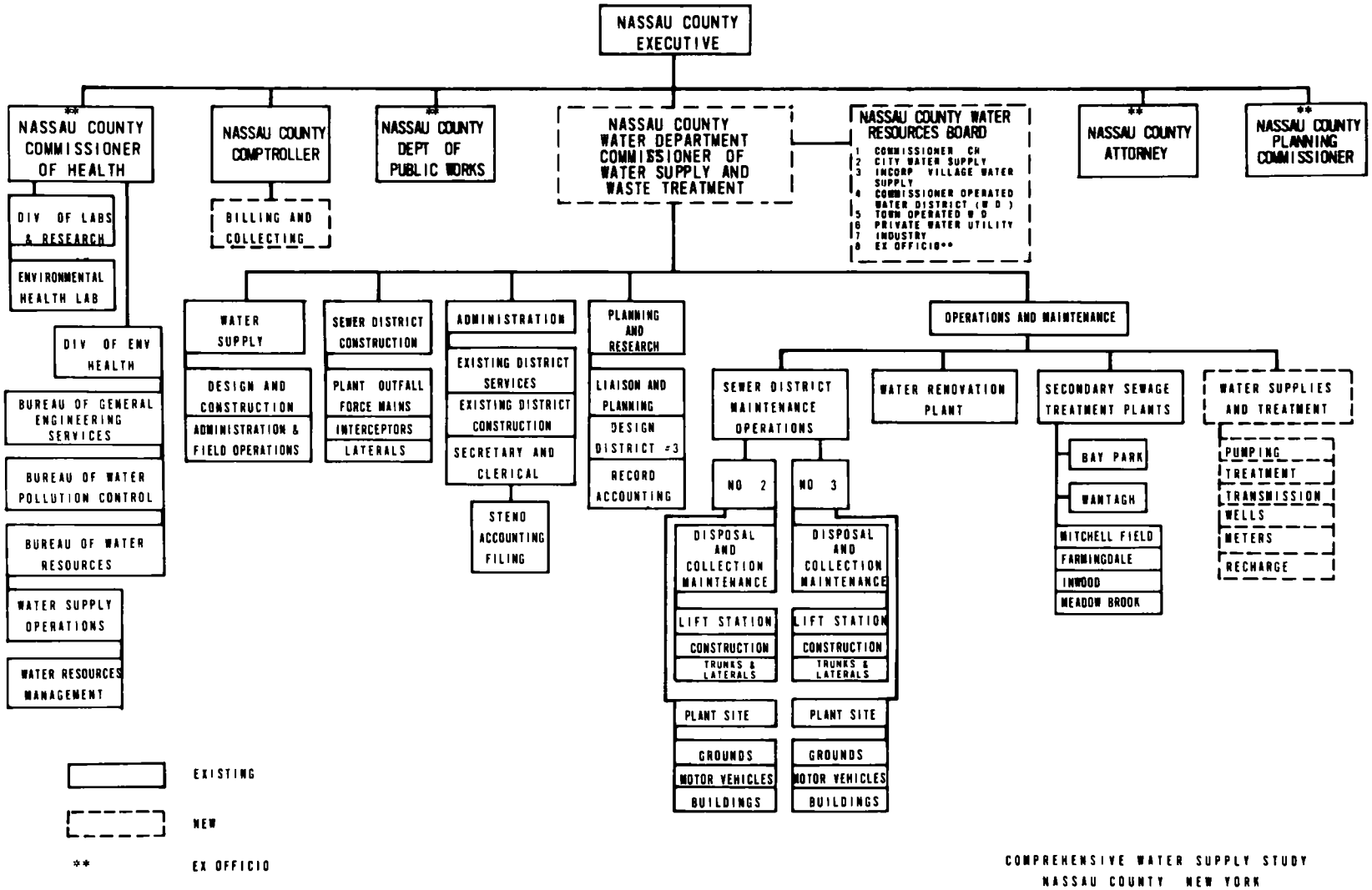
GREELEY AND HANSEN

HOLZMACHER, McLENDON & MURRELL



COMPREHENSIVE WATER SUPPLY STUDY
NASSAU COUNTY, NEW YORK
CPWS-60
RECOMMENDED BICOUNTY ORGANIZATION
FIGURE 9

GREELEY AND HANSEN
HOLZMACHER, McLENDON & MURRELL



COMPREHENSIVE WATER SUPPLY STUDY
NASSAU COUNTY NEW YORK
CPWS-60

SUGGESTED INTERNAL ORGANIZATION FOR NASSAU COUNTY

GREELEY AND HANSEN
HOLZMACHER, McLENDON & MURRELL

FIGURE 10

APPENDIX D

LONG ISLAND WATER CONFERENCE

COMPREHENSIVE PLANNING COMMITTEE

LONG ISLAND'S WATER SUPPLY
AND ITS MANAGEMENT
A STATUS REPORT

PRESENTED AT THE
LONG ISLAND WATER CONFERENCE
SIXTH ANNUAL LEGISLATIVE DINNER
ON NOVEMBER 22, 1971
BY
LOUIS MIRANDO
COMPREHENSIVE PLANNING COMMITTEE CHAIRMAN

Chairman Lauman, Members of the Conference, Honored Legislators and Guests:

Water resources seems to be one of the prime interests of today's concentrated emphasis on the ecology and of prime importance in dealing with water resources is tonight's subject – *Water Supply and Its Management.*

The importance of the subject can best be appreciated when you consider that our water supply affects a present bi-county population as great, or greater than, the population of 25 of our fifty states. Imagine, that's one half of the states that comprise the United States.

It is not my intention to saddle you with statistics about our water resources, but rather to try to enlighten you on the major conclusions and recommendations recently promulgated in two State-funded Comprehensive Public Water Supply Reports prepared for Nassau and Suffolk Counties, respectively and to impress on you the conclusions and recommendations of the Comprehensive Planning Committee of the Long Island Water Conference.

First, let me give you some background about how and why the Long Island Water Conference got into the planning business through the establishment of this very essential committee.

In 1966, Long Island was nearing the end of it's well publicized 1962 to 1966 drought. Less ground water recharge, due to decreased rainfall, coupled with increased use of water as a result of the drought, dramatically illustrated, particularly in Nassau County, that the bi-county area has a limited resource.

Our water resources, an essential service long taken for granted, was in the public eye. It seemed the

expedient thing to do to place the blame somewhere for the drought. Some public officials, happily a very small minority, attempted to use the Local Water Districts and Suppliers as "whipping boys" - blaming them for a fact of life over which they had no control, namely, the burgeoning population growth, with a subsequent greater demand on the existing water supply. In a word, the water consumption continued to increase greatly, but the groundwater recharge remained relatively constant. As you know, legislation was introduced repeatedly in the State Assembly which would allegedly solve all of our water supply problems by eliminating the local water supplier. This is a pat solution but it doesn't work! Among those who recognized that combining the local water suppliers into one big agency did not add a single drop of water to our supply was the present Nassau County Executive. On March 28th, 1966, he addressed the Long Island Water Conference, exhorting the Conference to come up with a positive solution as a group to preserve our resources for future generations. The local water districts and suppliers who had served so well in the past and continued to do so, accepted the challenge. Mutual aid between suppliers was their immediate answer. No area would suffer a shortage in a time of emergency.

The Comprehensive Planning Committee was formed and immediately began its first task, that of persuading and assisting the top management in each water supply unit to formalize agreements to furnish water to neighboring water supply areas on an emergency basis. *On it's own initiative, the Planning Committee of the Long Island Water Conference, established longer range goals of installing large transmission mains to convey fresh water from areas where the water table was relatively high to other areas where the water table may be low and salt water intrusion a problem.*

The principle of apportioning water from surplus areas to deficiency areas is, in fact, already done by nature, since water movement underground knows no political boundaries. The local water suppliers were now helping nature do a better and more effective job. Now and in the forseeable future, no area need be without water, if it's neighboring supplier has an abundant supply. Your local water suppliers are seeing to this.

Every water supply system in Nassau County, and most in Suffolk, are interconnected with at least one other supplier and many of these interconnections have been utilized to the benefit of all the people in our two counties.

The Planning Committee of the Conference has taken important positive positions with respect to the investigation of barrier well injection and inland recharge of sewage plant effluent and the requiring of universal metering of all public water supplys.

Today's problems in Nassau County become tomorrow's problems in Suffolk County and involvement of the committee is now being turned to Suffolk County toward a regional approach. When we say regional, we mean in the area of cooperation, *not control!*

Dealing with the water supply problems in Nassau County, required us to go a step further. Approximately three years ago, the Long Island Water Conference began participation in the New York State sponsored Comprehensive Public Water Supply study, known as CPWS No. 60. In doing so, the Conference was instrumental in securing additional State funds necessary to conduct essential phases of this study.

Since the Long Island Water Conference has long been adamant in its resolve to fight the creation of a Nassau County Water Authority or any change in the management of the resource made merely for the sake of change, concentrated efforts were made to study all forms of management.

Holzmacher, McLendon and Murrell were designated by the Water Conference to work in conjunction with Greely and Hanson on a sub-contract basis to supply the basic data necessary to other parts of the

report and to prepare a Water Management Plan for Nassau County, based on utilization of the existing local water districts and suppliers, whereas Greely and Hanson would pursue the alternate of a Management Plan, utilizing a central form of control. We were not hesitant to take this step, for we were confident of our position that the existence of the local water suppliers would not be threatened because we knew that for a pure and plentiful water supply, the water districts and suppliers were absolutely necessary.

As the work on the report proceeded and various alternates were discussed, both Greely and Hanson, the prime consultant, and the Conference engineers, Holzmacher, McLendon and Murrell, saw fit, after considering a series of alternates, to recommend the use of an identical plan.

Now, what was the plan recommended for Nassau County and what did the CPWS No. 60 study show? —

First, since 1946, there has been a steady increase in consumptive water use due to the population growth and sewering programs in Nassau County.

The extensive use of cesspools and septic tanks in unsewered areas of the county, has led to a general deterioration in ground water quality, especially in respect to the increased concentration of nitrates.

In areas of high population density and accompanying overdraft, there has been a marked increase in salt water encroachment or lowering of the water table.

The annual average quantity of water entering the groundwater reserve for Nassau County is about 201 million gallons per day and the maximum rate at which water can be withdrawn and consumed perennially without bringing about some undesired result (called the Permissive Sustained Yield) is estimated to average 151 million gallons per day. In 1968, there was an estimated surplus of 32 million gallons per day. In the year 1990, there will be an estimated deficit of 92 million gallons per day and by 2020, a deficit of 177 million gallons per day.

The prime potential sources of future supply in excess of the 151 million gallons per day permissive sustained yield for Nassau County are:

(1) *importing Suffolk County's surplus water;*
(2) *recycling through recharge basins or direct reuse of Nassau County's wastewater after it has been renovated;*
(3) *planned mining from the ground water reservoir and —*
(4) *purchase of water from New York City.*

A supply plan predicated on importation of Suffolk County's surplus water could meet all of Nassau County's supplemental needs of 94 million gallons per day through 1990, continuing at that rate through 2110, and decreasing thereafter to 80 million gallons per day in 2020, then subsequently, to zero as Suffolk's local demands increase. The plan would include spread withdrawal in Nassau County and western Suffolk County, treatment of the well water as required and pumps and transmission mains to deliver the waters from areas of surplus to areas of deficiencies. The mutual aid plan instituted by the member suppliers of the Water Conference now becomes an essential feature of such a program.

The report further points out that a supply source for the needs of the 1990-2020 period is not recommended for selection at the present time. The possible supply plans for the additional supply of water needed during the 1990-2020 period, should be considered in the selection of the 1970-1990 plan, since the two plans should be compatible. The most likely sources which could supply the additional needs during the 1990-2020 period are:

(1) recycling of renovated waste water and —

(2) the New York City source.

This same report states that inasmuch as Nassau County forms only a portion of the Nassau-Suffolk County water budget area, which is an indivisible geohydrologic unit, the management of the area's water resources should be on a regional basis but as I have pointed out, this should be a mutually cooperative basis, not one of regional control. This report also tells us that it will be the responsibility of the New York State Department of Environmental Conservation to insure that the management is responsive to the available resources and to the people living in the water budget area - and how better is that going to be done than by an independent local water district or supplier.

With respect, gentlemen, to a county management plan, the report recommends the implementation of a deficiency supply plan administered by a water resources board and a county water department.

The plan, which requires the least initial expenditure for implementation would work as follows:

"A County Supplemental Department and Water Resources Board comprised of representatives from operating water districts and suppliers would function to organize, construct, operate and administer a supplementary supply plan, including the financing; countywide planning and coordination; expand the existing renovation and recharge studies and research; conduct finance and execute additional research and continuing programs in connection with the resource.

The existing utilities would maintain present ownership of all facilities and would continue to serve their areas up to the permissive sustained yield, provide peak capacity, main extensions, distribution storage and normal expansion. Withdrawals would be limited to the permissive sustained yield, with the assurance that average requirement in excess of permissive sustained yield or quantities of suitable quality, or both, would be provided by the County Department."

WE AGREE WITH THIS VIEW!!!

There is additional legislation on a state level required in order to achieve the desired management and administrative plans in the areas –

(1) affecting land use to facilitate construction of major regional transmission mains, wells and pumping stations.

(2) broadening the powers of the State Department of Environmental Conservation - and

(3) delineating the responsibility between the county water department and the local water suppliers.

I strongly urge you, gentlemen, to seek our counsel when such bills are proposed.

The proposals, as spelled out in the report, more than assure the continuance of an adequate water supply. The Water Conference is firm in its position that there is no need for the creation of an additional governmental agency beyond that suggested in the report. Thus, one can readily see that the existence of the local water district and suppliers is an absolute necessity.

Let's turn to Suffolk County. CPWS No. 24 for Suffolk County was initiated by the New York State Department of Health and the County of Suffolk in 1966; after it became evident that a study to govern the long range development of the Suffolk County water supplies was necessary. It, together with the Nassau County Study, was one of a series of studies concurrently conducted throughout the State of New York.

Some of the highlights of that study excerpted from the summary of the report are as follows:

"Future permanent population is projected to reach 3,060,000 by the year 2020.

Total estimated water usage in Suffolk County increased from an average of approximately 46 million gallons per day in 1950 to 128 million gallons per day in 1966.

Total dry year water use in the future is projected to increase to nearly 474 million gallons per day in the year 2020.

In a year of average precipitation, the water usage is estimated to be fifteen per cent less than the previously cited dry year use.

Consumptive water use, rather than total water use, represents a net loss from available supplies.

Future consumptive use is projected to increase....by 2020 to 381 million gallons per day in an average year and to 448 million gallons per day in a dry year, assuming the entire County were sewered.

The source of all fresh water in Suffolk County is precipitation.

The estimated permissive sustained yield for the 647 square mile water budget area of Suffolk County is estimated at 466 million gallons per day.

The estimates of permissive sustained yield are predicated on the basic assumption that the quality of the ground water will not become contaminated to the extent that portions of the groundwater reservoir cannot be utilized for public water supply.

The maintenance and/or restoration or ground water quality to high levels is considered of overriding importance. This can only be accomplished by the installation of sanitary sewers within the recharge areas which will intercept most of the contaminants now reaching the ground water.

Looking into the future to the time when overall water demands will exceed the permissive sustained yield, the large scale reclamation of waste water appears to offer the most economical means of meeting large scale deficiencies.

The discharge of highly treated waste water directly to streams, lakes and ponds offers some important advantages.

A comprehensive ecological study is necessary to determine the amount and quality of fresh water flow necessary to maintain the present environment of the shallow low salinity bays.

Suffolk will have surpluses to meet Nassau County's projected deficiencies until approximately 2010, assuming no substantial recharge for ecological reasons. From a technical standpoint, such a transfer is feasible. Any decision to do so, however, is a political one and must be resolved between the two counties and the State."

Gentlemen, this concludes a review of the current planning which has been going on in Nassau and Suffolk for the past several years. What are the recommendations of the Water Conference?

First - Prevention of continued contamination of the ground water resources of Long Island by sewage can be accomplished by the rapid installation of municipal sewage collection and treatment and disposal facilities in those areas in which discharge of insufficiently treated domestic sewage threatens the quality of the groundwater resources. *Planning for municipal sewage systems should be intensified in all areas of both counties!!*

Wastewater represents an increasing fraction of Long Island's total water resources and should be reclaimed for beneficial reuse. To this end, the development and application of methods for wastewater reclaimation must be accelerated.

We strongly recommend that Nassau with Suffolk adopt a *regional* cooperative effort toward an even better management of its resource through utilization of its existing water districts and suppliers. We commend the leaders of both counties for pooling their resources to set up a technological partnership for the purposes of carrying out field studies on treating sewage so that it could be returned safely to the groundwaters and on testing methods of recycling.

WE BELIEVE IT IS A STEP IN THE RIGHT DIRECTION!!!

The logic of this cooperative partnership management plan to extend over the entire water budget area of Nassau and Suffolk is obvious. Optimum management of our water resources can thus be achieved when treated on a basin level rather than on a political boundry basis.

In conclusion, gentlemen, let me state for the record that when the final judgment is made, I am confident that the water resources for the bi-county area will be utilized to benefit both Nassau and Suffolk and just as Nassau County is meeting the challenge of appropriating its available water through the efforts of existing suppliers so that there will be no area shortages, the bi-county area of Nassau and Suffolk must work together in a spirit of cooperation in solving their mutual water resource problems.

The policy statement printed on the back of tonight's program, and reprinted from last year, has renewed meaning in light of recent events. Please take it with you and refer to it when dealing with matters affecting water resources.

Available always for expert and professional advice and guidance is the Water Conference and its Comprehensive Planning Committee.

Don't be hesitant about consulting us!

Thank you.

NEW YORK CITY

April 23, 1971

New York City

NEW YORK CITY CONFERENCE

OPENING REMARKS

Mr. E. Virgil Conway, *Chairman,* called the meeting to order at 9:50 a.m. In his opening remarks, he noted that this meeting was one of a series of meetings that the Commission had scheduled with local water management officials. The first was held in Suffolk County, this was the second, and subsequent meetings would be held in each county in the Commission service area. He noted the major role that the City of New York has in the water supply for Southeastern New York, and expressed his appreciation to the New York City people for their cooperation and assistance in setting up the meeting and providing for space and luncheon. He particularly noted "the Commission is here to listen, absorb, and broaden its views of the particular problems of water supply for New York City". He further noted that this was an informal conference and was not in any sense a public hearing.

Mr. Hennigan, *Executive Director:* "The purpose of the meeting is to familiarize the Commission with the water supply situation from the viewpoint of the city water officials". He further noted that the City of New York water supply is, in fact a regional water supply for Southeastern New York. Consequently, the development, operation and policies concerning the New York City water supply have a direct relation to water supply and related issues in the eight counties of the service area, and to the counties in the source area. He noted that in the future, when recommendations for alternative courses of action have been developed, the Commission will hold public hearings throughout the study area. Mr. Hennigan expressed his appreciation to the New York City officials, particularly to Mr. Maguire, for their assistance in making the arrangements for the meeting.

PRESENTATION

Mr. Rosenberg, *President of the Board of Water Supply:* Mr. Rosenberg made the following statement:

"On behalf of the Board of Water Supply, it gives me great pleasure to welcome the Commission. I hope as the work of this Commission continues, you will make use of these offices whenever convenient. New York City is probably the largest supplier of water in the world. We are acutely aware of the problems of water supply. After all, how many entities are there that have to furnish an average of 1500 million gallons of water a day. We have prepared a series of charts and slides that present graphically the water supply problems of New York City.

New York City has greater needs than our presently developed resources. We recognize that our problems are not unique and that our neighbors to the north have similar water supply problems. After a careful examination of various sources and methods of increasing the present supply such as desalization, reuse of water and meters, we believe that the most feasible plan would be to go into the forest preserve area of the Adirondacks, and without too much interference with the area, develop an additional supply

of water to help solve the problems of New York City and the area to the north of us. If, as the Commission considers the problem, it develops an alternative to going into the Adirondacks, we will of course give it our most careful consideration. We are delighted to join with this Commission in reviewing and attempting to solve the water supply problem of Southeastern New York."

Mr. Rosenberg then explained the difference between the Board of Water Supply and the Department of Water Resources. The Board of Water Supply is the development and construction agency, and the Department of Water Resources, Bureau of Water Supply is the operating agency. The Board plans, develops, and constructs the source and delivery systems. On their completion they are turned over to the Department for operation. There is no overlap of function. Definition of responsibility is well delineated and as a practical matter works very well.

Mr. Feldman, *Commissioner Department of Water Resources,* briefly explained the organization of the Department of Water Resources. He noted that it is one of the three departments of the super agency, the Environmental Protection Administration. The other two departments in this agency are Sanitation and Air Resources. The Department of Water Resources is subdivided into two major bureaus, water supply and water pollution control. The former operates the water supply facilities, and the latter the sewage collection and treatment facilities. He noted that since the Department would be involved in the operation of any facilities which resulted from the Commission work, he felt that they should have a major input into any scheme.

Mr. Vincent G. Terenzio, *The Chief Engineer of the Board of Water Supply:* Mr. Terenzio began the main presentation by saying that the development and operation of the New York City Water Supply proceeds on a double premise. The first premise being that water is necessary to life, superceded only by the need for air. The second premise is that you can never shut down a water supply system. It must be available continuously without interruption.

He noted that the presentation would be in two segments: the morning session would be a description of the existing water supply systems of the city; the afternoon session would concentrate on water supply needs; furthermore, an extensive number of slides have been prepared for the presentation. (Note: The total number of slides used was 41, 27 for the morning session, 14 for the afternoon session. Some of the key slides used are reproduced in these minutes. Lists of the slides used are appended (Appendices D and E).

PRESENTATION MORNING SESSION

The New York City water supply system is a surface water system which was developed by impounding water in upland areas and then feeding this water through aqueducts to a control reservoir (Kensico). At the control reservoir the waters are brought together blended, and fed into the major distribution network through Westchester County. For convenience in discussing we can then consider everything north of Kensico reservoir as basically the supply and delivery area and, everything south of Kensico can be considered the service area.

The city draws water from three separate systems illustrated on the chart (Figure 1 Appended), which were developed separately as the need for more water was recognized. The chronological order of development of the three was: Croton, Catskill, and Delaware.

The Croton supply was originally developed for the Borough of Manhattan prior to the city consolidation of 1898. Croton system develops water from 370 square miles of the drainage area of the Croton River in Westchester and Putnam Counties by the use of twelve reservoirs and five controlled lakes. The Croton System has a yield of 300 million gallons per day (MGD). Water from the *upper* Croton System (40 MGD) is delivered to the Kensico Reservoir via the Delaware Aqueduct. Water from the *lower* Croton System flows by gravity through the Croton Aqueduct to Jerome Park Reservoir in the Bronx and then to Central Park reservoir. Water from the lower Croton can be pumped to Kensico for delivery into the intermediate pressure system. The gravity supply from the lower Croton is a low pressure system serving Manhattan.

The Catskill System consists of two reservoirs and the Catskill Aqueduct. The reservoirs are the Schoharie and Ashokan. Ashokan Reservoir impounds water from 257 square miles of drainage area on the Esopus Creek watershed which is tributary to the Hudson River. The impoundment is located on the eastern slope of the Catskill Mountains in Ulster County and was put into operation around 1915. Schoharie Reservoir was built in 1924 on Schoharie Creek and drains a watershed of 314 square miles, located on the northern slopes of the Catskills. Schoharie Creek is a tributary of the Mohawk River. Water is delivered from Schoharie Reservoir via a pressure tunnel 18 miles long which delivers water under the watershed divide to upper Esopus Creek. The water then flows in the open stream channel to Ashokan Reservoir. Water is delivered from the Ashokan by the Catskill Aqueduct to Kensico. The Catskill Aqueduct is an on-grade conduit approximately 17 feet in diameter. It was constructed by the cut and cover method; that is, a trench was excavated, the aqueduct was built in the trench, and the finished aqueduct was covered with earth. It is 76 miles long from Ashokan Reservoir to Kensico. 550± million gallons of water per day is produced by the Catskill system.

The system last constructed is the Delaware System and consists of three major supply reservoirs and a collecting reservoir: Cannonsville on the West Branch of the Delaware River, Pepacton on the East Branch of the Delaware River, Neversink on the Neversink River and Rondout on Rondout Creek. Rondout Reservoir is located on the Hudson River watershed and is the collecting reservoir for the other three impoundments. Water is delivered via separate tunnels from Cannonsville, Pepacton, and Neversink to Rondout. From Rondout the water is delivered via the Delaware Aqueduct to Kensico Reservoir. The Delaware Aqueduct is a deep pressure tunnel 85 miles long. Its maximum depth below the surface is 2500 feet. In addition to serving as a collecting reservoir Rondout collects water from its own watershed. The watersheds drained and the capacities of the reservoirs in the Delaware system are as follows:

DELAWARE SYSTEM RESERVOIRS

WATERSHEDS AND CAPACITIES

Reservoir	*Rondout*	*Neversink*	*Pepacton*	*Cannonsville*
Trib. area sq. miles	95	93	372	450
Capacity (billion gals.)	50	35.5	143.7	97

The Delaware Aqueduct was completed in 1945, Rondout and Neversink in 1953. Papacton was completed in 1955 and Cannonsville in 1965.

While the Delaware system has an authorized delivery of 800 million gallons of water per day, it produces about 600 million. The development of the Delaware sytem resulted in some problems because the Delaware is an interstate stream which flows from New York into and through Pennsylvania, New Jersey and Delaware. When the project was being planned, the taking of Delaware River water for New York water supply purposes was challenged by the downstream states since it involved the interbasin transfer of water and subsequent loss to downstream users. This resulted in the Supreme Court decree which requires that certain waters be released from the reservoirs downstream and certain minimum flows be maintained at Montague, New Jersey, a location just below the Pennsylvania-New York-New Jersey line. In addition to minimum flow requirements, there are certain excess flow requirements, which increases the amount of water that must be released. Consequently, the Delaware System provides water for delivery to the city for water supply purposes, and also for release downstream to comply with the Supreme Court decree. The decree was strengthened by the formation of the Delaware River Basin Compact, which is an interstate-federal agency consisting of New York, New Jersey, Pennsylvania, Delaware and the Federal Government. Part of the interstate compact was an agreement not to request changes in the Supreme Court decree for 100 years.

The delivery from the three systems into the city distribution system is somewhat complicated and not as simple as it may appear. Reference to slides (Figures 1 and 2, Appended) during the discussion will be of great help.

Water from the Catskill and Delaware Sytems is delivered to Kensico Reservoir (Elevation 357) via their respective aqueducts. The Delaware aqueduct also intercepts the upper Croton (43 sq. miles - 11.5% of Croton System) at West Branch Reservoir (Elevation 503) for delivery to Kensico. Kensico is the main mixing and equalizing reservoir. From Kensico the water flows to Hillview Reservoir (Elevation 295). Hillview is the major pressure regulating basin on the system.

From Hillview Reservoir the water is delivered through the city by city tunnels No. 1 and No. 2, deep rock tunnels which form a 38 mile loop. The original city tunnel No. 1 (1917) took care of Manhattan Island and the newer tunnel No. 2 (1936) runs through the Bronx, Queens, and Brooklyn. The latest addition is the Richmond tunnel which was completed in 1970 and carries water under the upper bay to Staten Island. The Richmond Tunnel replaces two pipelines which were very vulnerable to damage from activity in the bay. The original delivery systems were crowded over to the west side due to population density and distribution.

The Croton System as was noted previously was the first water supply system and was developed to furnish water to Manhattan. It is a low level, low pressure system. The upper portion (11.5%) of the Croton can be delivered to Kensico via the Delaware Aqueduct. However, the lower portion (88.5%) is fed into the city from Croton Reservoir (Elevation 196) through the new Croton Aqueduct to the Jerome Park Reservoir and then to the Central Park Reservoir. The old Croton aqueduct has been abandoned.

We are now in the process of making arrangements and undertaking new construction which will make Kensico the major pressure regulating basin for the system. This means that we will change from Hillview which has a one billion gallon capacity and a flow line of 295 to Kensico which has a 30.6 billion gallon capacity and a flow line of 357 feet. This will improve pressure levels and increase operating storage.

In order to incorporate Lower Croton into this new system pumping will be required since the Croton

flow line is 100' below Hillview and some 161' below Kensico.

The Kensico development is one stage of a four stage program to improve and reinforce the delivery within the City. The Board of Water Supply has developed a four stage program which is shown in the next slide (Figure 3 Appended). Stage No. 1 is under construction. Stage No. 2 will increase the capacity of the system to deliver water to lower Manhattan and to Queens and Brooklyn. Stage No. 4 provides for an alternate delivery route in case of the necessity to shut down one of the other tunnels. Stage No. 3 is the Kensico development and will join Kensico Reservoir directly to the city distribution system and reduce the dependency on Hillview Reservoir. In addition to the benefits mentioned, the main distribution network will be moved eastward greatly improving our water delivery capability to Long Island.

I don't intend to say anymore about distribution, but have some slides which will show some of the typical construction methods used in building the reservoirs and systems. (Mr. Terenzio then showed a series of slides which illustrated construction methods and techniques used. The construction of the Delaware Aqueduct was explained in great detail. See appended slide list).

In order to provide for an emergency water supply in 1959 and in the mid '60's we went to the Hudson River. In 1950 a plant was built at Chelsea on the Hudson River close to the point where the Delaware Aqueduct crosses the Hudson River. The original pump station was constructed in 1950 and was phased out in 1957 as a condition of the original state approval. As a matter of fact, it never was really used to provide water to the city. It was phased out because it was thought that the completed Delaware system would provide all the water we would ever need. The drought of the '60's forced us to reconsider the redevelopment of the emergency pumping station. This was done and the plant was rebuilt in six months and put into service. The plant provided 100 million gallons of water per day for the city system. The plant was used for about one year and furnished some 21 billion gallons of water for city use during the drought. At the present time the pumping station is kept on a standby basis and is started up on a regular basis to insure that it would be operable if needed.

DISCUSSION

Chairman Conway: How long did it take to build the Delaware System?

Mr. Terenzio: We started the aqueduct in 1936 and completed Cannonsville in 1965, some 29 years later. Some of the problems that we ran into included the war, with shortage of materials and shutdown of construction, the need to go back to the Supreme Court for change from the original Delaware plan, instead of a number of smaller reservoirs as in the original plan a request for a single large reservoir at Cannonsville was made. We asked for permission to build Cannonsville in 1951; it was actually completed in 1965, some 14 years. However, it took four years to get the amended decree from the Supreme Court. This experience of 35 years from start to finish might be a little misleading. Certain portions of the system such as the aqueduct to Rondout was completed in 1944, the first reservoirs in 1954, Pepacton in 1956, and Cannonsville in 1965. However, any major construction project calls for considerable lead time. The reasons may be different but every time we build, it takes from 15 to 20 years to start with an idea and finish up with a complete project.

Chairman Conway: That is what I understand, I think that it should be made clear to the Commission that it will take 20-25 years to build a major system. It would not be unreasonable to expect that any

future large development would take the same length of time.

Mr. Terenzio: We work by rule of thumb that we need 20 years lead time for any major project.

Chairman Conway: *Is there any major system now planned or underway?*

Mr. Terenzio: No, the Board is now working on the major distribution system improvements, which I described previously.

Mr. Rosenberg: Mr. Chairman, we have had newer sources under almost continuous study and have participated in numerous studies in use, reuse, and conservation. This is a continuing activity with us.

Chairman Conway: I wanted it made clear for the record that there is actually no construction underway for the development of new sources of supply. This will be one of the things that the Commission will have to consider most seriously.

Mr. Forster: *Has the population growth along the shore of Croton Lake affected the quality of Croton water?*

Mr. Feldman: Because of the increased population on the watershed, we have been experiencing some quality control problems with the Croton water. We have had increasing growth of weeds and algae and a public flurry about insect larvae in the water which appeared in the taps of some parts of Manhattan. We feel that the water quality problems in the Croton are most largely due to the increase in population and more intensive land use on the watershed. However, at the present time, there is no indication that the water cannot be used and, in fact, most of the time simple chlorination is sufficient. That is all that we are using at the present time. We are anticipating the time when we will have to provide more treatment for Croton water. A pilot plant is now in operation to give us more information for design and operating purposes. We feel that we could probably start off with a conventional rapid sand filtration plant and as a second step, if proved necessary, provide for coagulation and sedimentation. We feel that we have the quality problem under control and as conditions change, we can provide treatment for the Croton water.

Mr. Hennigan: *How much water does the Croton System supply?*

Mr. Feldman: The Croton provides roughly 300 million gallons per day (MGD). However, I should point out that not all of this is available without pumping. Approximately 150 MGD can be delivered to the city by gravity, however, if we wish to take full advantage of the available water we must pump the remaining 150 MGD to a higher elevation to send it into the intermediate pressure system.

Chairman Conway: *Isn't the Croton System a complete system in itself?*

Mr. Feldman: It is a completely separate system. The west branch of the Croton, however, becomes a portion of the Delaware System and is fed into the Delaware Aqueduct. This means that about 40 MGD of the 300 MGD is fed directly into the high level along with the Delaware River water. The remainder is

used ordinarily to feed the prople on a city system served by the Croton system. However, the needs are only about half of the system yield.

Mr. Hennigan, *Executive Director, Southeast Water Supply Commission:* Do you mean that you only use half of the capacity of the Croton System?

Mr. Feldman: During the drought we used every bit of the water available, power was purchased so that we could utilize the full actual yield of the Croton. In years of normal or above normal rainfall, we may use no more than 150 or 180 MGD from the Croton system. The remainder spills to the outlet streams. Because it keeps the downstream conditions so desirable, many local people would prefer us to do this as a matter of policy, but we can't afford to give 100 or 150 MGD just to make streams pretty.

Mr. Hennigan: *How does the New York City-Long Island groundwater supply factor into your future plans and how do you use it today?*

Mr. Terenzio: We don't use it today and I don't think that it factors into our plans except as a possible emergency supply.

Mr. Groopman, *Chief Engineer, Department of Water Resources:* The Long Island System has a capacity of about 30 MGD. We now use it on a standby basis only. It was operated during the drought. Part of the property has been abandoned and is presently being sold by the City Department of Real Estate. However, we intend to keep the remainder on a maintenance basis. The facilities are located east of Freeport.

Chairman Conway: *Is there any restraint on the amount of water you can take?*

Mr. Groopman: No, there is no restraint. The only restraint is a physical one and the present pumping capacity is 30 MGD. The water is not of the highest quality but is potable. During the drought period the water was pumped into a reservoir in Brooklyn and mixed with Catskill water. A point of interest is that the City of Brooklyn originally obtained their water supply from this system. At that time, they had a water supply with a yield of about 60 MGD.

Mr. Santucci: *Has anything been said of the Jamaica Water Supply Company?*

Mr. Groopman: There are two private water supply companies. One is the Jamaica Water Supply Company which feeds most of the Fourth Ward in Queens. It is a groundwater supply with a present yield of 60-65 MGD.

The other private company is the Woodhaven Plant of the Utilities and Industry Corporation. This supply has a yield of about 10 MGD. However, they have serious water quality problems due to mineralization, nitrates, and chlorides. These two water supply companies obtained their franchises from the State before New York City was consolidated. They are regulated by the New York State Public Service Commission. Two companies serve approximately 650,000 people in Queens and the Jamaica Water Company serves an additional population in Nassau County.

Mr. Santucci: *I read recently where the Jamaica Water Supply Company has applied for a rate increase and intended to install meters at a cost of some $10 million. It was indicated that this was required to conserve water. This looks like there may be some difficulty in supply and furthermore, there are some comments about the quality of the water. This doesn't match with what has been said here but they are having no problems. Please explain?*

Mr. Groopman: There are some reports from the Geological Survey that the groundwater level is being lowered below sea level but as far as our sampling program is concerned, the water quality presents no problem at this time.

Mr. Santucci: *Is New York City planning to take over these private companies?*

Mr. Feldman: At one time the city as a matter of policy planned to take over the companies. However, the drought brought about the realization that our dependable yield was lower than we had previously estimated. Consequently, the city has pulled away from the idea of taking over the companies. We do feel that we might have to do something, as far as Woodhaven is concerned, particularly if the question of water quality becomes more serious. We feel that we can furnish this 10 MGD without any problem. However, this is basically a state issue since the city has no power over either U & I or Jamaica. There are no negotiations going on between the city and U & I for the takeover. Regarding the Jamaica Water Supply Company, we do not at the present have the resources to provide the additional 60 MGD from our present sources.

Mr. Santucci: *The Jamaica Water Supply Company application said that one of the considerations is a possibility of a takeover by the City of New York. It would appear that it is on the drawing board right now. Is this the case?*

Mr. Feldman: This is not the case at the present time.

Mr. Groopman: In 1965 there was some negotiation relative to this brought about by local area people who wanted New York City water. However, they lost their enthusiasm when we put restrictions on water use during the drought and the Jamaica Water Supply Company did not.

Mr. Santucci: *Is there any control in the taking of groundwater?*

Mr. Feldman: That is controlled by New York State Department of Environmental Conservation. Any well that produces more than 43 gallons per minute must be approved.

Mr. Santucci: *Is there any conjecture as to the length of time that the Jamaica Water Supply Company will last?*

Mr. Feldman: There would have to be an extensive study of the entire area. Some of their wells are in Nassau County, some in New York City. The U.S. Geological Survey would be competent to give us an opinion on this.

Mr. Santucci: *Shouldn't you be considering these things in your overall planning?*

Mr. Feldman: We do to the extent that we are ready to provide the 10 MGD for the U & I Co. We do not feel that we have the capacity to serve the Jamaica Water Supply Company area at this time. Hopefully the study of this Commission will take this into consideration.

Mr. Forster: After our first hearing in Suffolk County a representative of the United States Geological Survey said that the aquifer source by the Jamaica Water Supply Company was being mined. That is, more water was being taken out than being replenished. The danger, of course, was lowering of the water table and intrusion of saltwater. I would like to have that on the record because I think it is vital.

Mr. Groopman: There is another point that I would like to make. At the present time we don't have distribution facilities of sufficient strength to take over the Jamaica Water Supply Company. When the third city tunnel is completed, we will have enough distribution facilities. However, based on the drought of 1961-67 we don't have enough water to furnish the needed 60 MGD.

Mr. Santucci: *If the Jamaica Water Supply Company is mining water and if there is a danger of saltwater intrusion, it looks to me like an immediate problem and one that we can't wait 40 or 50 years to look into. Do you agree?*

Mr. Feldman: There are degrees of immediacy. U & I has a much greater problem than Jamaica does. However, in the long range view, provisions must be made for furnishing the 60 MGD. But for the present, since New York City has no direct control over Jamaica and they have not asked us for anything, the city has to take the position that we are not in any position to take over the company at this time.

Mr. Hennigan: The groundwater situation in Queens County has been studied by the USGS. I have a copy of a report prepared in 1971 and the abstract of that report (USGS-Water Supply Paper 2001-A, 1971) reads as follows:

"Queens County is a heavily populated borough of New York City, at the western end of Long Island, N.Y., in which large amounts of ground water are used, mostly for public supply. Ground water, pumped from local aquifers, by privately owned water-supply companies, supplied the water needs of about 750,000 of the nearly 2 million residents of the county in 1967; the balance was supplied by New York City from surface sources outside the county in upstate New York.

The county's aquifers consist of sand and gravel of Late Cretaceous and of Pleistocene ages, and the aquifers comprise a wedge-shaped ground-water reservoir lying on a southeastward-sloping floor of Precambrian (?) bedrock. Beds of clay and silt generally confine water in the deeper parts of the reservoir; water in the deeper aquifers ranges from poorly confined to well confined. Wisconsin-age glacial deposits in the uppermost part of the reservoir contain ground water under water-table conditions.

Ground water pumpage averaged about 60 MGD (million gallons per day) in Queens County from about 1900 to 1967. Much of the water was used in adjacent Kings County, another borough of New York City, prior to 1950. The large ground-water withdrawal has resulted in a wide-spread and still-growing cone of depression in the water table, reflecting a loss of about 61 billion gallons of freshwater from storage. Significant drawndown of the water table probably began with rapid urbanization of Queens

County in the 1920's. The county has been extensively paved, and storm and sanitary sewers divert water, which formerly entered the ground, to tidewater north and south of the county. Natural recharge to the aquifers has been reduced to about one half of the preurban rate and is below the withdrawal rate. Ground-water levels have declined more than 40 feet from the earliest-known levels, in 1903, to 1967, and the water table is below sea level in much of the county.

The aquifers are being contaminated by the movement of salty ground water toward the deepest parts of the cone of depression in central Queens County. Contamination of ground water is probably also occurring from leaking sewers and from pollutants leaking downward from the land surface. Thermal pollution of the ground water has occurred locally where ground water pumped for cooling uses is returned, with elevated temperatures, to the source aquifer through recharge wells.

The quality of groundwater in Queens County in 1967 was generally satisfactory for public-supply and most industrial uses. However, the rate and distribution of ground-water withdrawals in the county are leading to greater decline of the water table and to increasing contamination of the aquifers. No "safe limit" on pumpage can be set for the county because limits on the effects of pumping have not been established. A safe limit, at the present stage of urbanization, could range from considerably less than the current average 60 MGD to considerably more over a wide-range of pumping effects and acceptable water quality. However, continued removal of fresh water from storage and deterioration of water quality reduces the value of the county's aquifers, not only for current supply, but also for additional supply to the county and other parts of New York City in times of drought or other emergency."

Mr. Santucci: *Is there something that we should be doing regarding this or perhaps something the Board should be doing?*

Chairman Conway: Since this area includes 5% of the population in the study area, it is very significant in my judgment. We will have to include this issue in our report and recommendations. Apparently, both of these systems are in jeopardy and some plan must be made to insure that these companies have a dependable water supply.

Mr. Santucci: *Would I be correct in assuming that the New York Board of Water Supply has no jurisdiction or responsibility over the matter?*

Mr. Feldman: Basically that is the way I understand it, the companies were franchised by New York State before the existence of greater New York City. We have no powers over them. The State has primary jurisdiction.

Mr. Santucci: *Do you have any jurisdiction over company practices?*

Mr. Feldman: We have the authority of superintendence over the system but our role is secondary compared to the State Health Department. We are in constant contact with the Health Department in connection with all water supply problems in New York City including these two companies.

Mr. Santucci: *I just wondered in view of what Mr. Hennigan read whether we should look into the possibilities in planning?*

Mr. Feldman: We are doing that. There are two major needs before the city can commit itself to taking over the water supply responsibilities in these areas. One is increased yield from cities sources. And the second is completion of city tunnel No. 3 which will give us the distribution capacity to deliver the 60 MGD. These two major situations must be corrected before we can guarantee to deliver water to this area.

Chairman Conway: *This discussion has been a major input to the Commission work and is something that we will have to consider very seriously.*

PRESENTATION AFTERNOON SESSION

The afternoon presentation was made by Mr. Terenzio and focused on the water supply needs of New York City. The presentation, like the morning presentation, used a number of slides (14) some of which are reproduced in these minutes (see appended slide lists).

My presentation this afternoon will be based on a number of discrete topics again utilizing the slide presentation. In view of this, it would probably work out much better if you ask questions as they occur to you rather than wait until the end of the session like we did this morning. So I would suggest that you break in whenever you have a question. The first chart (Figure 4, Appended) is a set of curves showing both consumption and yield in MGD vs. the year. The varying solid line is the actual consumption which is extrapolated after 1970 as a dashed line.

The step curve is the yield curve. Each riser represents the introduction into the total New York City system of an additional source of water. The safe yield curve was based upon the historical records of minimum available yield. You will note that safe yield and consumption pretty well match with some excess capacity at times and some deficient capacity at times. If you matched all the steps in the yield curve, you would find it represents the progressive development of the Croton, Catskill and Delaware systems. You will note for 1969 that the consumption was 1400 MGD and the estimated safe yield 1805 MGD showing a considerable factor of safety of yield over demand. However, recalculating the safe yield based on the '60's drought, we find out that the new safe yield is 1295 MGD representing a deficit of 100 MGD± of yield over demand. The next slide (Figure 5, Appended) shows the estimated safe yield from each of the major components of the city water supply. There are two sets of figures. The average yield is calculated before the mid '60's drought and the recalculated safe yield is based on that experience. In the major components of the water system the Croton safe yield dropped from 325 to 240, an 85 MGD drop. Catskill system dropped from 555 to 470, an 85 MGD decrease. For Delaware, the system including Rondout dropped from 920 to 580, a drop of 340 MGD; of this drop, 320 MGD was in the Delaware system. Totaling these up we went from a safe yield of 1805 MGD to one of 1295, a drop of 510 MGD or 28.3%.

Chairman Conway: *Explain the change?*

Mr. Hennigan: *Please define safe yield in your explanation?*

Mr. Terenzio: Based upon the premise that the water source must never fail and must always be equal to the demand, the quantity of water defined as the safe yield is the least quantity of water based on histor-

ical record that can be produced by the system rather than the average. Up until 1961 the period of least historical yield had been in 1930 and 31. This experience was thought to have a return period of one in 100 years. In other words, based upon a statistical analysis, you would expect that the experience of 1930-31 would be repeated once in a hundred years. However, the mid '60's drought was more severe than previous experience had indicated. It required us to recalculate everything based upon this experience. The previous computation had been based on fairly long hydrologic records. For instance, the Croton record was 100 years, the Catskill about 50 years, and the Delaware 25-26 years. So we were not talking about a guesstimate but a figure that had a substantial amount of history behind it. By 1965 yields had dropped below the estimated safe yields from 15-40%. It varied from place to place. The average was about 29% for the entire city system. The Delaware was in the neighborhood of 30%. Our calculated minimum yield dropped overnight. We had to take extraordinary measures since it was impossible to develop sources to meet this unexpected condition within a reasonable time frame. It really emphasizes the point made this morning that some 15-20 years is needed as lead time for the development of new major source projects. Consequently, we have to project future work on a reduced basis. This is based on the capacity of the present reservoirs and the watersheds that they encompass.

Chairman Conway: *If you enlarge the area of the reservoir, does it mean that it wouldn't have any effect because you are now maximizing water yield from these areas?*

Mr. Terenzio: In order to gain anymore water from the watershed area, you have to increase the size of the dam, if the existing dam is considerably smaller than the watershed yield. However, in some cases, we have designed for the optimum safe yield from the watershed. For example, Pepacton reservoir was designed that way and is much larger in relation to its watershed than Cannonsville. In other words, Cannonsville has a much lower capacity relative to the tributary watershed than Pepacton. It isn't an easy thing to increase the size of an existing reservoir due to a number of things, including the watershed area, runoff tributary, land to be inundated, amount of water to be used, capacity of the delivery system. All those things must be put into some balance. These were the factors that we designed into the Delaware Reservoir System.

Mr. Forster: *Are you going to discuss the legal releases that have to be made out of Cannonsville?*

Mr. Terenzio: I don't plan to discuss in detail except to acknowledge their existence.

Mr. Forster: *How much is Cannonsville actually yielding in terms of New York City's supply?*

Mr. Terenzio: The quantities on the chart take into account the releases.

Mr. Hennigan: *What is the time frame you use in calculating your safe yield? Is it a single year, two years, three years, or what?*

Mr. Terenzio: We are talking a 2-4 year time frame.

Let us now move to consider the consumption habits in New York City. We have a chart which shows the present capacity consumption for nine large cities for which New York City is one. You will note

that New York City compares favorably and, in fact, has a considerably less per capita consumption than other cities used in the comparison. The present per capita consumption figure is arrived at by taking the total amount of water used by the city in one day and dividing it by the number of people who live in the city. This gives us a figure of gallons per person per day. It should be pointed out that this is not the actual water a single person uses but is a convenient measure which includes domestic, industrial, commercial, and municipal uses. It is a handy tool for comparative analysis. The cities shown on this chart (Figure 6) include: Chicago, Philadelphia, Detroit, Los Angeles, Baltimore, Cleveland, St. Louis, and Boston. In 1968 New York City was using an average of 156 gallons per capita per day. This is shown on the chart. The average of the eight other largest cities is about 180 gallons per capita per day. Included in this total is a large transient population which moves in and out of New York City every day. What I am trying to demonstrate here is that New York City is at least comparable with other cities and even better than some of the cities. It has less present per capita consumption than the highly industrialized cities like Chicago and Detroit which should be expected. However, comparisons are somewhat dangerous since New York City is so much larger than any of these cities. The next chart shows the consumption in large cities with 100% metering vs. New York City with limited metering. They range from 139 gallons per capita per day in Seattle to 285 in St. Louis. It would appear that the percentage metering does not have much of a relationship in relation to the quantity of water consumed. (Note: the latest per capita per day consumption figure for New York City is 178).

Mr. Forster: *Does that chart mean that metering has no effect on consumption?*

Mr. Terenzio: Not necessarily. It does indicate that metering does have less of an impact than people think.

Mr. Forster: *What percentage of meters do Baltimore and Philadelphia have?*

Mr. Terenzio: Philadelphia has 99.6%, Baltimore 80%, and New York City 23%.

Mr. Hennigan: *Has anyone ever analyzed per capita consumption in relation to total population served, and in relation to unaccounted for water in these communities?*

Mr. Terenzio: There are a good many points to be raised on the metering picture which do not appear on the chart. All water should be metered because it is an essential management tool for the design and operation of a water system. The point to be made here is that metering will not necessarily solve the water problems of New York City. One of the most difficult aspects of metering in New York is metering of large apartment houses. The problem of a single meter or submeters for each apartment presents an entirely different situation than metering single or two family dwellings.

Mr. Feldman: I would like to comment on this, particularly the position of the city in favoring metering. This is the official position of the Department of Water Resources and the Environmental Protection Administration. However, to implement this position requires council action. The estimated cost of installing meters in the city runs about $100 million. To justify that kind of an investment and to gain the approval of the Council we must show some direct benefits to the city. We have found that this is very

difficult to do. One of the reasons is that the formula governing the excess release requirements on the Delaware River system requires that some 80%± of the water saved in the entire city system would be released as excess water down the Delaware. So we are in the peculiar position that by reducing consumption of our gravity supply the immediate result is to increase the excess flow in the Delaware River downstream. This returns no benefits to the city. As the city consumption rises, the impact of this agreement will become less and less. It is hard to sell the City Council the idea that we should invest $100 million to improve the quality of water for Philadelphia. It has been my position that we should have probably followed an intermediate course and require that new construction be metered. This along with other measures could result in a long range program of metering. We have found it impossible to push through a metering program of any kind in the city.

Mr. Hennigan: *What is the $100 million cost based on?*

Mr. Feldman: The actual cost of installing meters at every tap from the city mains.

Mr. Hennigan: *What would be the operating cost if you had to go into manual meter reading?*

Mr. Feldman: $1-2 million per year. This would be in addition to the initial capital cost of 100 million. The capital cost may reduce somewhat by requiring contractors to install meters or by requiring consumers to purchase the meter. The pressures for conservation continue. I expect that a metering program will be introduced. We cannot count on it since we have no positive insurance of what will take place.

Mr. Santucci: *If metering is not considered a conservation measure since we only save a small amount of water, is it a revenue measure?*

Mr. Feldman: No, although it could be. It's major benefit is improving management of the system and giving us exact knowledge instead of estimates. We could better calculate the leakage in the system and the unaccounted for water. In other words, it would just provide a better management tool and could also enable us to introduce pricing based on metering which could be used to constrain wastage or excessive use.

Mr. Santucci: *Couldn't you do that by location of meters along the system?*

Mr. Feldman: No, not very well. We have meters on all the risers but this gives imperfect control because of the nature of the system. We have done pitometer surveys which help us locate leaks and get better information on the actual flow of water in the distribution network. There are various management benefits. From total metering it is questionable if they are sufficient magnitude to justify an immediate investment.

Mr. Hennigan: *What is included in the 22.9% metering in the city?*

Mr. Feldman: Basically commercial and industrial, including office buildings. Domestic supplies are not required to be metered. However, some of them elect to because of savings over the flat rate charge.

About 2% of the houses are on a metered flat rate.

Chairman Conway: *Does this include apartment houses?*

Mr. Feldman: No, they are generally on one and two family houses. The pricing schedule is such that a large family could get water cheaper by the flat rate system, and a small family in a large house would do much better on the metered schedule.

Mr. Forster: *Is it better practice to have the city maintain and own meters and service lines or to have the owner of the building own and maintain the service lines and the meters?*

Mr. Feldman: From a financial point of view it would probably be better for the owner to own the meters and service lines but maintenance almost always becomes a city function. About 25% of our meters are privately owned and privately maintained. We find that satisfactory maintenance is almost impossible when the meters are privately owned.

Chairman Conway: *Does City Council fix the water rates or does the Department?*

Mr. Feldman: The Board of Estimate.

Mr. Hennigan: *Are water rates figured on a fair return on the investment?*

Mr. Feldman: Yes.

Mr. Hennigan: *What is considered a fair return?*

Mr. Feldman: The present figure is something like 5.8%.

Mr. Hennigan: *Is that figure on replacement value or initial investment?*

Mr. Feldman: No actual investment. The present investment is about $1.4 billion.

Mr. Merkens, *Director of Engineering Studies and Analysis: The comparisons presented lead to a conclusion that metering does not appear to have any effect on per capita consumption, but I am wondering if it might have some effect on residential consumption?*

Mr. Groopman: There is one area and that is apartment houses. There is no incentive for the landlord to keep the plumbing in good repair without metering. If he paid a metered rate, he would probably make sure the leakage was kept to a minimum. We made some specific studies around 1950 and 1965 and estimated that from 125 to 150 MGD could be saved by leakage control through metering.

Mr. Terenzio: I would now like to discuss the question of new sources. The next slide (Figure 7, Appended) is from the Northeast Water Supply Study prepared by the Corps of Engineers. They suggest a

number of projects, including the use of Suffolk County groundwater for Nassau County. Other projects are to develop supplies outside the state for use in Connecticut and New Jersey. The major suggestion of interest here is a taking from the Hudson at Hyde Park. They suggest that the Hudson supply be fed into Kensico Reservoir and from there into the city system. It is also suggested that another Hudson supply be developed to feed the west side of the river and a portion of New Jersey, but this is almost external from our present supply and I won't discuss it in any detail.

Chairman Conway: *Is this proposed Hudson project a sustained withdrawal from the Hudson or a seasonal flood skimming operation?*

Mr. Terenzio: It could be a flood skimming operation which may be augmented by river regulation. It appears in some detail in the comprehensive water supply report (CPWS-27) prepared for New York City and Westchester County. As a matter of fact, the same consultants prepared the Westchester-New York report and the NEWS report.

The next slide (Figure 8, Appended) shows the Hyde Park-Hudson River proposal in detail. It includes a proposed treatment plant and pumping station at Hyde Park and an aqueduct to carry this water to Kensico Reservoir which fits in with our present distribution development plan that was discussed this morning. This is the proposal that was basically made in the CPWS-27 report. Now the fundamental question which was raised earlier is whether this was a flood skimming project or whether this was sustained withdrawal. It is hardly worth relying on the project if the facilities could only be used as a flood skimming project. This means that we could only take water from the river periodically. Water would be available only during that portion of the year when there is sufficient water in the river to insure adequate dilution of upstream pollution and adequate water to keep the salt front below the down-river intake. When there is not adequate water, skimming operations could not take place. However, a dependable sustained yield of water has to be provided from somewhere and this brings us to the question raised previously. One of the possibilities is to build a reservoir up in the Adirondacks which would supply water at low flow time when the flow in the river is not adequate to keep the proposed Hyde Park plant in operation. The suggestion has been made that a reservoir could be built in the area known as Gooley at the extreme north end of the watershed. Another suggestion has been to expand the reservoir at Hinkley on the upper Mohawk. Gooley would impound about 180 billion gallons, Hinkley an additional 141 billion gallons. Other proposals were made for reservoirs on the east side of the Hudson in the Albany area. The point to be made is that the Board of Water Supply, City of New York is concerned with obtaining water, not necessarily in having a particular reservoir or reservoirs built. The present scheme is different from our existing arrangement in that it provides for the transmission of water in open streams. Closed conduits don't come into play until after the Hyde Park station.

Chairman Conway: *Do all these sources presently flow into the Hudson?*

Mr. Terenzio: Yes.

Mr. Terenzio continued. This next graph (no figure) represents pollution and shows coliform densities from Albany south. Coliforms are organisms used to indicate sewage pollution. The highest counts are in the Capitol District. The count steadily decreases until around Kingston as we proceed down river towards West Point. This area of the Hudson (Catskill to Poughkeepsie) has a water quality that is reason-

ably acceptable and has been classified A by the State which indicates that the best use is public water supply with standard treatment of coagulation, sedimentation, filtration, and disinfection.

The next illustration (Figure 9, Appended) shows the area covered by the CPWS study and the area of jurisdiction covered by the Commission. The CPWS study includes the same area as the service area of the Commission with the exclusion of Suffolk County. Consequently, the work done in the CPWS-27 study is directly applicable and can probably be used by the Commission. The Commission Study area includes some 12 million people out of a total New York State population of some 18 million. Consequently, we are talking about supplying water to 2/3 of the population of the State of New York. This is an important and overriding consideration. The needed program far exceeds other considerations. It cannot be limited or parochial because directly or indirectly we are talking of the welfare of many, many millions of people, even beyond the 12 million. The problem is illustrated on the next chart (Figure 10, Appended) which shows drought yield vs. water demands. Commencing in 1980, it shows the deficiency considering just New York City and Westchester County and then considering all the counties; a deficiency which, by 1980 will be 150-200 million gallons per day and by 2020 is estimated to be from 800 to 1200 million gallons per day. Where will we get this water to make up the estimated deficiency? We have suggested that perhaps the Hyde Park project with some streamflow regulation from upstream impoundments. There may be other ways of doing this. But so far, the long and best tested method has been by upland development. Any other way is experimental. Any other way is probably dangerous because it has not been proven. So I will leave it at that.

Chairman Conway: *Does your chart include Suffolk County either demand or yield?*

Mr. Terenzio: No, it doesn't.

Chairman Conway: *Do you feel that the flood skimming operation would require new impoundments somewhere?*

Mr. Terenzio: If we are to take advantage of flood skimming, you must have a place to put the water so it would probably call for some storage somewhere.

Mr. Forster: *A few years ago, we worked like beavers for the Pure Waters Program. Are we to assume that the river will not improve?*

Mr. Terenzio: We also worked hard for that pollution abatement program. But up to date, we have failed to observe any improvement of quality since that bond issue was passed. Because of the long term pollution and the sludge deposits in the river and the continual input of new pollutants, we must assume we are not going to get pollution free water on the Hudson. We are going to have to go on a full fledged treatment program if we use Hudson River water.

Mr. Feldman: The water in Hyde Park is sufficiently good to be used with treatment. Cleaning up the river will reduce treatment but not the method of treatment.

Mr. Hennigan: *What population projections and increased per capita uses are built into increased*

per capita demands?

Mr. Terenzio: Population increases are extrapolated from the past as are per capita increases. This is based on past experience. Air conditioning has been one important factor.

Mr. Santucci: *Would it be practical to recycle Hudson River water used for sanitary purposes?*

Mr. Feldman: There is very little work done on either individual recycling or massive recycling as would be necessary in this situation if it would have any value. At this time recycling doesn't seem to offer much hope.

Mr. Terenzio: To-date there is no method of providing dependably the quantity of water we need by recycling. Furthermore, there is a danger of possible infections resulting from recycling.

Mr. Santucci: *When you speak of sewage do you mean what goes down the toilet or what goes down the sink?*

Mr. Groopman: It is all the same. It is all wastewater.

Mr. Feldman: The word sewage means any wastewater that comes from a building. It is collected in common sewers and delivered to the treatment plant as a mixture. There are two complete systems. The water supply system and the waste collection system. No workable system has been developed to recycle wastewater or any portion of the wastewater within a home. At some point in time some system may develop but there is none at the present time. A further suggestion has been made that we should have two water supply systems, one for drinking water and one for other water since drinking water is such a small portion of the water supply. However, past experience has shown that this is a severe public hazard and has led to epidemic disease. It has been impossible to effectively control double systems where they have been attempted.

Mr. Santucci: *I wasn't thinking entirely of the New York City System. I was thinking in terms of the statewide situation and perhaps we could try a different approach on some type of building project?*

Mr. Feldman: I don't think that we could expect people upstate to conserve water so we here in the City of New York could have all we wanted. I think their attitude would be that the city should try recycling, which would be reasonable.

Mr. Santucci: *When they start building houses in Dutchess County, are they going to have trouble sending water down here?*

Mr. Feldman: The Croton has a higher population density and we are sure that we can maintain the quality of that supply.

Mr. Santucci: *Is it logical to assume that one day Dutchess County will have a population like Suffolk (over one million)?*

Mr. Feldman: That is one of the problems that this Commission will have to consider.

Mr. Hennigan: The idea of a separate system has been tried in the past and has been found wanting mainly because of the fact that it became a clear and present public health problem, and the public policy gradually emerged that required that all water delivered by public water supplies should be fit to drink. One possible approach would be to take no action to insure the potability of the supply and encourage the development of a large bottled water business so that our drinking water would be furnished as a private venture under some type of control. I don't think that this would find much public acceptance.

I would like to pose a question. Are we talking about a regional water supply system or about a series of discrete water supplies and water systems?

If you are talking about a regional system and extrapolated from past experience, it makes sense. For many years the city had a lot of open space and grew continuously. However, the city now is constrained by available land area and extrapolation of population makes no sense except on a regional basis. I don't think you can put a wall around the city and think of serving the city only. We are really considering on a longe range basis, a regional supply that has to take into account the private water supplies of Queens, the problems that are coming to the fore in Nassau County, and the question of supply for the upstate counties such as Ulster. These are the issues that we have to address ourselves to. This in turn raises the issue of intergovernmental relations and the city's policy of dealing with outside municipalities, constraints on per capita consumption, a system of establishing rate schedules; in other words our attitude depends on whether we are talking about a regional water system to serve a metropolitan complex or a series of water systems serving small discrete areas.

Mr. Maguire, *Executive Director, Board of Water Supply:* My impression is that the approach must be a regional development. However, the details of working out the relations in the system have to be developed. We think that the problem of supplying water is common to the whole region, and anything that is done has to contemplate the regional needs and will require their participation. I would note that the City of New York has been criticized a great deal for going ahead and taking care of itself. We must do this because we do have needs and we just can't wait interminably for somebody else to do something. So, despite the fact that our attitude is frank and we recognize the regional aspects we must proceed with some kind of a definite timetable.

Chairman Conway: I gather that you say that if this Commission concluded that for the Southeastern area some regional approach was absolutely necessary, New York City would cooperate in this approach as long as the interests of the city were properly protected.

Mr. Feldman: We believe it is an historical imperative because the city is unable to unilaterally extend its supply. We don't have much of a choice. We are beggars, not choosers and I would guess that one of the main reasons which lead to the establishment of this Commission and included the other eight counties was in recognition of this fact. If we could extend our supplies for twenty or thirty years by ourselves, I

don't think Albany would have to intercede. It is irrational thinking to ask this Commission to set up two systems: one for New York City and one for the other eight counties. It must be regional. I don't know if this region should be integrated into a single system. That is something for us to look into. I think New York City will be forced into whatever regional plan comes up but I have no doubt that there will be months of agonizing negotiations on who pays what.

Mr. Rosenberg: Interstate arrangements would take a lifetime.

Mr. Anderson: It would be well if New Jersey were to study the water supply problem concurrently with New York.

> **Mr. Forster:** *Will the completion of Tocks Island give us ground for renegotiating such release requirements on the Delaware?*

Mr. Feldman: Logical grounds but not legal grounds.

Mr. Groopman: What Commissioner Feldman is referring to is the fact that when the Delaware River Basin Compact was enacted, New York City gave up its rights to go back to the Supreme Court for 100 years. That was back in 1961 so we have 91 years to go.

> **Mr. Hennigan:** *In other words you gave up your right to petition to amend that Supreme Court decision? Do you if you have the permission of the member states?*

Mr. Feldman: With unanimous agreement, the Commission has the power to alter the arrangements. The Commission has the power by unanimous agreement to institute changes, but we can hardly get one member, let alone unanimous.

> **Chairman Conway:** *Is the CPWS-27 proposal based on the recalculated safe yield and would it be adequate to supply the needs for the next sixty years?*

Mr. Terenzio: I don't remember the exact number but engineers who prepared the report believe there is sufficient water to meet these needs.

> **Chairman Conway:** *Is the safe yield of the Hyde Park project adequate to supply the projected needs of the region?*

Mr. Terenzio: Without augmentation it is not sufficient. That is why they have recommended the creation of upland storage for river regulating purposes.

Mr. Hennigan: What degree of risk are we willing to accept in municipal water supply?

For instance, in the 1960-67 drought a crisis arose and the water supply managers were called upon to meet a situation that wasn't counted on. The fact of the matter is that with some recourse to extraordinary measures, the basic water needs of the city were met even during this very critical period. *What*

degree of risk are we willing to accept? If I understand the city position, it is that we proceed on the basis that we accept no degree of risk. In other words, based on past experience we build capacity and systems so that we always meet projected needs without taking extraordinary measures. We build for the rare occurrence. This simply means that we build a tremendous overcapacity which will seldom be used. During the drought by measures such as a public education campaign, leakage control in the system, instituting the Chelsea pumping station, you managed to come through a tough period without collapsing. I think it was a tremendous performance. So I come back to the question. *What degree of risk are we willing to take in this situation?*

Mr. Feldman: This is one of the fundamental problems you are going to have to address yourself to. The '60's drought we had a statistical return period of once every 400 years. We thought that the early thirties drought was once in 100 years but it turned out to be one in 20. When an elected official's reputation is involved, we can expect he will want the degree of risk to be as close to zero as possible. This may point up one of the advantages of the regional approach, because if the regional agency takes it in the neck on failure, we can save literally millions of dollars by introducing into the mix a reasonable risk factor. You have got to get the public to accept the fact that once in 100 years or so you may run into a tough water supply situation that might require some public discomfort. I believe that this can only be done by a regional approach which is somewhat independent of an elected official.

Chairman Conway: An elected official that wants a zero risk is often taking another risk of increased taxes for the cost of a system that is grossly overdesigned. There are two sides to every coin. What kind of tax burden are people willing to pay for the risk? It is obvious that zero risk is expensive and difficult.

ADJOURNMENT

The meeting was closed by the Chairman, Mr. Conway, with thanks to all participants and with great appreciation to the Board of Water Supply for preparing the program and furnishing the space and luncheon.

The meeting adjourned at 3:30.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
Neil H. Anderson
Herman Forster
Thomas J. McInerney
Gerald R. O'Brien, Jr.
John J. Santucci
William J. Schickler
William Borghard (for James Harding)

Staff

Robert D. Hennigan, *Executive Director*
Nelda Martin, *Secretary*
David Duffy, *Administrative Assistant*
Paul W. Merkens, *Director, Engineering Studies & Analysis*

NEW YORK CITY

Board of Water Supply

Herbert E. Rosenberg, *President*
Edward C. Maguire, *Executive Director*
Vincent G. Terenzio, *Chief Engineer*
Martin Hauptman, *1st Deputy Chief Engineer*
William G. Belli, *Assistant Deputy Chief Engineer*
Samuel Gofseyeff, *Engineer-in-Charge, Needs and Resources*

Department of Water Resources

Maurice M. Feldman, *Commissioner*
Abraham Groopman, *Chief Engineer*
Frederick C. Stein, *1st Deputy Chief Engineer*
Morris Becker, *3rd Deputy Chief Engineer*
John T. Egan, *Director of Water Quality Control*
George Mekenain, *Assistant to Chief Engineer*
Edward Schaeder, *Assistant Design Engineer*

Others

Duncan M. Brown, *Coffin & Richardson Consulting Engineers*
Mr. Leonard Victor, *Photographer-Reporter, Long Island Press*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

NEW YORK CITY

Morning Session

9:30 **OPENING REMARKS AND WELCOME**

Mr. E. Virgil Conway, Chairman, SEWSC
Mr. R.D. Hennigan, Executive Director, SEWSC
Mr. Herbert E. Rosenberg, President, BWS
Mr. Maurice Feldman, Commissioner, DWR

10:00 **N.Y.C. WATER SUPPLY SYSTEMS**

Board and Department Responsibilities

Mr. Edward C. Maguire, Executive Director, B.W.S.

10:15 **COFFEE BREAK**

10:30 **DESCRIPTION OF NEW YORK CITY'S EXISTING WATER SUPPLY SYSTEMS**

Mr. Vincent G. Terenzio, Chief Engineer, B.W.S.

SUPPLY
Croton System
Catskill System - Schoharie & Ashokan Reservoirs
Delaware System - Rondout, Neversink, Pepacton and Cannonsville Reservoirs

DELIVERY
New Croton Aqueduct
Catskill Aqueduct
Delaware Aqueduct plus Neversink, East Delaware and West Delaware Tunnels

City Tunnel No. 1
City Tunnel No. 2

Richmond Tunnel

City Tunnel No. 3, Stage 1 - under construction
Stages 2, 3, & 4 - proposed

TYPICAL CONSTRUCTION
West Delaware Tunnel
Richmond Tunnel
Cannonsville Release Water Facilities

EMERGENCY SUPPLY
Hudson River Pumping Plant

12:00 **LUNCHEON**

Afternoon Session

1:00 **NEW YORK CITY'S WATER SUPPLY NEEDS**

Mr. Vincent G. Terenzio, Chief Engineer, B.W.S.

SAFE YIELD vs. CONSUMPTION
SAFE YIELD – BEFORE AND AFTER DROUGHT
CONSUMPTION – LARGE CITIES vs. N.Y.C.
POTENTIAL SOURCES OF WATER SUPPLY
HUDSON RIVER DRAINAGE BASIN
HYDE PARK PLAN, CPWS-27 STUDY
DEMAND vs. SUPPLY, CPWS-27 COUNTIES
CPWS-27 COUNTIES vs. SEWSC COUNTIES
EXISTING N.Y.C. WATER SUPPLY SYSTEM

2:00 **INFORMAL DISCUSSION OF NEEDS AND POTENTIAL NEW SOURCES**

Representatives of:

Temporary State Commission
Board of Water Supply
Department of Water Resources

3:00 **SCHEDULING OF FUTURE PROGRAM**

Field Inspection Trip
Working Committee Meetings

3:30 **CLOSING REMARKS**

Mr. R.D. Hennigan
Mr. E.C. Maguire

APPENDIX C

FIGURES

Figure 1 . . . . . Existing Surface Supplies
Figure 2 . . . . . Water Supply Systems south of Kensico
Figure 3 . . . . . Third City Tunnel
Figure 4 . . . . . Use end supply of water, 1900-2020
Figure 5 . . . . . Safe Yield of existing system
Figure 6 . . . . . Per Capita Consumption compared to 8 largest cities
Figure 7 . . . . . Proposed projects
Figure 8 . . . . . Proposed Hyde Park Project
Figure 9 . . . . . Population
Figure 10 . . . . . Drought Yield vs Water Demand

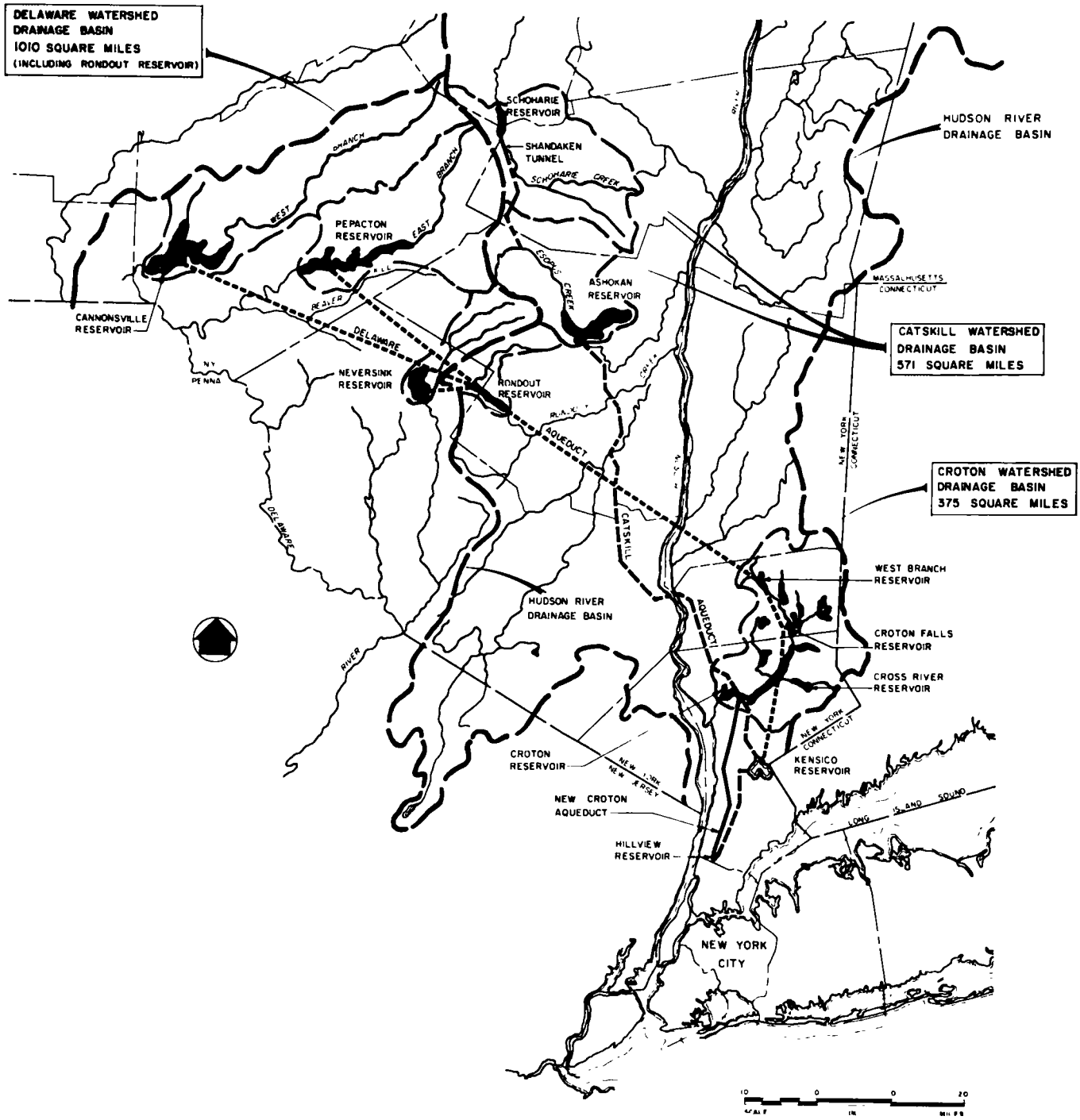
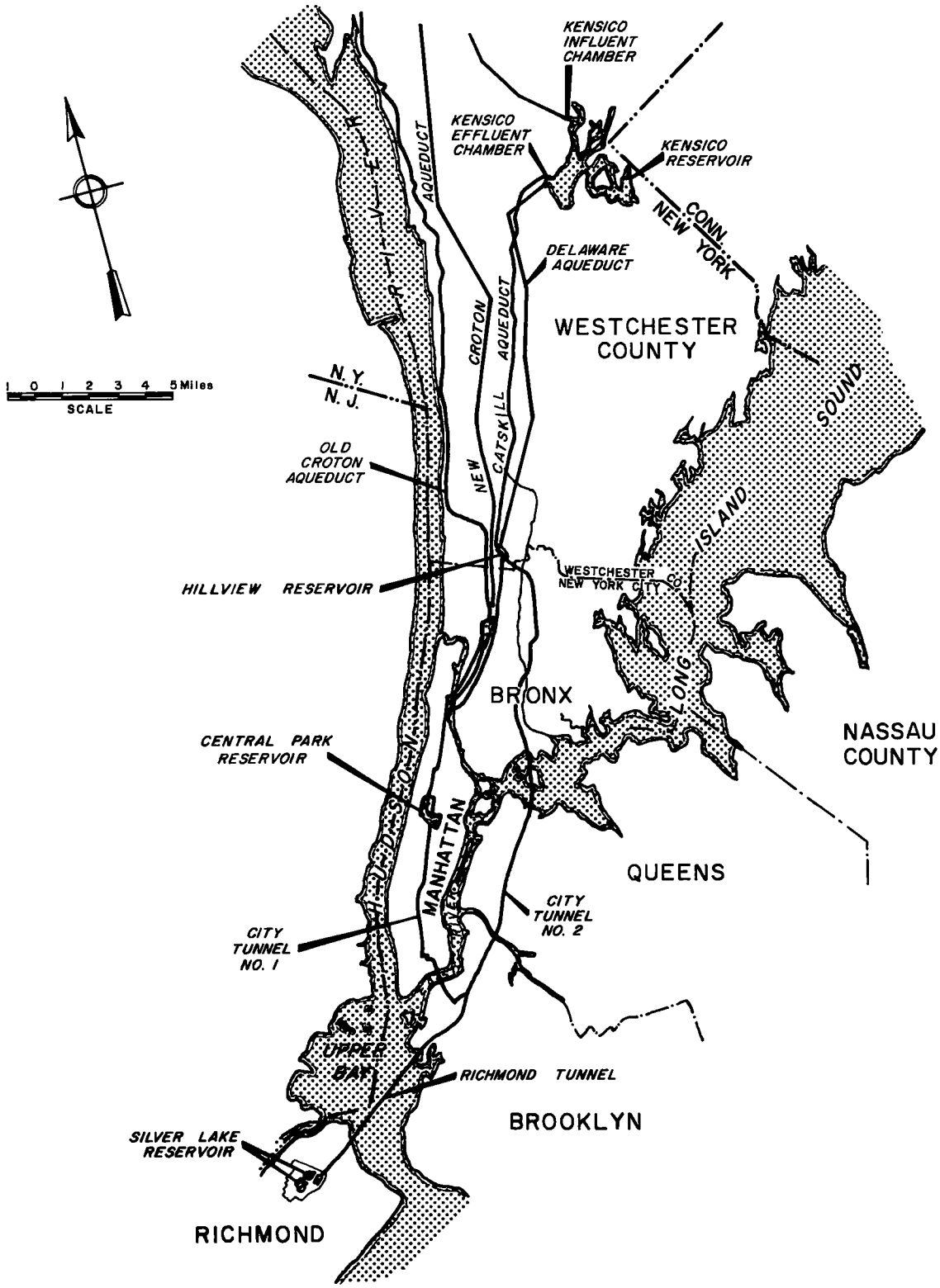


FIGURE 1

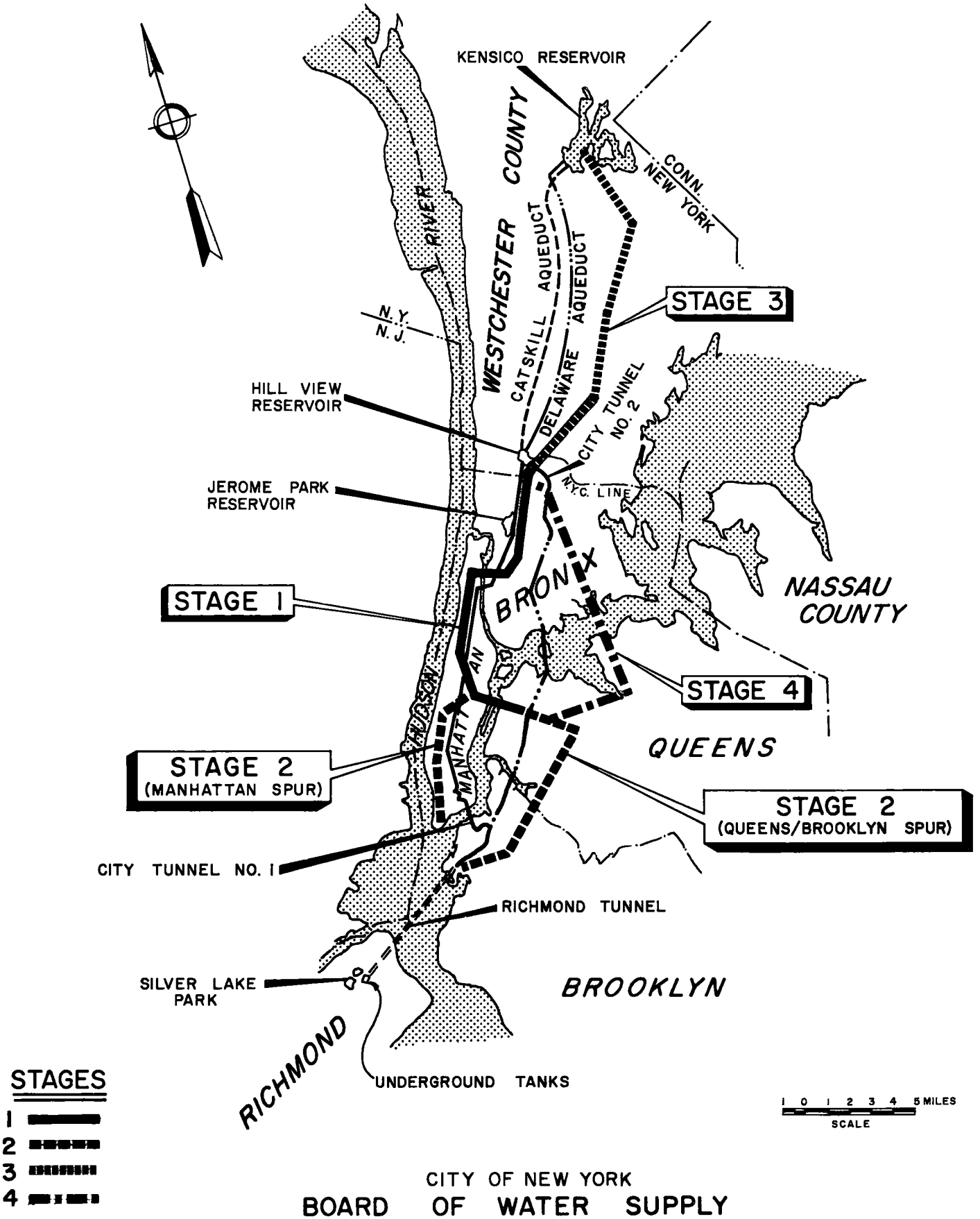
EXISTING SURFACE WATER SUPPLIES OF NEW YORK CITY



CITY OF NEW YORK
BOARD OF WATER SUPPLY

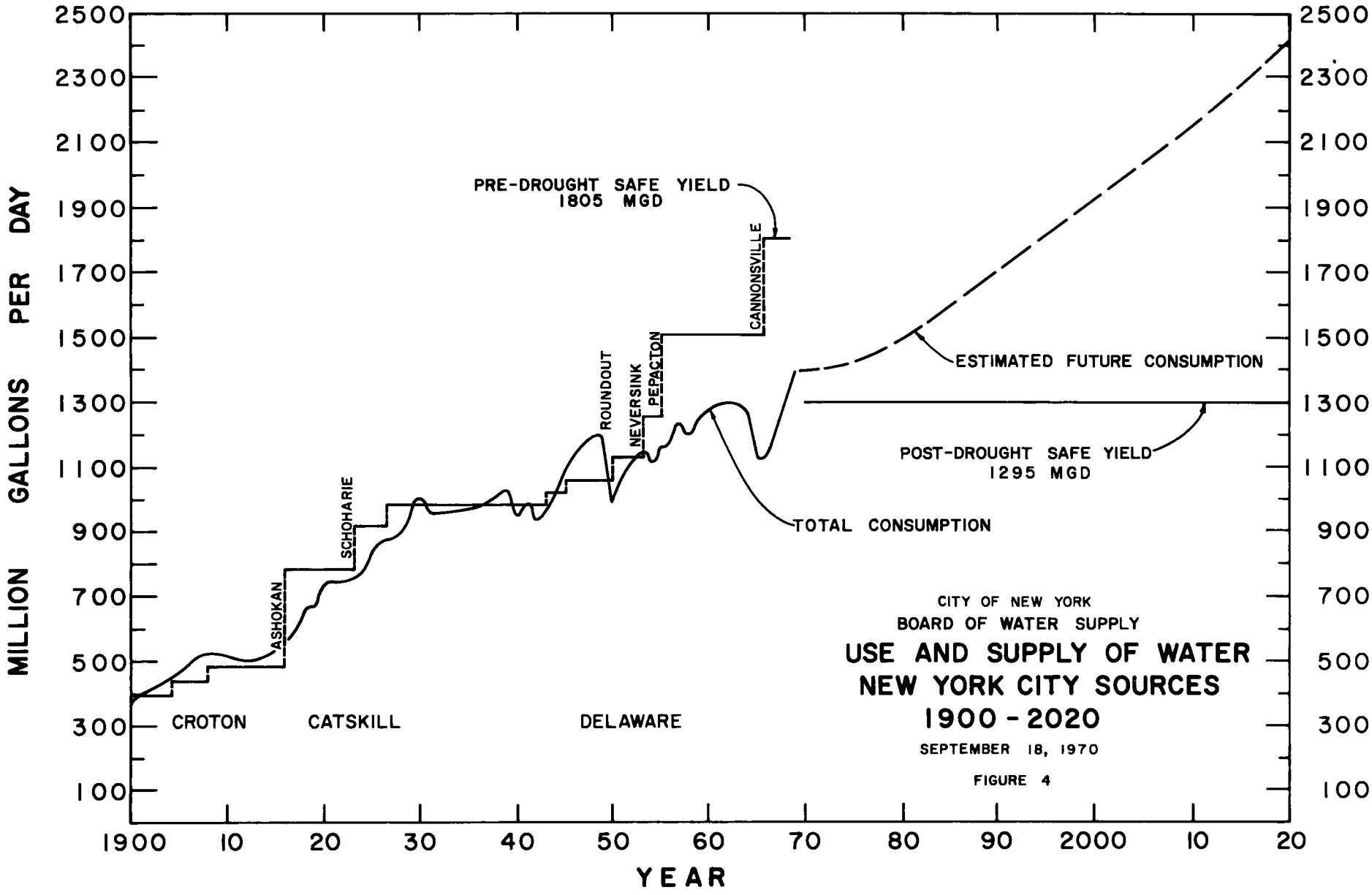
WATER SUPPLY SYSTEMS SOUTH OF KENSICO RESERVOIR

FIGURE 2



CITY OF NEW YORK
BOARD OF WATER SUPPLY
THIRD CITY TUNNEL

FIGURE 3

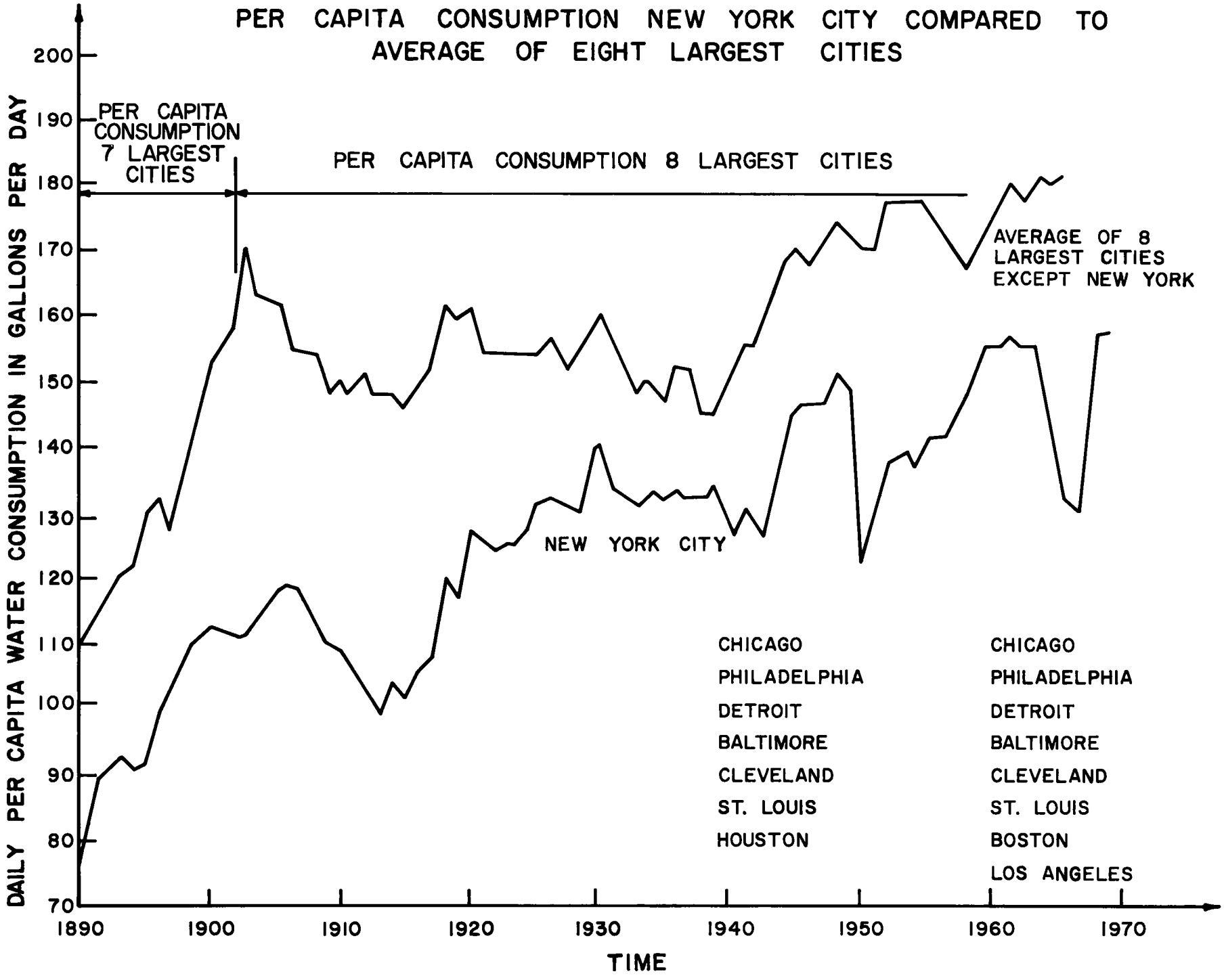

MILLION GALLONS PER DAY
2500
2300
2100
1900
1700
1500
1300
1100
900
700
500
300
100
1900
10
20
30
40
50
60
70
80
90
2000
10
20
YEAR
PRE-DROUGHT SAFE YIELD
1805 MGD
CANNONSVILLE
PEPACTON
NEVERSINK
ROUNDOUT
SCHOHARIE
ASHOKAN
ESTIMATED FUTURE CONSUMPTION
POST-DROUGHT SAFE YIELD
1295 MGD
TOTAL CONSUMPTION
CROTON
CATSKILL
DELAWARE
CITY OF NEW YORK
BOARD OF WATER SUPPLY
USE AND SUPPLY OF WATER
NEW YORK CITY SOURCES
1900 - 2020
SEPTEMBER 18, 1970
FIGURE 4

SUPPLY		
SOURCE	PRE-DROUGHT	POST-DROUGHT OF 1961–1967
CROTON	325 MGD	240 MGD
RICHMOND	0	0
BRONX RIVER	5	5
CATSKILL ESOPUS	340	470
CATSKILL SCHOHARIE	215	
RONDOUT	120	100
NEVERSINK	115	480
PEPACTON	375	
CANNONSVILLE	310	
TOTAL SAFE YIELD	1805 MGD	1295 MGD

FIGURE 5

FIGURE 6

PER CAPITA CONSUMPTION NEW YORK CITY COMPARED TO AVERAGE OF EIGHT LARGEST CITIES



PROGRAM YIELD IN MGD

*	WATER SUPPLY PROJECT	1980	2000	2020
1	RARITAN	70	70	70
2	DELAWARE - TOCKS ISLAND	90	300	300
3	SOUTH JERSEY GROUND WATER		80	200
4	HUDSON - RAMAPO			250
5	SUFFOLK GROUND WATER	150	150	100
6	HUDSON - HYDE PARK		300	740
	HOUSATONIC - TRAP FALLS	40		
7	HOUSATONIC - ROBBINS		100	240
	TOTAL	350	1000	1900

* SERVICE AREAS ARE AS OF 2020

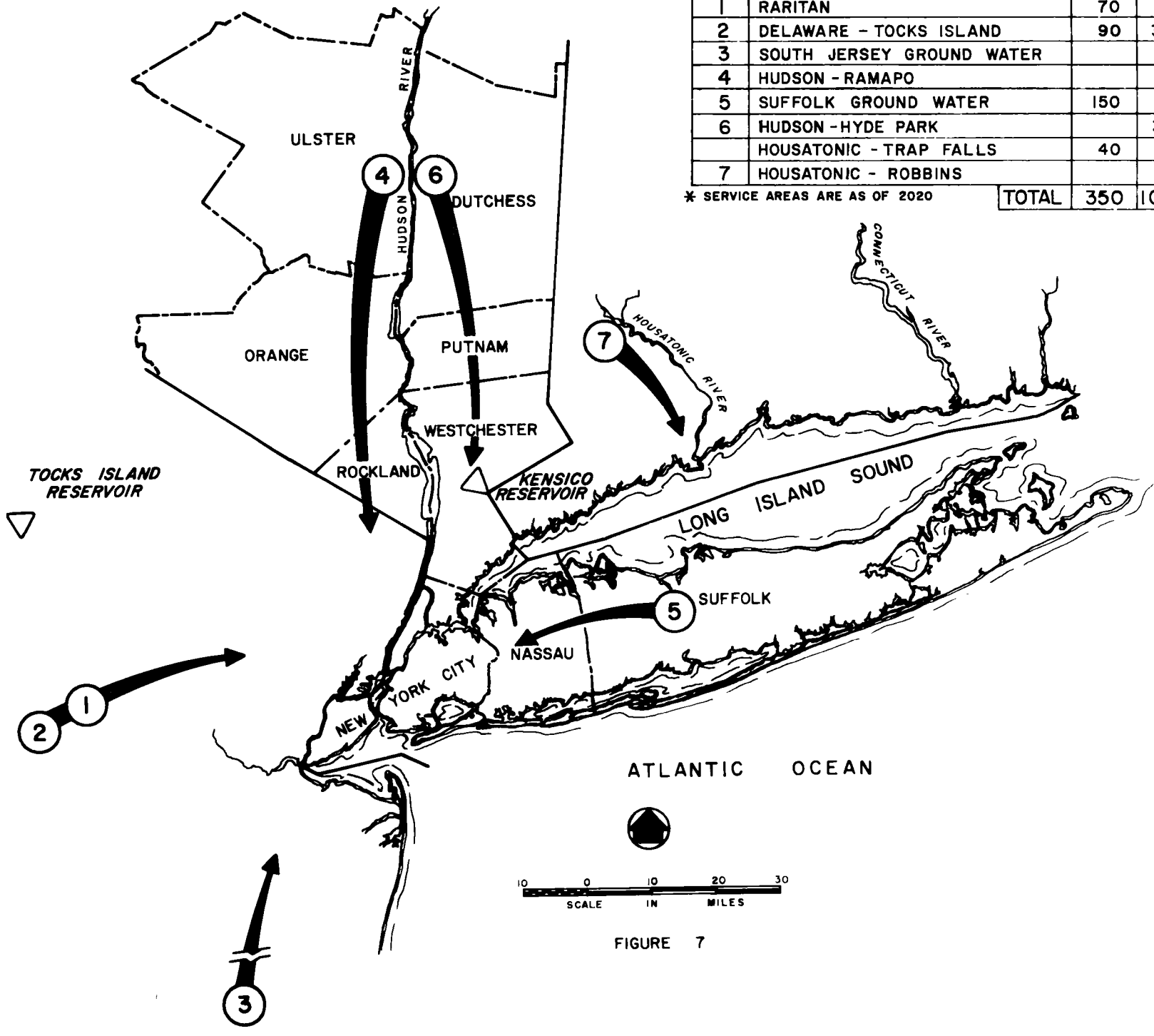


FIGURE 7

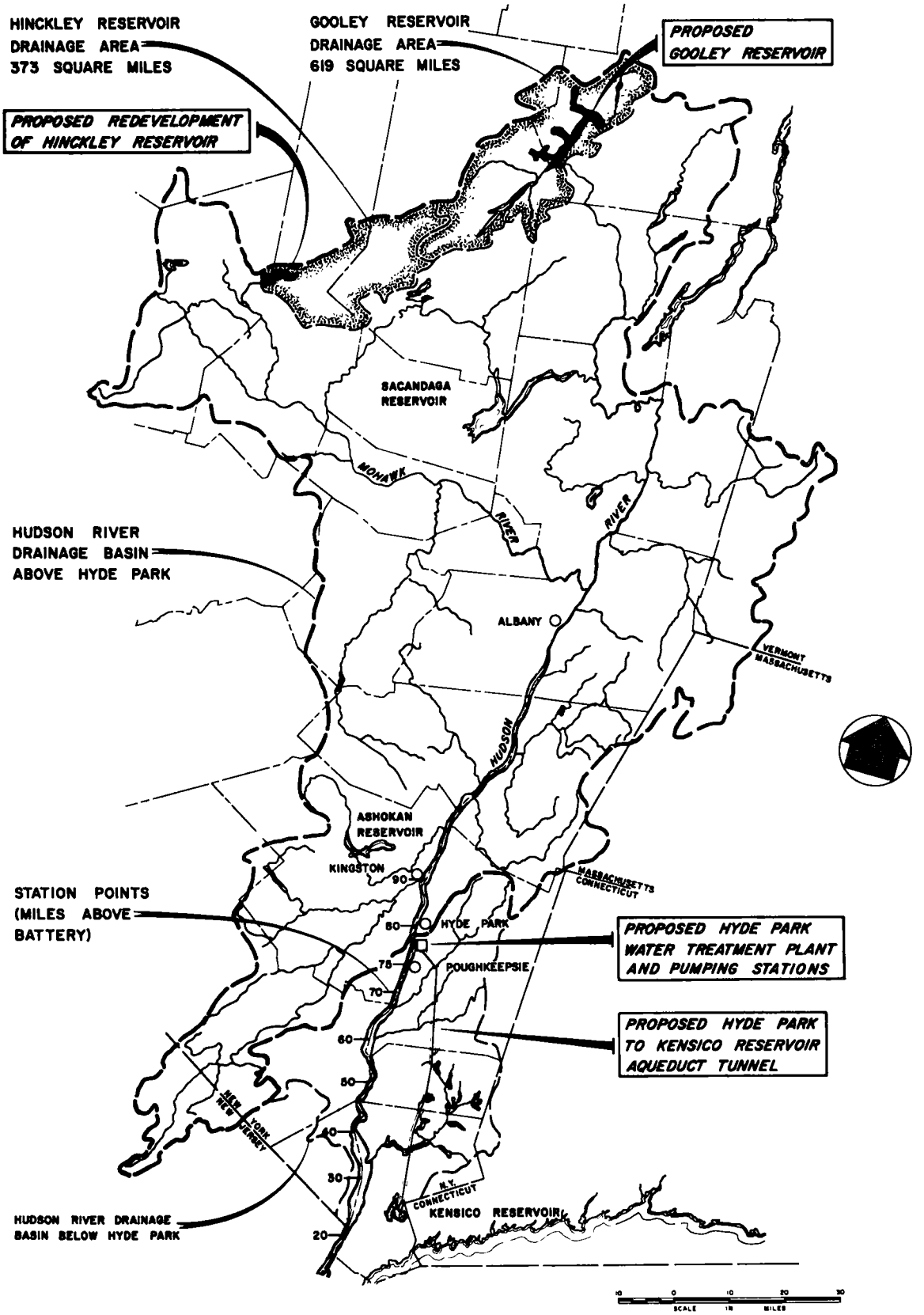


FIGURE 8

HUDSON RIVER-HYDE PARK PROJECT - LOCATION PLAN

POPULATION

AREA	U.S. CENSUS 1960	U.S. CENSUS 1970
NEW YORK CITY	7,781,984	7,798,757
WESTCHESTER COUNTY	808,891	886,641
	8,590,875	8,685,398
PERCENT OF NEW YORK STATE		*48*
DUTCHESS COUNTY	176,008	218,325
NASSAU COUNTY	1,300,171	1,420,021
ORANGE COUNTY	183,734	218,358
PUTNAM COUNTY	31,722	54,411
ROCKLAND COUNTY	136,803	228,897
ULSTER COUNTY	118,804	137,111
TOTAL CPWS-27	10,538,117	10,962,521
SUFFOLK COUNTY	666,784	1,114,164
TOTAL SEWSC	11,204,901	12,076,685
PERCENT OF NEW YORK STATE		*67*
TOTAL NEW YORK STATE	16,782,304	18,081,615

FIGURE 9

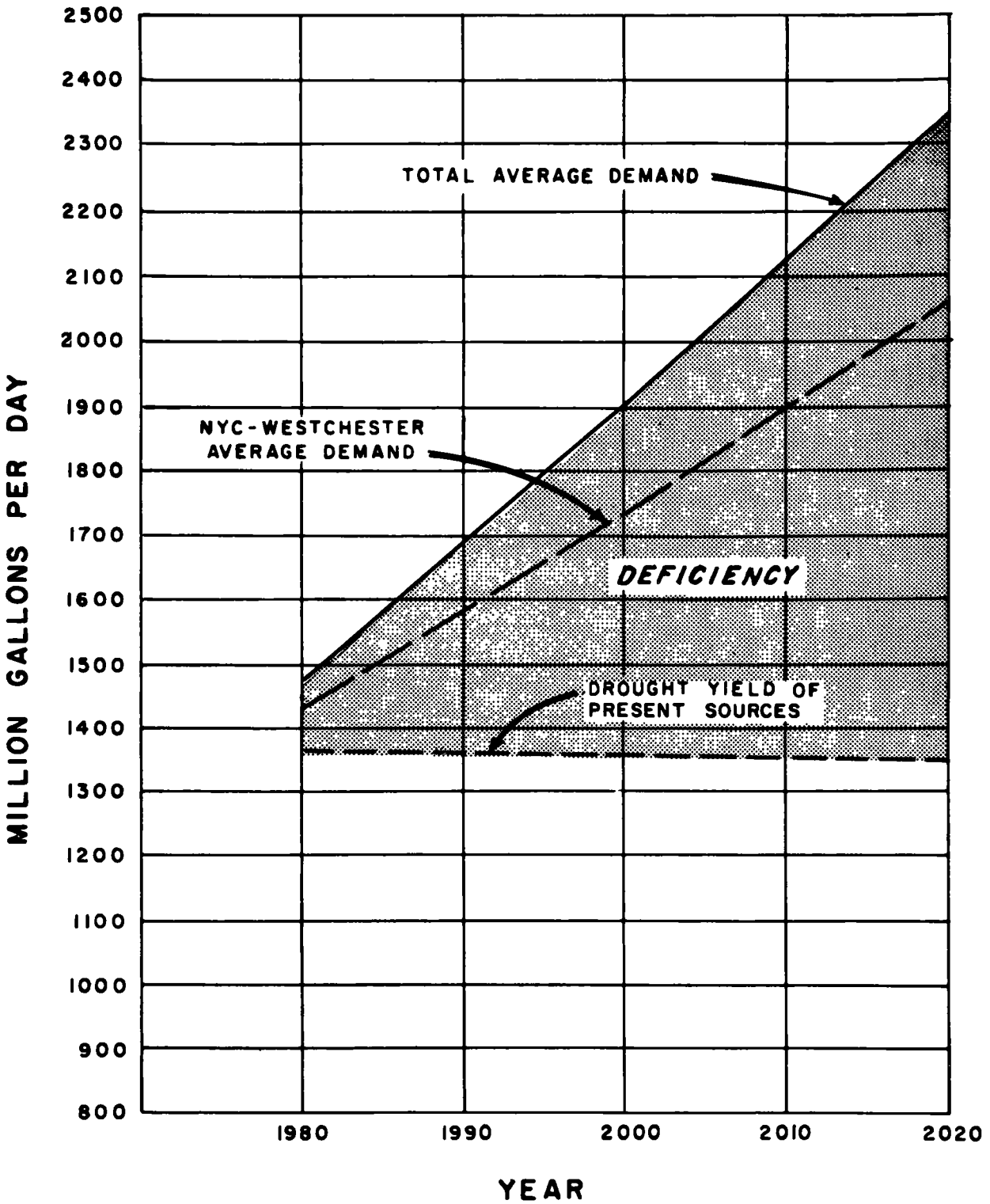


FIGURE 10

DROUGHT YIELD vs. WATER DEMANDS

NEW YORK CITY AND WESTCHESTER COUNTY SYSTEMS

APPENDIX D

NEW YORK CITY MEETING
SLIDES

List No. 1 **Morning Session**

1. N.Y.C. Water Supply Systems - From 3 Upstate Watersheds to Richmond
2. Aerial Photograph - Rondout Reservoir
3. Aerial Photograph - Neversink Reservoir
4. Aerial Photograph - Pepacton Reservoir
5. Waste Weir-Pepacton Reservoir
6. Aerial Photograph - Cannonsville Reservoir
7. Waste Weir-Cannonsville Reservoir
8. N.Y.C. Water Supply Systems - South of Kensico
9. Cross-sections and Profiles of Aqueducts
10. Aerial Photograph - Upper N.Y. Bay - Route of Richmond Tunnel
11. Plan and Profile - Richmond Tunnel
12. Richmond Tunnel - Section Excavated by "Mole"
13. Silver Lake Park Storage Tanks - Interior
14. City Tunnel No. 3 - All Stages
15. Typical Shaft Site - Shaft 4 - West Delaware Tunnel
16. Drill Jumbo - West Delaware Tunnel
17. Excavated Tunnel - Richmond Tunnel - Double Track Section near Shaft
18. Placing Concrete Curb for Richmond Tunnel Lining
19. Holing Through - West Delaware Tunnel - Excavated vs. Lined Tunnel
20. Grouting Lined Tunnel - Richmond Tunnel
21. Restored Surface - Shaft 4 Site - West Delaware Tunnel
22. 96-inch Dow Pivot Valve - Control for West Delaware Tunnel Outlet
23. 12-ft. Diameter Release Water Conduit - In Base of Cannonsville Dam
24. Release Water Chamber - Cannonsville Dam
25. Release Water in W. Br. Delaware River below Cannonsville Dam
26. Hudson River Pumping Plant - Exterior
27. Hudson River Pumping Plant - Interior Showing Pumps

List No. 2 **Afternoon Session**

1. Consumption vs. Safe Yield
2. Safe Yield - Before and After Drought
3. Average Consumption - 8 Largest Cities - vs. N.Y.C.
4. Consumption in Large Cities with 100% Metering vs. N.Y.C.
5. Average Consumption in 4 Large Cities after 100% Metering
6. Potential Sources of Water Supply - Corps of Engineers
7. Hudson River Drainage Basin
8. Hyde Park Plan - CPWS 27
9. Hudson River Drainage Basin with Hyde Park - CPWS 27
10. Hudson River - Coliform Density & Stream Classification
11. Sampling Stations
12. CPWS 27 Counties vs. S.E. Commission Counties
13. Population of CPWS 27 & S.E. Commission Counties
14. Demand vs. Supply - CPWS 27 Counties

ORANGE COUNTY

November 29, 1971

Goshen, New York

ORANGE COUNTY CONFERENCE

OPENING REMARKS

Mr. E. Virgil Conway, *Chairman Southeast Water Supply Commission:* I call this meeting to order.

The Chairman then introduced members of the Commission and Commission Staff in attendance. He also read the following letter from Assemblyman Gilman who was unable to attend the meeting.

> "Dear Chairman Conway,
>
> I regret that many sessions of the Assembly which are being held in Albany prevent me from participating in the Southeast Water Commission's hearing which you are conducting in Goshen. Having long been concerned about the water needs of Orange County and hopeful that the Commission's research will help our region resolve some of our water resource problems, I have requested a member of our staff to join you today, Mrs. Guizenheimer, and I look forward to reviewing with you the results of today's proceedings. Please extend my regrets for not being able to be present to my fellow Commissioners and to our Orange County officials.
>
> Best wishes.
>
> Assemblyman Ben Gilman"

This is the eighth meeting the Commission has had with County officials. These meetings have been conducted on a relatively informal basis and have been most helpful in educating the Commission.

We do keep minutes as a permanent record of the Commission. However, the minutes are sent to the local officials for editing before they are made a part of the official Commission's record.

In addition to serving a very important input function, we find these meetings very helpful as far as establishing an interface with the various local officials. In this way, we hope to come out with recommendations that will serve all the people in this nine county area.

If there are members of the press here today, they are indeed welcome. This is in no sense a public hearing, but it is not a closed meeting.

These meetings all depend on officials from the local county area who organize the meeting. We are very appreciative that Peter Garrison has undertaken this task with others and made this meeting possible. We are also very pleased to have with us today the County Executive of Orange County, Louis V. Mills, and appreciate that he could spend some time with us this morning.

Mr. Mills, Perhaps you might have some remarks to make.

Honorable Louis V. Mills, *Orange County Executive:* I would like to welcome the Commission to Orange County.

Insofar as the problem of providing adequate water supply to the entire county is concerned, Orange

County has been foresighted. We have been engaged in a five million dollar acquisition program for future watershed properties which has provided a lot of problems.

Water and physical problems are indicative once again that we no longer live in separate communities and that what happens in one community also influences things in another county.

I think it is worth saying that we are keenly aware of the problems associated with water supply and of the need for the kind of work your Commission is engaged in. Therefore we are very pleased that you are here, and we offer whatever facilities we can.

Chairman Conway: Thank you very much, Mr. Mills.

I would just like to make clear that the Commission is not just a technical commission to find an adequate water supply. We also hope to determine any viable plans for financing additional water supplies, and take in the total picture of management integration.

Now I would like to introduce Vincent Brown, the Orange County Legislator.

Honorable Vincent Brown, Jr., *County Legislator, 3rd District:* I think that Mr. Mills has more or less summed up our farsightedness in making a study and going into a program of acquisition of possible sites for water.

The only snag in carrying out the study that has been made is that there has been questions come up of legality in the manner in which we are proceeding. I think the presentation by Mr. Garrison from our Planning Department, will definitely show the need of some State enabling legislation to carry out our program to supply the needs of water.

Chairman Conway: Thank you, Mr. Brown.

Now I will turn this meeting over to Peter Garrison, Commissioner of Planning.

PRESENTATION

Mr. Peter Garrison, *Commissioner of Planning, Orange County:* My purpose at this juncture is to give the Commission a sort of general organization of Orange County, where we are, and where we are going as we see it at this point.

I think we have to recognize Orange County in terms of its role and its place in the Metropolitan region of New York. In New York State we are bordered by Rockland County on the south, Putnam and Dutchess across the Hudson River to the east and Ulster County and Sullivan County to the north and west. We also touch base with Pike County in Pennsylvania and Passaic County in New Jersey, Pennsylvania and New Jersey is somewhat south of us.

The general physiography of the County is that we have the Hudson Highlands which run northeast to southwest and the Shawangunk Mountains which become the Cantinnes in New Jersey. The Shawangunk Mountains eventually become part of the lower region of the Catskill Mountains.

The Wallkill is the only major river valley. It is rather unique in this part of the country because it flows north. It originates in Jersey and flows north to Orange County, then into Ulster County and eventually dumps into the Hudson River at Kingston.

We also have two lesser valley systems, aside from the Delaware to the west and the Hudson to the east. One of these is the Ramapo Valley which runs parallel to the Thruway, and contains the Thruway,

Erie-Lackawanna Railroad, and Route 17. We also have the Neversink River which originates in Sullivan County and flows south through our County where it ties in with the Delaware at a point below Port Jervis (Cantrow). We also have extensive what is called "black fruit area", a major crop producing area, onions, celery, lettuce and sod farming which is becoming an important part of this overall agricultural area.

Our main transportation access is very good from a highway point of view. The Thruway, north-south, Route 17, east-west, and Interstate 84, which ties in with Connecticut and New England and with points west through Pennsylvania. With this system of highways, the County has started to experience the impact of these highway systems in terms of pulling the people out of the core of the Metropolitan region. By and large, this is where the bulk of the County's population growth is coming from, as a result of immigration.

We have two, really three cities in the County. Two important centers being the greater Newburgh area which faces the Hudson, the greater Middletown area at the access of 17 and I-84, and the smaller city of Port Jervis on the Delaware, and Interstate 84. We have several lesser concentrations of population in the Monroe-Harriman area, and the three villages along Route 17 of Goshen, Chester, and a growing area in Warwick. Overall, the County has 39 communities, twenty towns, sixteen villages, and three cities (See Figure 1 - Appended).

This is apart from all the central school districts, special taxing districts, etc. If you add them all up you have 642 units of government operating within about 830 square miles of territory.

What we are looking at today in terms of County population is roughly 225,000. The 1970 census reported 221,000, and we feel that we have reached the point where we are approaching that 225,000 figure.

Our earlier estimates, estimates that we did back in 1968 and 1969 following a special census which we took in 1967, said that we were going to double our population within about fifteen years which would take us up to about 1985, and that we were going to double again by the year 2000. As we go beyond the year 2000, things get pretty foggy. The County envisions an ultimate population, and we are not sure what we mean by "ultimate" in terms of a precise year, but we would be talking roughly 1,100,000 persons. But there are a lot of inhibiting factors to that growth. One of these is water. Without water, we might as well forget a lot of things we are looking at.

From a casual point of view, we feel that the county has, basically, two options. We can pretty much grow as we are, which is essentially a spread-city approach. Under this option we don't recognize anything in terms of holding it as open space or natural areas, other than those which are already in the public domain. This includes large stretches to the east, the Ramapo and the Palisades Interstate Park, combined with the United States Military Academy. We recognize that if we go this present trend of spread-city, we are just going to fill in all the presently undeveloped areas. We will have no sense of community when we get through. The people will be spread around so that it would be very difficult, very costly to provide any community services, such as water.

We recognize that the water many times is not where you'd like to have it. This poses a transportation problem, but it is a transportation problem we feel we can deal with. However, if everything is spread out, it's going to become just horrendous in terms of cost.

This brings us to the other option. Under this option we structure our growth, concentrating it to get the most mileage out of our existing centers. After all, this is where the investments have been made in public works, water, sewers, streets, highways, lighting and all the utility components that go with the

existing centers.

What we are saying is, let's take that increment that is going to come from in-migration, and structure it into the county framework; recognizing that we have a number of communities that are already established, let's build on it. Let's discourage the present spreading out trend. This is what we are shooting for; a plan that envisions and accepts growth and seeks to guide that growth in certain areas where we can provide the overall amenities of living.

I am going to leave it at that for a moment, unless the Commission members have specific questions at this time. We will get back to this after we have had an opportunity to dig more deeply into the question of water supply. Where we are at, what we are doing, and see how it is related to the things integrated and related to the future development of Orange County. I have asked George Fulton from Metcalf and Eddy to briefly outline the Comprehensive Public Water Supply Report for Orange County for the Commission.

George Fulton, *Consulting Engineer, Metcalf and Eddy:* When Metcalf and Eddy started this study, it was toward the end of the recent drought. Therefore, we were able to get a rather rapid picture of what the problems were in the county. While the county did survive the drought without any serious problems, there were several areas that just managed to make it.

The base year for the study was 1965 because that was the year that we had full data as far as water supply and population. In 1965, the population in the county was a little over two hundred thousand. We did work with the Planning Department in our population objectives. According to our projections, the present population of the County will double around 1985. However, I have chosen three year points, 1995, 2020 and the base year 1965. In 1995, we predict that the population will be over 500,000 and will increase to over 700,000 in the year 2020.

In 1965 there were some twenty-four municipal systems serving the county and thirty private systems. These private systems were essentially small water supplies serving housing developments of two hundred houses or less. At that time, there were about 138,000 people served with some sort of water supply system. We project that 450,000 people in 1995 and 676,000 in 2020 will be served by some sort of multi-unit system. We assumed that the population will become denser and that there will be more of a trend toward public water supply systems. By 1995, 84% of the population will be served by public water supply systems, and 90% by 2020. This compares to the 69% presently served by public water supply systems.

In 1965, the water consumption was 15.1 million gallons a day (MGD); in 1995, it is estimated to be 54.5 MGD, and in 2020, 92.5 MGD. This represents an increase in demand in Orange County of over three times by 1995, and in 2020 we are talking about six times the water supply which we had in 1965.

For the purpose of the study, we divided the county or its population into four planning districts. The A Area is the northeast part of the county, and includes the large urban center of Newburgh. This is the area which lies generally along the Hudson and somewhat inland. The B area is the Quickway or Route 17 area, with the villages of Monroe, Chester, Goshen and the City of Middletown, along Route 17. The C Area is the West Point Military Reservation and the town of Highland, which crosses the property holding of the West Point, and the general topography is more or less separated from the rest of the county. The D Areas are those areas of the county that we expect will stay somewhat rural in nature, even in the distant future (Figure 2A, Appended).

As far as available water supplies are concerned, Orange County has absolutely no problems. It has the

Delaware and Catskill Aqueducts of the New York City water supply system going through the northeast corner. They are entitled to an amount from the New York City system equal to the per capita usage in New York City, times the number of the population served in, or the population of each community in that system.

It is interesting to note, however, that in spite of the fact that these supplies have been available, there is very little use made of this water supply system in Orange County. The City of Newburgh has an emergency connection, and the Village of Cornwall has a permanent connection to the Catskill Aqueduct. The Delaware Aqueduct, at the time of the study was not used at all by Orange County.

The problem with Orange County is the fact that it has a large land area in relation to its population. Even though this water supply is available, it must be transmitted significant distances to serve the areas that need the water. It is some eight miles from the Catskill Aqueduct to the Village of Monroe and over eight to ten miles between Monroe and Middletown for a system to interconnect the city supplies to the villages.

In our study, we found it was significantly cheaper to develop the water resources within the County, rather than to use the City system. I might say that there has been an increase in the City's rates. I think that picture is pretty much the same today, in spite of the fact that the construction costs for a new water supply development are still going up.

The studies show that to meet the 2020 needs of the County in Area A, the Newburgh Area, a new water supply with a yield of approximately 37 MGD will have to be developed at a cost exceeding twenty-eight million dollars. This is construction cost, with an engineering index of 1200. Today the engineering index is 1500 or 1600, therefore construction costs have gone up almost 50%.

The *B* Area, which is along the Route 17 corridor, will require an additional 30 MGD of water supply development at a cost exceeding $31 million.

The *C* Area, which is West Point and the Town of Highland, will require about 3 MGD more for about $2½ million investment.

The *D* Area, which is the three areas indicated on Figure 2A, will remain essentially rural and require approximately 4 MGD at a cost somewhat over $2 million.

The *A* Area, the City of Newburgh, would expand its watershed area somewhat and refurbish its filter plant and make a permanent connection, rather than an emergency connection to the Catskill Aqueduct. The Town of Newburgh has a lake reservoir which was started at the time of the study. We have recommended that this be expanded in steps to meet their needs. These steps would be steps of filter plant capacity and transmission up to its full capacity, and then at the time that that was exceeded, a permanent connection would be made to the Delaware Aqueduct for use in this northeast portion of the county.

The remainder of the development in Area A was in the Town of Montgomery where additional well supplies were developed. Also, the Town of Cornwall was designing a filter plant, and we recommended that they complete that design and make permanent connection with the Catskill Aqueduct (Figure 2B, Appended).

The large plant in this area we recommended to be done under the auspices of the County Agency. This would be a connection to the Catskill Aqueduct as an initial step to serve the surrounding area, and the eventual development of a reservoir in preferably the central western part of the county. We called this project the Dwaar Kill Reservoir; and it would involve the development of a reservoir on the Dwaar Kill, supplementing that supply with a flood-skimming pumping station on Shawangunk Kill, which has a

larger watershed.

The reason that we recommended the Catskill Aqueduct as an initial project was because the transmission of the water from the central part of the county to the eastern part is an expensive undertaking, therefore it was necessary that a base of users be built before a more expensive system could be constructed. However, once the customer base to pay for the Dwaar Kill project was available it would actually be cheaper to use the local water than to use New York City water.

Also, I would like to point out at this time that it is required that the Catskill Aqueduct water be treated and filtered. While the City does not treat the Catskill Aqueduct water, the local community would have to because they don't have large storage capacities to allow suspended sediment a chance to settle out in the reservoir. This high turbidity occurs only a few times in the year, but it necessitates the installation of a filter plant.

In Area B, along Route 17, it is recommended that the City of Middletown refurbish their filter plant. The Village of Florida had an investor-owned utility, and we recommended that a filter plant be installed there for its present supply. In the Village of Chester, we recommended that they expand their well supply.

I would like to point out that there is an extensive use of wells in Orange County. It is not, however, a good area for groundwater supply. Most of the capacities are 100,000 to 200,000 gallons a day. There are just a few locations in the county where there is sufficient groundwater supplies. By far the largest amount of water used in the county by volume is from surface water supply.

The Village of Monroe is supplied by Mombasha Lake, and we recommend a filter plant for this supply. We recommended that the Town of Woodbury and the villages of Warwick and Washingtonville expand their respective well supplies. There are very small quantities of water which are required.

The large projects in this area (Figure 2B) were two reservoirs in the western part of the county. One was Indigot Branch Creek Reservoir, with a large storage capacity that could be integrated into the existing Middletown reservoir system. The other was a Bloomingburg Reservoir, on the Shawangunk Kill. In the case of Indigot Branch, we recommended expansion; it could be readily connected to the Middletown system. Also, we recommended expansion of their treatment facilities for distribution in the area. The Bloomingburg Reservoir would require new facilities that would bring water into the Wallkill and Middletown area.

There are two other reservoirs of a minor nature that we recommended to serve the communities closer to the middle of the county, the Cromline Creek Reservoir near Washingtonville, and the Black Meadow Creek Reservoir. These two reservoirs would be interconnected, and would serve Warwick, Chester, Goshen, Monroe, and the Village of Washingtonville.

In Area C, we recommended simply that West Point, which has the largest area, develop another reservoir on their site, and integrate their system with the Highland Falls system.

The D Areas which we expect will stay rural, will just have minor well expansions, and additions of filter plants in some cases. The Crawford area certainly could be served by the Wallkill supply at that time.

I just want to complete my presentation by reiterating that the problem in Orange County is not one of supply. Supplies are available from the New York City sources and from the development of supplies within the county. The problem is more one of money. The people that live in the county today, who must develop these major water resources, are really investing in the future, and they are investing in a future that is very large size, compared to the present population.

There were very few cases where we found that additional water supplies could be developed, based on income from the selling of water. In most cases, if we expected that the user pay for it, the water business would go out of sight. So, the financial program that we developed for the county was one where the initial development would have to be accomplished by going to the county tax base. Therefore, we have to develop. The water is here to be developed; the question is where do we find the money and how much do we expect the present population to pay for the future of the county.

Mr. Garrison: So far, we have given you a thumbnail sketch, or an overview of the county and the County Water Plan. In the second part of this morning's schedule we will get down to the nitty-gritty of what we collectively, as city, town and village, have been doing in the way of implementing the plan. Then we will discuss what the county has been doing, from a county point of view.

I will turn the meeting over now to Kenneth Abt. Ken is a Consulting Engineer to the County Departments of Health and Water. Ken was formerly the Commissioner of Public Works for the City of Middletown. Ken is well known around the county in terms of the municipalities, working with the municipal engineers, and doing a lot of spadework from the county point of view on working with these cities, towns and villages.

Kenneth Abt, *Consulting Engineer, Orange County:* I will indicate to you a little bit about what these individual communities in Orange County have been doing.

Taking Section A, the Town of Newburgh purchased and developed a modern 2½ MGD water treatment plant. They have also installed approximately 35 miles of water distribution system throughout the town. Their present storage capacity is 1,300,000 gallons of storage now in their system, and they have another 750,000 gallons storage tank that is completed but hasn't gone on line yet.

They are a very rapidly expanding community, and I have urged them to consider the expansion of their filtration plant. The present plant is now going 16 hours a day. They have expanded their district to include the new Roseden Plant of Con Edison, which will be using 200,000 gallons a day from the system, and the Ganz Camera Plant right alongside of it is also going on line by next March, and will probably use another 200,000 a day from their system.

We are urging them to consider the next phase of their Chadwick Lake project, which should be the raising of the dam, and eventually a flux coming from the adjacent Gidneytown Creek into that. That is the major thing there, the City of Newburgh basically hasn't done anything. The drought is over now, and everybody in Orange County is riding along because we are back to a normal water supply. They are in good shape until the next drought.

Continuing in Section A, Montgomery and Maybrook basically haven't done anything. The Town of New Windsor is going along with the development of the Master Plan, the first phases of it. They are talking about flood-skimming from Silver Stream in the vicinity of Newburgh. They are also talking about a filtration plant for the site, and the possibility of using Catskill Aqueduct water too in that plant. That would be a long-range phase; the plant, and the impoundment that they are talking about would be a first phase, rather than using Aqueduct water, and then eventually bringing down the Dwaar Kill. The County has actually purchased about 75% of the land in the future reservoir development in that area. As Mr. Fulton mentioned, the development of the Dwaar Kill would eventually bring water back down into the filter plant that they are talking about building now.

In Area B, Harriman developed a new well in the last couple of years. Monroe hasn't done anything.

Chester has built a new half-million gallon-a-day modern filter plant on Walton Lake, and has also put in a half-million-gallon storage tank. Their well development in that area has not been very fruitful. There is an old rendering plant there with some dunes that were developed years ago. The high use of salt and so forth to try to control the odors that come out of that has polluted the groundwater in that general area and has made some of the wells in that area bad.

Goshen has done very little since the drought. We have had some interest in attempting to do something. The Village of Goshen, the Town of Goshen and the Village of Florida have had one joint meeting to consider the joint purchase, perhaps, of Glenmere Lake. Our County proposal shows a development of the Black Meadow Reservoir right alongside of that Glenmere. As a matter of fact, it is a completely new reservoir in a watershed adjacent to the existing watershed of Glenmere.

One of the very serious things for Area B is the Cromline Creek Reservoir development which was proposed in Metcalf and Eddy's study, and the committee, or the Legislature, has been looking into. We find there are very serious legal problems connected with the acquisition of land at the present time. There are perhaps two hundred individual property owners in a subdivision that actually have lake rights to that lake.

The expansion of this lake by the raising of the dam as proposed in the plan would inundate some of the largest homes there. Right now it looks as though we can write that site off, and that is probably one of the most important in the center of Orange County.

In the Middletown-Wallkill area, we are also having problems with the acquisition of the Bloomingburg Reservoir site. Two-thirds of it is in Sullivan County, one-third in Orange, therefore we are having meetings with Sullivan County on this. The Conservation Department also has planned for a reservoir-recreation area in this section, but it probably has the most potential for water supply in our whole area. Sullivan County's population density is farther to the northwest, and they therefore do not have the need in the reservoir area. They are reluctant to put any money into it right now, in acquiring their share of the land. It is very vital to Walkill and the central section of Orange County. There we were talking about a potential need of twenty million gallons a day.

In the Middletown area, Middletown is moving ahead with the refurbishing of their plant. They have plans for changing over four of their major filters. The County has acquired at least 75% of the land in the Indigot Branch Reservoir. Back in '68, we had a joint study made by Middletown and Wallkill, considering the joint use of this reservoir. Middletown traditionally was getting water for their distribution out here. The costs worked out such that Wallkill could not go with it at that time.

Wallkill has been growing very rapidly, and as of last year they have developed four 50-gallon-a-minute wells. They are using somewhere in the range of probably ten or twelve wells, scattered throughout the area, in order to supply a demand in the range of a half million gallons a day. They have plans for next year, I believe, to attempt to develop another well in areas adjacent to the Wallkill River.

Warwick and Port Jervis basically have not done anything more. In the comprehensive subsurface exploration, they do have the potential for the development of a couple of good wells there.

Cornwall is still using their old system. In this pumped storage negotiation with Con Ed, Con Ed built them a new two-million-gallon-a-day filter plant, using water from the Aqueduct, treating water from the Catskill Aqueduct, but it has never been used as yet.

Tuxedo Park built a new water treatment plant a couple of years ago that seems to be doing a good job. In the Town of Woodbury, nothing has been added. They would come to the Mineral Spring. Tuxedo, which would depend on Mineral Spring, has done nothing.

The Village of Montgomery just installed a new half million gallon storage tank, but has done nothing on their sources. They would come eventually to the Dwaar Kill. Walden has done nothing. Harriman built a new well in the last couple of years. The Village of Monroe uses Mombasha Lake, and they are now considering or having plans prepared for a new filter plant, using Mombasha water.

But for one who can look back on the drought and remember all the problems that were connected with it and with the increased population that we have, the water supply situation in Orange County, in my opinion, is in a very critical state.

We are having these spread, remotely situated housing developments of 50 to perhaps 100 homes developing their own individual water systems that are not interconnected with any other system. I think this poses a very serious problem if we get into any kind of drought condition.

Mr. Garrison: Thank you, Ken. The next speaker is Al Petersen, our Commissioner of Public Works. Al will give us a status report of an implementation nature on what the County in fact is doing. You have heard what the municipal outlook is, and now Al will give us a brief report on the County's outlook.

Alfred H. Petersen, *Commissioner of Public Works, Orange County:* I would like to briefly go through the history of what steps the County has taken. Mr. Mills mentioned the County Governing Body has recognized the need for some studies and some action on the subject of future water supplies for a number of years. This dates back as far as September of 1964, when the former Board of Supervisors first passed a resolution approving an application for aid to make a study for future water supplies. In December of 1965 the Board of Supervisors authorized the contract with Metcalf and Eddy to make the comprehensive water study.

Then, in July of 1966, the Board of Supervisors passed another resolution authorizing the necessary steps to obtain approval from the Water Resources Commission of the Water Study. In November of 1967, Metcalf and Eddy's comprehensive study, that we have been discussing here, was submitted to the Board of Supervisors and approved and accepted by the Board.

The next step the Board of Supervisors took was in April of 1969, when they appropriated a bond resolution of $5 million for the acquisition of lands for reservoir purposes. The thought behind this move was to acquire some of the land in areas of these proposed reservoir sites so they could be placed in a land bank, before they became too greatly developed. Under the present provisions of the law, this resolution of appropriating $5 million for the purchase of land for the general County purposes, the intention was specifically for reservoir purposes, but was not so stated in the bond resolution.

Subsequent to that appropriation of $5 million, the County did enter into a contract with Post Field Service, who concentrated their efforts primarily on three of the five reservoirs sites for the reasons Mr. Abt mentioned. Tomahawk Lake, because of the existing development, created a number of problems. Also, the Bloomingburg site, where two counties are involved, created all sorts of problems, so that Post Field Service concentrated their efforts primarily on the Indigot and Dwaar Kill and Black Meadow sites. They did make appraisals of all the properties in these sites, and then proceeded to acquire options for the land in these three sites, concentrating first on Indigot and the Dwaar Kill site. As Mr. Abt mentioned, they have acquired a fairly large percentage of the property in the Dwaar Kill and Indigot sites. Of the $5 million which was appropriated, about $2.6 million has already been spent for land purchases. On the basis of the appraisals made on these two sites, it would require approximately another $1.6 million to complete their acquisition. This will leave some $700,000 remaining of the original $5 million

appropriation.

The gentleman from Metcalf and Eddy said it is not a matter of supply, it is a matter of money. It was anticipated that the $5 million would be sufficient to acquire land for five reservoir sites. It now appears obvious that it will acquire land for two and maybe give us a start on the third.

The Land Acquisition Committee, under the chairmanship of Mr. Brown, is continuing negotiations with some of the owners. We have almost reached a point where land has been acquired that could be acquired through negotiations. The remainder of the land in the two sites, we are almost at a standstill, in that we have not been able to settle with the property owners, and the probabilities are in some cases that it cannot be acquired other than by condemnation.

The other site which we will probably begin to give attention to is the Black Meadow site. To date they have not acquired any options there, although we have had appraisals.

It is a feeling in the Committee that they have acquired a sufficient percentage of the property at the Dwaar Kill and Indigot sites that the two areas are actually tied down and reserved for reservoir purposes, even though they have not acquired 100%.

What the present County Legislature might see fit to do, as far as providing additional funds at this point, we have no way of knowing. Money again is a big need, if the County is to continue the program of land acquisition. This, along with some needed State legislation, is what is necessary so we can continue acquisition of these lands by condemnation, where and if necessary. I think this will be the subject of the County Attorney's speech.

Mr. Garrison: Thank you, Al. We have not only a fiscal limitation, as you can see, in terms of advance land acquisition. Recognizing that we are dealing with a surface supply primarily, so you have to respect the fact that the lead time here for acquiring land or actually developing land is considerable.

You have to understand that Orange County is basically no different than anybody else. We don't react until the crisis is on the table, but by that time it may be a little bit too late.

In addition to a fiscal and time constraints, we also have certain legislative constraints, under which we must operate. These have dealt some rather severe blows in terms of our capacity to move in these areas and to react to them in advance of the need.

I have asked Peter Striphas, our County Attorney, if he could lay before you some of the legislative problems that we are running into in the matter of acquiring lands for water supply.

Peter S. Striphas, *County Attorney, Orange County:* Thank you, Pete. Perhaps the use of the word "constraint" is not an apt one, because there is authority for the acquisition of land for reservoir sites, of course, that is contained in the County Law. However, the procedure is rather cumbersome, because it presupposes the creation of a water district, and with all the complexities that that involves. For example, when it comes to the formation of a County water district, the impetus has to come from the local legislative bodies; that is, the Town Boards and the other municipalities that may be involved, or it can be initiated by the residents of the community, the taxpayers, by the submission of a petition.

Apparently, when the Metcalf and Eddy report that Mr. Petersen referred to was prepared, neither the County nor the towns were in a position to really move ahead and get into the complexities of the formation of districts. But nonetheless there was a realization that of course the price of the property at these other reservoir sites would escalate, and that when we were able or in a position to move in a direction of formation of districts, why, the price of the lands would be out of sight.

So, the County Legislature several years ago adopted a general resolution appropriating $5 million for the acquisition of land for various County purposes. That was the expression used in the resolution, the intent being, of course, to acquire the sites that were designated in the Metcalf and Eddy report as suitable for the development as reservoirs and watershed purposes.

We embarked on the land acquisition, acquired quite a few properties, and then about a year ago a lawsuit was started against the County to declare the action of the Legislature invalid on the grounds that there was no specific statutory authority for in effect creating a land bank for reservoir purposes, which is what we were doing. The lawsuit also sought to enjoin us from proceeding on the acquisition of any further sites. That lawsuit is still pending. I don't know what the outcome will be. Realizing that perhaps the action of the County Legislature would be subject to attack on this ground, we had endeavored for about two or three years to obtain legislation to be passed by the State Legislature authorizing counties to acquire properties for use by proposed districts, whether it be a water district, sewer district, or whatever, and in effect create a land bank for these purposes.

This is not new legislation. Towns have this authority already. They have had it since 1962, under Section 208-A of the Town Law. Apparently towns were given this power back in the early sixties because water supply, and I suppose sewage disposal, was primarily a matter of town concern. As a matter of fact, the legislation which authorized counties to form county water, sewer and refuse districts was enacted back in 1963, so that is kind of late recognition by the State Legislature that the subject of water supply was a matter of County concern.

We drafted a number of bills, patterned after Section 208-A of the Town Law, giving counties the authority to purchase properties for these purposes. We drew one that would have had state-wide application; we drew another one that would apply to Orange County only.

Realizing that these properties would not be put to immediate public use, and that they might just remain undeveloped until such time as we moved ahead with the formation of water districts, we provided that the towns would be paid—that the properties would remain on the tax rolls, it would not be exempt—and I think this made good sense. But notwithstanding some really herculean efforts on our part, both in 1971 and 1970, this legislation hasn't been passed. Thanks to Assemblyman Gilman, it did pass the State Assembly in 1971, but it never moved through the State Senate.

We had planned to renew our efforts to obtain passage of this legislation during the forthcoming 1972 session. I don't know what the results will be. It may be that we will redraw the legislation to refer specifically to Orange County, and to the reservoir sites that have been designated in the Metcalf and Eddy report. I think this possibly might meet some of the objections by the members of the State Legislature.

I think the feeling was that this would permit a county to get into the real estate business, and just acquire desirable sites for resale at a profit. Well, I don't think that fear is very well founded. I think the history of our County Government and that of county governments throughout the state is such that they are not about to engage in endeavors that are going to result in profit to the counties.

In any event, that is our problem; that is our hangup. Nonetheless, we are still proceeding with the acquisition of these sites, as Mr. Petersen has indicated, because it has not been established that we do lack the authority.

I have nothing further to really add on the question of constraint. The only constraint is the possibility that the County may not have the power to land-bank for this purpose. But in any event, we think that can be corrected by legislation, and we are moving in that direction.

Mr. Garrison: Thank you. That completes our presentation, and I would think it would be appropriate at this point to entertain questions.

DISCUSSION

Chairman Conway: *Peter, do all of the towns have zoning laws?*

Mr. Garrison: Yes.

Chairman Conway: *What is the relation of zoning laws to your office? Do they have to clear your office under the County Charter?*

Mr. Garrison: They do, if it involves a new zoning ordinance or an amendment to an ordinance, they must, under the General Municipal Law, submit same to us for our review and comments. Under that law, Section 239-L and M, we do have the power of review, and that power in fact gives us the authority to approve or disapprove or approve with modifications, if it is particularly critical.

The communities, of course, under this law also have an out too. They can overrule the County by a majority plus one vote. But our experience today on zoning matters particularly is and has been I think a very amicable relationship between our operation and the individual cities, towns, and villages.

We are working now at a point where we are developing a longer range, comprehensive county-wide look. We recognize that many problems of land use, and definitely those related to water and sewer matters, transcend the political boundaries under which we are operating. We are beginning to look at these things in a more comprehensive fashion. Ultimately we would take a county-wide development package, and begin to move it in the direction of city, town and village level for implementation purposes.

Ultimately, we hope to achieve out of this process a more integrated zoning effort. We will not be dealing with a hodgepodge of zoning requirements, but will have a basic framework within which we can hopefully, through the process or the power of persuasion, get the communities to adopt in a model sense, recognizing that the differences that exist in the zoning areas are not that great.

We are trying to standardize the format that goes with it. This is a long range effort, when you are dealing with 39 communities. But they have the necessary administrative machinery for carrying it out.

Chairman Conway: *What was the total cost in the four areas of the Metcalf and Eddy recommendations?*

Mr. Fulton: In the total of four areas, close to $65 million.

Chairman Conway: *Five million of that has been covered under the various programs of acquisition. Commendably, Orange County has undertaken a sort of go-it-your-own program for water supply to 2020. If you tap the Catskill and Delaware aqueducts, the costs of distributing county-wide would be much greater than your $65 million figure?*

Mr. Fulton: I would say significantly higher, in the order of 10 to 20%. We did not mention it in the report, except in passing, because the report asked that only logical programs be presented.

You see, the city now is asking for a new rate. They are asking about $150 per million gallons just for the raw water. You have to build a filter plant, even though you don't use the filter plant all year. The filter plant and the transmission lines will add in the hundreds of dollars per million gallons, whereas in the county you are starting out with free water. If you put in a reservoir, you are not paying for raw water.

Chairman Conway: *If we set that $150 per million gallons aside, and assume we have one big pool of water on a regional basis, how would that effect your cost?*

Mr. Fulton: I think, if we didn't have to pay for the water, it would be feasible to tap into the line. In other words, if you had a regional supply that touched Orange County, and the transmission lines could be built along the Hudson River, along Route 17, to serve the major communities, it would be cheaper than the transmission facilities we proposed within the county. When you add on top of that the cost of the water supply, as you would in the case of the City of New York supply, then it is cheaper for Orange County to develop it within the county itself.

Chairman Conway: *Is there another county that has run into a land bank problem?*

Mr. Striphas: I don't think there is, because I don't think any other has attempted it. I think we are probably the first; we are the only ones who have undertaken a program of this kind. I hope we succeed. Of course we feel that we have been put upon, in a way, in not having this legislation passed, for the simple reason that the towns have had this power since about 1962. We can't quite see the discrimination in the county, and that is about what it amounts to.

Mr. O'Brien: *I haven't heard anything of the distinction between municipal supplies and privately owned or other supplies, or the relationship between them in Orange County. There are private companies supplying water in the County, is that correct?*

Mr. Fulton: Yes. At the time of the study, there were 24 municipal systems, and 30 development supplies. We limited our study to those developments that had 25 homes or more.

Mr. O'Brien: *So it is not a company, the purpose of which is to provide water?*

Mr. Fulton: They are, as far as these individual developments are concerned, they are private investor-owned utilities, in that somebody is running that system for the benefit of that development. In some cases the builder tried awfully hard to put it in the hands of the homeowners. They succeeded in some cases, in other cases they didn't.

Mr. O'Brien: *Were there any recommendations in your proposal to acquire or in any way administer these systems?*

Mr. Fulton: Well, as Ken pointed out, this did happen in Wallkill. They have some eleven or twelve wells that are supplying a half million gallons a day. You can imagine what the supply of each well is. They

simply took their development systems and tied them together with pipelines. So yes, I would say that most of those 30 supplies would disappear, if the improvements were developed that we recommended. They would be taken into municipal systems.

Mr. O'Brien: *Were they in existence prior to 1960, and do you have any drought conditions operations for them?*

Mr. Fulton: Yes, some of them had problems. Most of them are groundwater supplies in shale. The shale faces don't have much storage, and at the time of the drought they reacted rather radically as compared with Suffolk County, where you have a huge pool of water in the ground.

Mr. O'Brien: *The other question was the extent of metering throughout the municipal as well as the private systems—the percentage.*

Mr. Abt: The City of Newburgh, Town of Newburgh is metered, the City of Middletown is not, and in the period of drought conditions, the use per capita in the City of Middletown was practically the same as the 100% metered in the City of Newburgh. So, in the area, I don't think it is a very great factor, or as great, as dramatic as it might be in other areas.

Mr. O'Brien: *Do you have good loss figures on your systems, municipal systems at least?*

Mr. Fulton: Well, you can only determine the percentage of loss where you have a meter.

Mr. O'Brien: *Right. But you do meter, although not to the user, you locally meter supply, and your demand?*

Mr. Fulton: Yes.

Mr. O'Brien: *So you ought to be able to have loss figures, even though they are not ultimate to the user.*

Mr. Fulton: Well, the non-industrial per capita use of the water supply system in Orange County ranges from 139—with the exception of Tuxedo which uses 275—gallons per capita per day, down to about 46 in Crawford. The average of the county is 94, which is not unusually high. I would say in a good system, where you have normal or average use, the water usage per capita is 75 or 85 gallons per capita, so that in Orange County, where it is 94, this is not a high figure.

Obviously there is some loss, but it is not an unusual loss; and it is not all lost, either, it is unaccountable water. There are many ways that you lose water. First, you never meter water from a fire truck. In most cases, the town hall doesn't have a meter. They flush the streets. There are a lot of things. We usually accept fifteen gallons per capita per day as a reasonable figure for unaccounted water. So if you take the fifteen off the 94 or 95, it gets you down to 80. So our county is not a bad county as far as leakage. I am sure there are local situations that are really bad.

Mr. O'Brien: *Aside from the older sections, like Newburgh and Middletown, are most of the systems relatively new distribution systems?*

Mr. Abt: Well, I would say they are pretty much—some of the older villages, like Goshen, may have some old distribution mains, but in general the villages are not old. However, their total overall use doesn't add up to that much in our overall picture.

Chairman Conway: *Does 94 gallons per capita include just the people that are on municipal or private systems, or does that take into account people with private wells?*

Mr. Fulton: No, this is only public water supply systems, but it does include all use except the industrial. It includes municipal use of water, and commercial use such as stores and shopping centers.

Chairman Conway: *Do Middletown people pay for water through a real estate tax, or a separate water charge?*

Mr. Abt: This charge depends on the number of persons in the family, fixtures, and so forth; they have a whole scale.

One thing I could point out is that in Middletown they have a large state mental institution with a population probably in the range of 3,000 people, and they are fully metered. They probably consume 25% of the Middletown use with that amount of population. With 10% of the population, they consume 25% of the water.

Mr. O'Brien: *Could you tell me roughly the percentage of the entire population that is sewered here?*

Mr. Fulton: Probably on the order of 50%.

Mr. Dineen: *I have a question on the Bloomingburg Reservoir. I think Mr. Abt mentioned the fact that they had negotiated with Sullivan as far as acquiring land. Was this a multi-purpose reservoir, for recreation as well as water supply? I don't think Sullivan is going to participate in the water supply taken out of the Bloomingburg Reservoir.*

Mr. Abt: Well, I think it was Orange County's feeling that, in order to protect their future need for water supply purposes from that site, we would have liked to have gotten something going on Orange County's part. Unquestionably we need some of that water supply, for water supply purposes, and with the State considering it for conservation and other type of purposes, it was felt that we should do something about it.

Mr. Dineen: *But if Orange County developed it for water supply, they would have to acquire some land in Sullivan County, I understand?*

Mr. Garrison: Right. One of our problems is, it is an uneven situation. I think this is also reflective of

some of the problems we have internally in the county. Here you have a county which may, over the long haul, in terms of Orange, be more advanced in terms of its needs than Sullivan County. So there is a reluctance on getting together here for that very reason.

For the same reason, in large part, it becomes an impediment to a multi-jurisdictional approach to the problem within the county. You have certain communities within the county who are in more urgent need for the solving of their water supply problems than the next-door community. Yet those two communities, over the long haul, should be getting together on this. If you are going to effect the creation of a county district or water district, assuming that the impetus for this rests with the petition of those two communities to the county for the creation of this district, you run into the problem that one would like to do it, the second one doesn't feel the need for it. So how do you begin to reconcile this unevenness as it exists? It is a very real problem. Again, it gets back to the pricing situation.

The lead time here is enormous, from the acquisition to the full development of that supply, and making the necessary improvements for distribution.

Another problem, as I see it here, is the question of protection or management of this water resource, both the surface supply as well as groundwater supply. What we are acquiring now, or attempting to acquire, basically, is the reservoir itself, it does not involve the land beyond that for watershed protection. We can go so far in this area, and eventually it may be a losing game, particularly in areas of rapid growth. These are very real problems, in terms of the long range solution.

You have the other problem, I think, which sort of goes hand-in-hand with this. You have a situation where you are looking now at the longer range county planning, but there are day-to-day needs that must be satisfied. The more time that we spend in solving the day-to-day needs, we may be postponing the longer range solution to the problem.

Mr. Abt: As a matter of fact, with our day-to-day solutions, we are almost precluding the development of our master plans, and we are also adding the catastrophe factor in there, because when the small ones fail, there isn't any existing back-up for them.

The question is, how do you channel the money that is coming into the county into the development of a master plan. We know from the investigations that Metcalf and Eddy made that the potential for groundwater as a solution of our overall problem is a very small percentage, perhaps in the neighborhood of 10%, and even the small wells that are being developed at the present time to supply the interim use by these developments, are of such small amounts that they won't have any potential use in the master plan. So it is possible that there is some overall criterion which would establish certain minimums for development and use of public water supplies. This would preclude the development of small supplies and would allow us to get on with the development of the major supplies.

This goes also for sewage systems. With the proliferation of these small systems throughout the county, it is killing all our small streams, and eventually our large streams. We are not channeling the money to development of the kind of systems that perhaps could take care of it. The longer we go with this type of individual development, I think, the worse it is going to become.

Mr. Hennigan: *Is there a comprehensive sewerage study?*

Mr. Abt: Not yet. None of these things are mandatory. You see, the first stage of this is left to the communities. They have to develop these on their own. Eventually they will be blended together, and it

is even harder on the sewerage than it is with the water.

Chairman Conway: What are they doing with the effluent now?

Mr. Abt: Well, our master plan was coordinated by our water supply study, so we couldn't get into the same water. Consequently, the Wallkill, which flows directly through the center of our county, was not used for water supply purposes in our comprehensive water plan. However, it has been proposed to be used quite extensively in the comprehensive sewerage study.

Mr. Hennigan: *What you are saying is that there isn't any focus of authority and responsibility locally, is it still diffused?*

Mr. Abt: They are bypassing those. Mr. Schleifer could probably give you more on that.

Mr. Hennigan: One thing that concerns me is the question of the county role. Most of the counties have moved in the direction of authorities, or the use of county districts. The county then has a definitely assigned function in water or other activity. As I understand it, Orange County is trying to carry out a water supply role, by buying land for future reservoir use, however, the exact future role of the county is questionable.

Mr. Abt: It all depends on them. They have to make their desires known cooperatively before the County can act, under present law.

Mr. Hennigan: This raises a question as to whether the County Law should be changed or amended. There are certain special acts which are much more liberal than the general County Statute for the formation of districts. One liberalization has been already mentioned. There is the question of actually having authority for prior acquisition of the needed property for public works facilities, when the county has no specific function or authority in water supply development and operation.

Mr. Abt: I think our water needs are pretty much a foregone conclusion. Anybody that does not recognize them is not looking for the solution.

Mr. Hennigan: Another point that has been raised at most of our meetings with the counties, in some places very strongly, is the question of private water supplies. Most of the complaints have been that these private supplies are too small to be viable, either fiscally or in any other way. It is very difficult to assess responsibility for operation, and I remember particularly in Suffolk County, people came out very strongly with the recommendation that a public takeover of these inadequate supplies should be instituted.

Mr. Abt: That is what I mentioned. Certain minimum standards should be developed for their use and acceptance. Metcalf and Eddy pointed this out in their study. They recommend a minimum well size of I think 250 gallons a minute.

Mr. Hennigan: You probably noted that in the last session of the Legislature all private water companies were put under the jurisdiction of the Public Service Commission.

Mr. Schleifer: We have discussed this in the past, and my recommendation would be to just forbid small privately owned water supplies. What we did by allowing them, was compound the problem rather than solve it.

Mr. Brown: There have been quite a few times when there have been low pressure, and people without water in these developments for some lengths of time.

But I would also like to call to your attention one fact. Because of the prevalence of limestone in the county, many of these wells are suspect. In other words, I know certain wells in the area that are polluted when they are drilled. This could eliminate well supplies in some areas. Tests will be completed throughout the county in approximately two years, and at that time we may definitely have a crisis in this area by not having surface water supplies. It would either have to be elimination of the septic systems or of underground water supplies because of pollution. Since there are so many developments throughout our county, with individual septic tanks for individual homes, this could be a great problem if we don't have a supply of water readily available.

Mr. Hennigan: You have got two problems, one is the limited quantity of groundwater you can get, the second one is the fact that the groundwaters are polluted.

Mr. Schleifer: Our basic deep groundwater is limited in quantity. We are looking for municipal wells. We don't have groundwater for municipal wells as such. For individual or small use, the wells are good for that; but not for permanent supplies. The county is basically underlain by shale, which naturally has clays. Therefore, you get a cut-off layer for most surface pollution.

> **Mr. Hennigan:** *Is it a general state policy to require complete treatment on the water taken from the aqueducts of the City supply?*

Mr. Fulton: The Delaware Aqueduct, I believe, can be used all year round with no problems, but the Catskill is subject to heavy sediment at certain times of the year. At these times you have to treat the water because the people wouldn't drink it. Unfortunately, you have to put your full filtration in for a very short time of the year.

Mr. Fulton: The problem in the Catskill system is that the Schoharie has the larger watershed and Ashokan has a larger storage. What happens is, they transfer from Schoharie into Ashokan. They use the natural waterways to convey the water down into Ashokan Reservoir. When there is very high runoff and a high transferral rate, they literally gouge out the clay banks of that stream, which results in sediment in the Ashokan Reservoir, and it doesn't stay there long enough to settle out.

> **Mr. Forster:** *This is helped at times by drawing from the East Basin if the West Basin starts to show turbidity. My question is, is there any reservoir into which this Catskill water could be transferred, which could be used as a settling basin here?*

Mr. Fulton: There are no large reservoirs up in that part of the county. If you take all of them, and add them all together, you probably would have over a year's supply for Orange County just stored in the City system. The reservoir we are talking about here, Chadwick Lake and Newburgh, I doubt if you add up to a month or two's supply, so the relation to storage is very small.

I might add this, that the practice of coagulating and settling in reservoirs is disastrous. The City got burned very badly trying that on the Croton supply. They eventually had to drain that reservoir just to clean out the alum that was stored in there. It just took a slight wind to stir it up.

But they also tried, when we had the emergency Chelsea pumping station in the Hudson River, going into the West Branch Reservoir. They would rather not treat with alum, because they have an inventory of alum in the corner of the West Branch Reservoir. It is not good practice, because alum does not go away. It just stays there.

> **Chairman Conway:** *If the Dwaar Kill reservoir were completed, would that be adequate to use as a settling basin?*

Mr. Fulton: No, because if you are going to use natural settling, you really need a long time. The unfortunate thing about the county's problem is that Dwaar Kill and Indigot Branch Reservoir, where they had relative ease in acquiring land, the land area is large compared with the amount of storage of water. These are relatively shallow reservoirs. The Cromline Creek and all the others are deeper reservoirs, so that for less land acquisition, you get a lot more storage. So this is the problem that we have.

They probably would have been better off if they had gotten all the other reservoirs and not those two, from the point of view of cost for storage supply.

> **Mr. Hennigan:** *This brings up another point. In the comprehensive study of the county, there are four major projects. You have apparently given up on two already, which just leaves the two that you mentioned?*

Mr. Abt: Black Meadow would still be in.

> **Mr. Hennigan:** *Has your population projection from '65 to '71 been pretty well borne out?*

Mr. Fulton: Obviously, the big jump in population that has been projected is going to be mostly in-migration, and this natural growth figure, we have been reassessing these population projections up and down the line.

Mr. Garrison: Based on the '67 special census that we had for the county, we revised our short range objective to '70. We were taking a fairly close look at probably something in the neighborhood of 235,000. As it turned out we are 221,000 in '70. I suspect that that is going to reflect itself probably at least over the next ten or fifteen years, we are going to be behind. In other words, our estimates are probably much more liberal than what we are going to get.

After that period, when we start going beyond that, you are really looking at a crystal ball, because there are too many other things that are on the periphery right now, that it is still too early to assess what their ultimate impact is going to be on the county. Stewart Airport is a big question. Highland Dam

and recreation project is still an unresolved question in terms of its total impact.

To a lesser extent, you have the development of the Great Gorge area in Sussex County which is certainly going to have an immediate impact in that area, but what spillover we can anticipate from that is still unknown.

Even with Stewart Airport as a modified airport, if you are going to tie it in with the city and upgrade the mass transportation high speed rail component, that in and of itself is going to have an impact on this area. It is going to reinforce this area as a commutership to points south.

So again, these are all things that are waiting in the wings. It is a question of scale and a question of impact and the timing of that impact, are still unresolved. But I would suspect that over at least the next ten-year haul, we are going to be growing at a slower rate than we originally expected that we would. Whether this accelerates beyond that period and in effect makes up for the lost population in the initial period is an unknown question at this point.

Now, we have tried to say to you today, in effect, "Look, fellows, we are trying to do our homework here." We think we have done a reasonably good job of getting off the ground. There are problems in implementation, and this is really where you hang up. We have got the water supply in large measure, if we can hold onto it, because it is a fixed thing, you don't move sites around like you do other land uses. Water is where you find it. We recognize that where we find it and where it is needed is a multi-jurisdictional one, and it may be more appropriate if the County would address itself to that overall problem.

Ideally, if things were going smoothly, the development was going at a rate, and into the areas that we felt it should go, the County could begin to divest itself of some of these landholdings. This is in terms of selling them back to the district for development of that supply.

There are again, the problems that you have to face up to that are quite real, the problem of the more immediate situation, of meeting a certain water need, of developing a source of supply, however interim or however temporary, which may over the long haul be doing damage to the longer range solution of the problem.

I think these are real, they are important. If we could redirect this growth we would have more of a handle in terms of phasing of our development package, taking the plan and modifying it, working within that framework. But there are too many hands in the pot at this point. It is a question of getting these things so that they are working together and not at cross-purposes.

There is the question of what will be the real role of the State and Federal Government in terms of financing in the future. These are all things that we are going to have to be facing up to.

> **Mr. Lackey:** *Mr. Hennigan pointed out that two of the five major reservoirs proposed in Metcalf and Eddy's study are in jeopardy for one reason or the other. Are there any alternatives, or should these reservoirs not be constructed? As I look at your map, they seem to be major components of the total system, and if they aren't constructed, you've got to do something else.*

Mr. Fulton: Unfortunately, Cromline Creek Reservoir is the most strategically located. It is in an area in the central part of the county where they have almost no place to go for water. If that goes, the only logical solution is simply to enlarge the Catskill Aqueduct connection, which is tied in with the Dwaar Kill development. We were going to use the Catskill connection for the initial use of water, then build the Dwaar Kill, and use the Aqueduct as an emergency connection. If water from Cromline Creek cannot be developed, then the logical alternative is to keep the connection to the Aqueduct, increase the amount of

flow, and since Shawangunk Kill cannot be used, increase the diversions to Dwaar Kill Reservoir from Shawangunk Kill and use the City system.

The problem basically is that it was not intended that the Middletown-Wallkill area be connected to the Goshen-Monroe-Chester group. Now they may have to be. It requires that the whole Route 17 group be connected to it and that we have major transmission facilities along Route 17.

So it means basically that you can meet the problem through other means, but it means a lot more cost of transmission facilities.

Mr. Lackey: *Is this the 10 to 20% you mentioned earlier?*

Mr. Fulton: It could be that. That is off the top of my head.

Mr. Abt: There is another potential source which we are not considering because of cost, and that is the Indigot. Part of the Indigot is such that the storage there could be considerably increased. I think it is proposed to store about four billion gallons there. Also the Bashers Kill, which is just across the mountain from that area, has not been tapped, and it has quite a large drainage area, so storage flood-skimming could be done there, using Indigot as storage as well. But that would be considerably more expensive because there is a mountain involved there.

Mr. Lackey: In any case, we are talking more money now.

Mr. Abt: Definitely.

CONCLUSION

Chairman Conway: I would like to adjourn this meeting at this time. I would certainly like to thank once more all the officials of Orange County, and George Fulton, from Metcalf and Eddy, who participated in this meeting. Also Peter Garrison, for having organized the meeting, and every person who participated in it. It has been a very helpful and very fruitful meeting.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
Herman Forster
Gerald O'Brien, Jr.
Anthony M. Quartararo
William J. Schickler
Jerry Dineen, Representative of James Harding
Rosalyn Guizenheimer, Representative of Benjamin Gilman

Staff

Robert Hennigan, *Executive Director*
David Buerle, *Director, Management Studies and Analysis*
Stephen Lackey, *Assistant Director, Technical Studies and Analysis*
Irene Baker, *Public Relations*
David Duffy, *Administrative Assistant*

ORANGE COUNTY

County

Louis V. Mills, *Orange County Executive*
Henry G. Parry, *Chairman, Orange County Legislature*
Vincent Brown, Jr., *County Legislator, 3rd District*
M. Ronald Phillips, *County Legislator, 20th District*
Alfred H. Petersen, *Commissioner of Public Works*
Peter G. Striphas, *County Attorney*
Peter Garrison, *Commissioner of Planning*
Mathias Schleifer, *Assistant Commissioner for Environmental Health*
Kenneth B. Abt, *Consulting Engineer, Orange County*

New York City

Samuel Gofseyeff, *New York City Board of Water Supply*

Other

George Fulton, *Consulting Engineer, Metcalf & Eddy*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

ORANGE COUNTY MEETING

Date: November 29, 1971

Time: 9:30-12:15 – Meeting and Discussion
12:30-2:00 – Cocktails and Lunch
2:00- – Open

Place: Meeting – Orange County Government Center: Main Conference Room (932)
Luncheon – Goshen Inn

Program

9:30 **OPENING REMARKS**

Hon. Louis V. Mills, County Executive
Hon. Henry G. Parry, Chairman, Orange County Legislature

9:45 **ORANGE COUNTY – ORIENTATION and OUTLOOK**

Peter Garrison, Commissioner of Planning

10:00 **ORANGE COUNTY PLAN for WATER SUPPLY DEVELOPMENT**

Summary of Findings

George Fulton, Consulting Engineer
Metcalf and Eddy

10:15 **BREAK**

10:30 **ORANGE COUNTY PLAN for WATER SUPPLY DEVELOPMENT**

Implementation: Status Report

Kenneth Abt, Consulting Engineer
City, Town and Village Profile

Alfred H. Petersen, Commissioner of Public Works
County Profile

11:00 **ISSUES, PROBLEMS and NEEDS – Discussion**

Legislative Constraints to Implementation

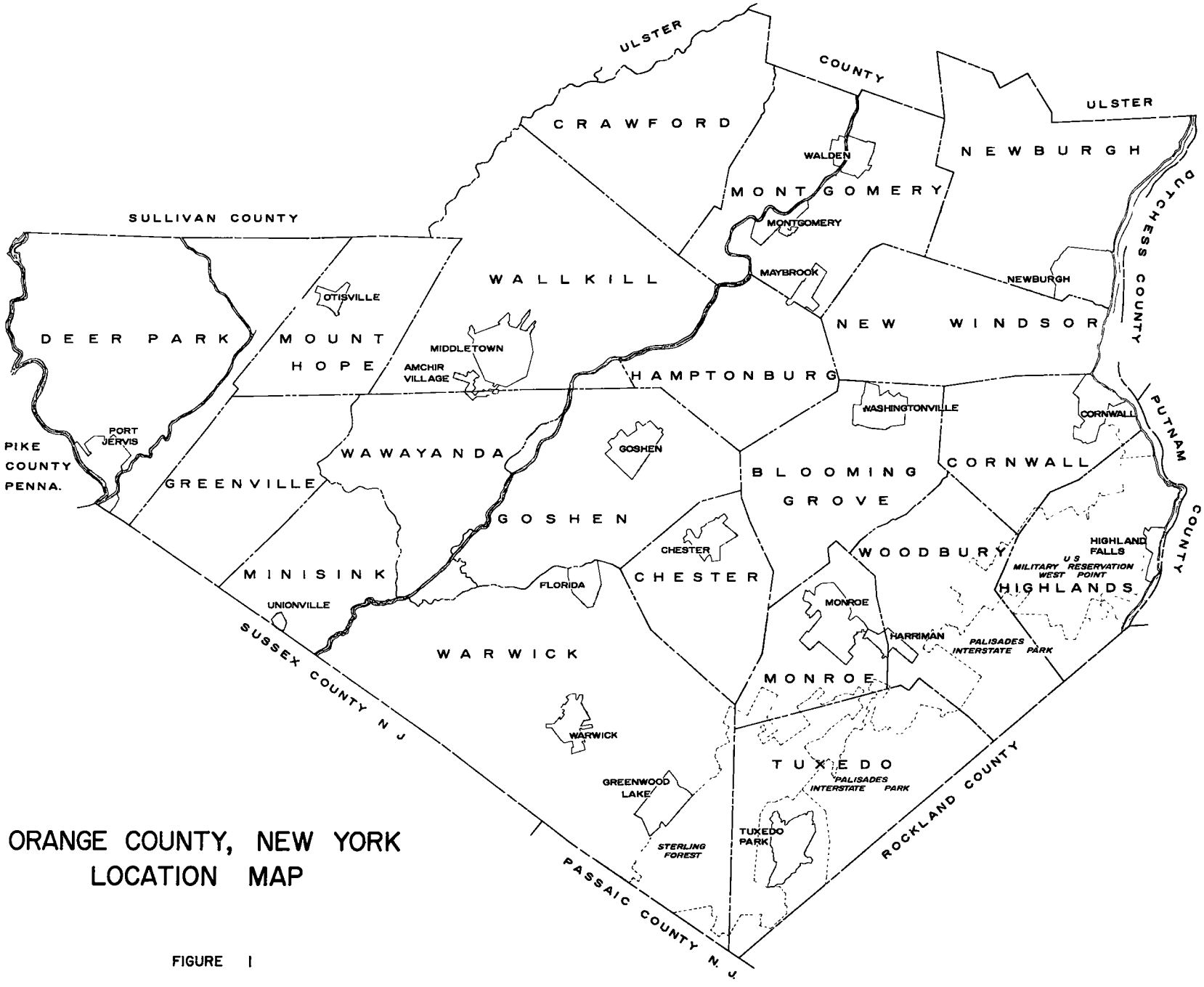
Peter S. Striphas, County Attorney
Other

12:30 **LUNCHEON**

APPENDIX C

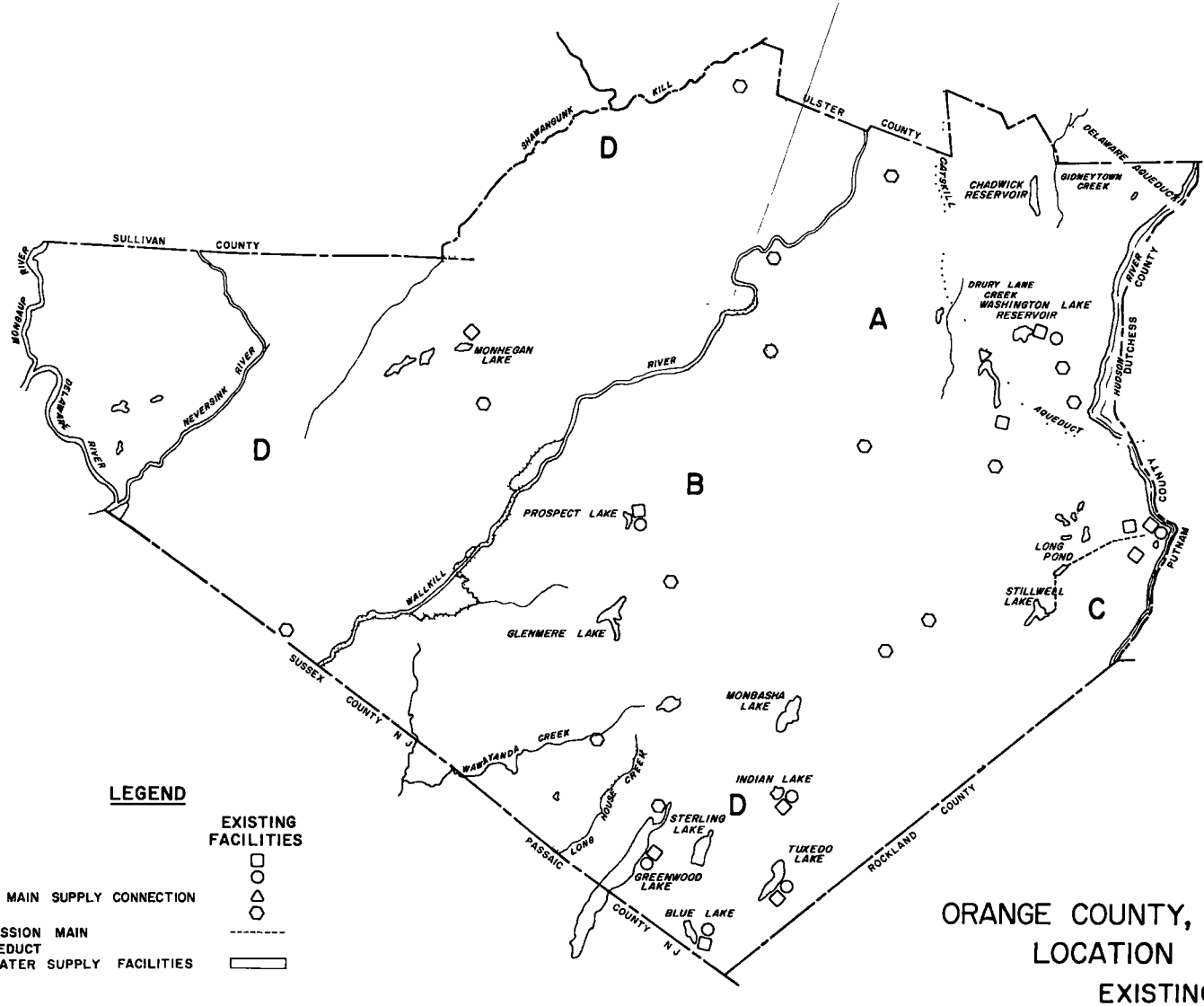
FIGURES

Figure 1 . . . . . .Municipalities in Orange County
Figure 2A . . . . . Existing Supply Systems
Figure 2B . . . . . Proposed Projects



ORANGE COUNTY, NEW YORK
LOCATION MAP

FIGURE 1

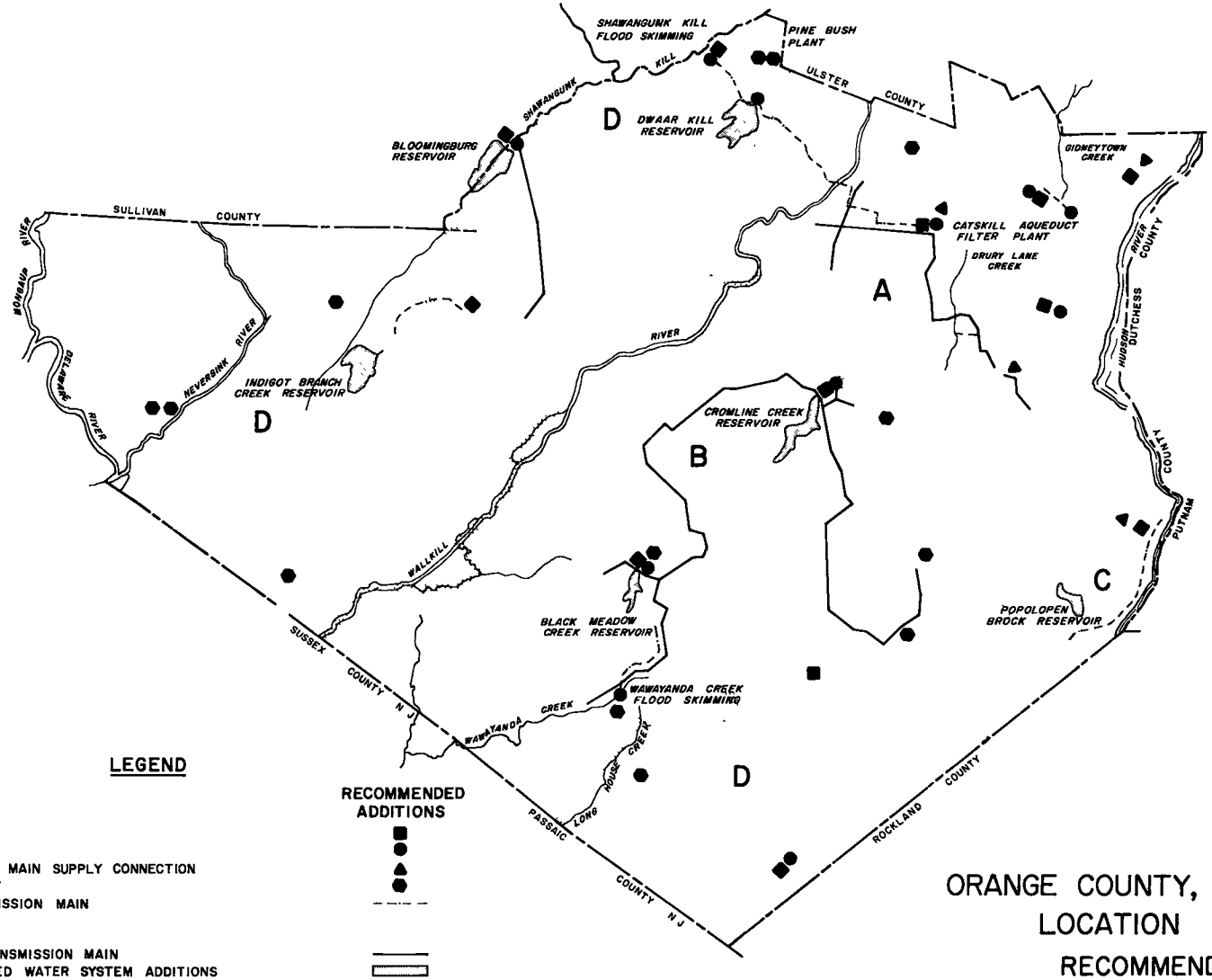


LEGEND

	EXISTING FACILITIES
FILTER PLANT	□
PUMPING STATION	○
AQUEDUCT OR WATER MAIN SUPPLY CONNECTION	△
WELL WATER SUPPLY	⬡
RAW WATER TRANSMISSION MAIN	--------
NEW YORK CITY AQUEDUCT	
DENOTES EXISTING WATER SUPPLY FACILITIES	▭

ORANGE COUNTY, NEW YORK
LOCATION MAP
EXISTING WATER SUPPLY FACILITIES

FIGURE 2A



LEGEND

FILTER PLANT
PUMPING STATION
AQUEDUCT OR WATER MAIN SUPPLY CONNECTION
WELL WATER SUPPLY
RAW WATER TRANSMISSION MAIN

RECOMMENDED ADDITIONS

TREATED WATER TRANSMISSION MAIN
DENOTES RECOMMENDED WATER SYSTEM ADDITIONS
DENOTES RECOMMENDED SERVICE AREAS

A

ORANGE COUNTY, NEW YORK
LOCATION MAP
RECOMMENDED WATER SUPPLY FACILITIES

FIGURE 2B

PUTNAM COUNTY

October 29, 1971

Carmel, New York

PUTNAM COUNTY CONFERENCE

OPENING REMARKS

Mr. E. Virgil Conway, *Chairman:* I call this meeting to order. This is a meeting of the Temporary State Commission on the Water Supply Needs of Southeastern New York. It is one of a series of meetings which the Commission is holding with the local officials in the Commission study area.

The meeting serves an input function, educating the Commission from your viewpoint, and acquainting the Commission members with the local officials personally, and furthermore, provides a base for the interchange of ideas, not only today, but throughout the life of the Commission.

These meetings are on a relatively informal basis. They are in no sense a public hearing. We do make a transcript of the meeting. However, these minutes are exchanged with the local officials that planned the meeting, so you will have a chance to look them over before they become part of the official record.

I think that the meetings that we have had with the local officials have been most valuable and have provided a broad insight into particular problems. I would like to thank Steve Estrin from Putnam County, who did the lion's share of the work in organizing this meeting. I would like to also thank each one of you from Putnam County who is here with us today and will be taking part in the meeting.

Bob, do you have anything to add?

Mr. Hennigan, *Executive Director, Southeast Water Supply Commission:* No, other than to underline the expression of appreciation to Steve Estrin for making these arrangements.

Chairman Conway: If there are any members of the press here today, they are more than welcome, but I hope they will remember that this is an input meeting. Nothing is being decided here.

Steve?

Mr. Estrin: Mr. Barbarita, the Chairman of the Putnam County Water Commission, has some remarks.

Mr. Barbarita: Mr. Chairman, ladies and gentlemen:

As a Supervisor in the Town of Kent and Chairman of the County Water Commission, I am happy to greet you. Putnam County is the fastest growing county in the State of New York. We know that natural resources are going to play an important part in our development, so that these discussions will be very pertinent to our future.

We welcome you and we hope that your conference is fruitful. I am sure that it can be most helpful and I thank you very much for coming.

PRESENTATION

Stephen A. Estrin, *Planning Director, Putnam County:* Mr. Barbarita referred in his introduction to Putnam County as the fastest growing county in the State of New York. We are also the fastest growing county in the Tri-State Region, and the second fastest growing county on the Eastern Seaboard, only surpassed by a couple of percentage points.

The County has experienced an input growth over the last decade of approximately seventy-five per cent. In terms of real numbers, we have come pretty close to doubling our population, from 31,000 in 1960 to approximately 57,000 people in 1970-71.

Putnam County is pretty unique. We are one of the five communities in the United States with a north-south, east-west roadway link within the confines of the County. That east-west link, which is located here in the Town of Southeast, the interchange here with 684, is within one mile of a rail center in the Village of Brewster, the terminal point for the Penn Central Railroad. The north-south roadway link is interstate Route 84. These transportation facilities are going to have a tremendous impact on growth in the community.

We have a lot of open area with the beginnings of residential development. This is not a good example of residential development (slide). This is what we refer to as a "graveyard" subdivision. It looks like a set of headstones. Residential developments, a type of land use, very much like what you see here, occupy ten per cent of the County's two hundred thirty seven square miles.

What we have essentially in the County, in terms of concentrations, is a corridor from Mahopac to Lake Carmel (Figure 1 appended). Route 6 from Westchester was the original and primary means of movement into the County. Consequently, we have dense population in this area, and along the 52 corridor, which is an extension of 6, and the historical summer development in the Lake Carmel area.

We have other concentrations here in the Lake Peekskill area, the Cold Springs-Nelsonville area to the west, the Putnam Lake area and Patterson, Lake Tonnetta and Brewster Heights in Southeast.

What we are seeing here (slide) is in these areas the phenomenon of a summer community that has become permanent residents. We are getting conversions. Between 1960 and 1970, fifty per cent of the summer residences of seven thousand units were converted to full-time residency. We now have only thirty-five hundred summer residences in the County. Eleven hundred of those units are situated in the community of Putnam Valley. So we can expect to see the change in this area to full-time residences.

We are known for our water. Much of that water belongs to the City of New York for water supply use. This is just the beginning of our water supply. Lake Gleneida is on the terminus of Route 6 in both directions, and 52.

This is a private lake (slide), which is also a water supply for approximately five thousand people. This is Lake Mahopac, the largest private lake in the County. It is heavily developed along the entire shore by either private homes or by private swimming area. Access to this lake is presently non-existent in terms of availability for new construction.

This gives you an idea of some of the vast extent of the West Branch Reservoir (slide). Surface water reservoirs that belong to the City of New York, the City of Peekskill, and the City of Beacon—amount to about six per cent of the total County land area.

This gives you a look at residential population (slide). You can see it is scattered, making water supply difficult to provide within the County. The other lake areas that are shown on here, involve about four per cent of the County's total land area. So total water and the land supporting that water, which is

shown in light blue on this map, is ten per cent of the County area. Consequently, ten per cent of the land area we consider to be permanent open space through our water supply.

This gives you the breakdown of our open space land (slide), which is better shown on here, including State Parks, the Hudson Highlands, and the County park. The area amounts to approximately six per cent of our total land mass. So, for our planning purposes, we can reduce the amount of buildable land right now by approximately sixteen per cent, which is natural open space in the form of parks and surface water, and does not include the Hudson River.

This gives you an idea of the County zoning (slide) as it exists right now. To a great extent, we do have adequate industrial zoning, but Putnam County is primarily zoned residentially. Based upon this zoning map, we project that the maximum holding capacity of the County is 350,000. We believe that any capacity exceeding 200,000 people, would essentially destroy our environment because much of our land is extremely difficult to build on. Therefore, the maximum population we expect would be between 180,000 and 200,000 people. This means we are going to have to do something with the zoning.

We believe that the eventual source of water supply to the County must come from the existing reservoirs within the community. The proliferation of well drilling will not supply our needs and will have an extremely adverse impact upon the community.

DISCUSSION

Mr. H. Clark Bell: *You mentioned that your zoning is predominantly residential with very little industry. In order to achieve 180,000 to 200,000 maximum population, something has to be done with your zoning. Is the entire County fully zoned now?*

Mr. Estrin: All the towns are presently zoned. Only the Village of Nelsonville, of one square mile, is not. We are in the midst of writing their zoning ordinance. There is a need throughout the County for recodification and rewriting of zoning ordinances, because they are not up to date and do not reflect current conditions.

Mr. Bell: *On this new ordinance that you are talking about, does it have limitations with respect to acreage, or with respect to trailers?*

Mr. Estrin: We recommend in the County that trailers must be handled in the same manner as one would handle single-family residential subdivisions.

Mr. Bell: *Has that been systematized into adopted rules and regulations, or is it still in study?*

Mr. Estrin: It is still in study as a recommendation. The role of the County planners is as a consultant. We make recommendations to the County and to the municipal governments. They have gone along and have adopted many of our recommendations, but we are at a point in time now where zoning must be updated. We are writing subdivision regulations now for the community of Kent.

Mr. Bell: *When you talk about "graveyard development" is this the type of thing that you want to get a better control of, so that builders just can't come in and set up a complete subdivision?*

Mr. Estrin: That is correct. We are trying to get creative subdivision design, one that utilizes the best techniques. But we are getting a lot of bad subdivisions, in that they are creating problems with road construction, with water supply, with maintenance of the area, and we hope to reverse this. We are beginning to study in the County a concept called PEED, Planned Economic Environmental Development. A total community is created, providing not only housing, but commercial, industrial, and open space uses, so that it will be possible to concentrate in the best locations the best kind of development, instead of this scattering that we have.

Mr. Bell: *Like the Staten Island project?*

Mr. Estrin: Yes, however, the Staten Island project is a little different, because we are not contemplating too much high rise.

Mr. Robert C. Wertz: *How many of your towns here have professional planning staffs?*

Mr. Estrin: None. The County of Putnam's professional staff acts as consultant to any municipality requesting that assistance. We are now the planning consultants to Town of Kent, the Village of Brewster, and to the Village of Nelsonville. The Towns of Philipstown, Carmel and Southeast utilize a part-time planning consultant, the firm of Bryan & Pancio in Fairfield, Connecticut.

One of the big inputs, I think, that the County has made to municipal government is that the County is available for any consultations whatsoever, and produces a series of documents, much like the map and demographic data you have before you, which are disseminated to the communities with recommendations. Now, whether or not they accept that recommendation, is their choice.

Mr. Wertz: *How big is your staff?*

Mr. Estrin: Five people. Mr. Wilson is our photogrammetrist. We are now preparing area mosaics for the County on a scale of one to two thousand. We are doing a map compilation for Kent, and for Putnam Valley. We have got the equipment, and that cuts down a great deal on the number of people.

Mr. Wertz: *How about engineering in the towns, such as drainage?*

Mr. Estrin: Each one of the towns has a Town Engineer who is generally in private practice but is available. I am familiar with Mr. Kelly for Patterson and Mr. Eberlin of Kent, who do all of the site work in drainage. All drainage for subdivisions on a County road or which will affect a County road must be approved by the Superintendent of Highways. This is handled by the County.

Mr. Wertz: *How do you handle sewage treatment in subdivisions?*

Mr. Estrin: Sewage treatment is handled by Mr. Caddell, who is the Director of the Environmental Services Division of the County Health Department, including approval of all subdivision sewerage. Plans must carry the stamp of the County Health Department signed by Mr. Caddell.

Mr. Wertz: *Do you have any subdivisions with their own treatment facilities, or is it all leaching?*

Mr. Estrin: Yes, we do. By a real estate law, fifty units or greater must have community system.

Mr. Caddell, *Putnam County Health Department, Division of Environmental Services:* We have a number of subdivision treatment plants. Treatment plants in general are small. We have two major municipal plants, and several older plants operated by the City of New York.

Mr. Wertz: *Who does your field inspections? Do you have a regular staff in the County, or do they have that in the towns?*

Mr. Caddell: There are County Health Department inspections, and town inspections relative to drainage, all done by engineering staff.

Chairman Conway: Steve, do you want to introduce the next speaker?

Mr. Estrin: Mr.Robert Jonas is responsible for Soils Data with the Soil and Conservation District, and they have completed their soil mapping of the County right now.

PRESENTATION

Mr. Robert Jonas, *Putnam County Soil and Conservation District:* I work for the Department of Agriculture Soil and Water Conservation Service, and my title is District Conservationist. We provide technical support through the various County Soil and Water Conservation Districts. So I am here today to furnish support to the Putnam County District.

About thirty or forty years ago, Congress determined that we needed an acre by acre, up-to-date soil survey of the United States. About fifteen years ago, districts that found themselves with urban and suburban populations discovered that soil information was just as vital for urban and suburban uses as it was in agriculture, and the SCS came under increasing pressure to provide this information to others than farmers.

Putnam County saw the need for this basic information, and has accelerated the program. Three weeks ago the last acre was mapped in Putnam County. I believe firmly that anything we do on the land should be related to the capabilities and limitations of the land, as determined by an up-to-date soil survey. I think that this is applicable in considering water supply.

The last soil survey in Putnam County was a very generalized survey of the area made in 1919. In my early work with the Putnam District, we decided that we needed to use available soils information. In 1968, the Putnam County Soil and Water Conservation District published for their annual report a generalized soil map of Putnam County using the 1919 soil survey. Since 1968 we have discovered that our names for these generalized areas weren't accurate, and we have come up with better names and groupings, according to this national classification.

What I propose to do this morning is to update this generalized soil survey, and give you an idea of what the groupings of soils in Putnam County are, and their significance.

Let's start out with the Stockbridge-Farmington group. In the northeast corner of the County the

topography is on a fairly gentle slope and the soil is classified in the Stockbridge-Farmington ground. The soils are deep coarse loam texture, well drained, have ground particle surface soils and sub-soils, and are high in lime. One of the largest soil groups in the County is Hollis-Charlton, which is extremely stony and is found mainly in the western part of the County. These are shallow soils, porous loam or sandy loam texture, very well drained. Rock fragment content usually ranges from thirty-five to fifty per cent by volume. Granitic bedrock outcrops are frequent.

The Charlton-Chatfield-Hollis association is the major soil in the eastern half of the County. This is a deep, sandy loam soil. It has moderately high rock fragment content. There is also a Chatfield-Paxton association, which is predominantly in the northern part of the County. These are, again moderately deep coarse loam or sandy loam soils, so they are well drained, and with rather small rock fragments in the surface soils. The Paxton association is in the southeastern corner of the County, with slopes ranging from gentle to moderately steep. It is a deep, friable, fine sandy loam or loam-textured soil with very little rock. One of the large groups found mainly in the valleys in the eastern part of the County is the Narragansett association. It is gently sloping to steep and is a deep silt loam, well drained, some sand, little rock fragments.

These are the basic major soil groups in the County. Some of the wetter organic soils could be sources of shallow wells. Using topography and the soils data, it is possible to identify good sites for more water supply reservoirs. The Putnam County Soil and Water Conservation District plans to publish an interim report, similar to the one of Rockland County, sometime this winter. When the soils in Rockland, Westchester, and Putnam County are all mapped, the Department of Agriculture Soil Conservation Service will publish a soils report for this area, and this will be available to the public.

Chairman Conway: Fine, Mr. Jonas, thank you very much.

> **Mr. Hennigan**: *Are these soils generally satisfactory for sub-surface sewage disposal systems? Can you make a generalization?*

Mr. Jonas: I would say, generally no. The generalized soil survey gives a general interpretation for suburban uses. For example using the Papekating group which occurs predominantly in the valleys in the eastern part of the County. "Annual and seasonably periodic flooding, in addition to a water table that is generally within two feet of the surface for most of the year, severely restricts the use of areas in this group for urban development and sewage disposal facilities. For most uses, stream pollution must be considered."

Chairman Conway: Any further questions?

Mr. Estrin: The next speaker is Mr. Jacobson of Goodkind and O'Dea, Consulting Engineers. They were responsible for the Putnam County Comprehensive Water Supply Study (CPWS-16).

PRESENTATION

Mr. Nathan Jacobson, *Goodkind and O'Dea, Consulting Engineers:* Mr. Chairman, Commissioners, ladies and gentlemen:

It is my pleasure to be here today as a representative of Goodkind and O'Dea, the County's Consulting Engineers on the Comprehensive Water Supply Study, to outline the results of the study. Inasmuch as we have previously furnished a copy of the complete detailed report on this study for the use of the Commission, and because of the limited time available here today, it is not intended that my presentation cover all aspects of the study. What I will try to do is to cover those aspects which I believe you would be most interested in, and following the discussion I will be very glad to answer any questions you might have on any aspect of the study.

First of all, the area studied was the entire County of Putnam, including all the municipalities in the area, the towns and the villages. Approximately half of the County is in the Croton Watershed, and the remaining western portion of the County drains directly to the Hudson River through small tributaries.

In order that a sound, logical basis be established for estimating the demand for future municipal water supply facilities, long-range population projections were prepared for the County, each municipality and those areas within each municipality where a demand for public water supply exists or is expected to occur within the study period. The study period was from the year 1970 to the year 2020.

Population projections indicate that the total county population is expected to reach 181,000 by the year 2020. At the end of the study period, about 150,000 persons are expected to reside in areas where provision of public water supply service can be considered a reasonable requirement. These areas are referred to as "project areas" and they are shown here (Appended figure).

The eastern two-thirds of the county is referred to as the Eastern Putnam Project Area. We also have the Cold Spring-Nelsonville-Northern Philipstown Project Area which is located in the northwestern third of the county, and also the Putnam Valley-Southeast Philipstown Project Area which is located in the southwestern third of the county.

At the time of the completion of the report there were sixty public water supply systems serving the residents of Putnam County. There were a total of 46 year-round systems, serving over forty per cent of the resident population. Groundwater was used as a source of supply by thirty-four of these systems, while the remaining twelve used surface water sources. There are fourteen additional systems activated to serve some of the seasonal population. Eight of these obtain their supply from groundwater sources and the remaining six utilize surface water sources.

For the most part, the existing systems are small, serve residential areas, and are operated by part-time personnel. Existing systems utilizing surface water sources take their supply from lakes, ponds, reservoirs or local streams, many of which are also used for bathing and boating purposes, and are thus subject to varying degrees of pollution. Some of these systems experience recurring periods of poor raw water quality, due to algae blooms and other causes. In many cases, the existing systems are marginal in capacity, lack adequate backup facilities, or are substandard in condition. Adequate records of existing facilities, sampling, testing, treatment, population served and water consumption are either lacking or incomplete.

While a number of systems have fire hydrants installed, their delivery is quite low, since most systems are severely limited either by safe yield of supply works, system storage or distribution main size. Thus, only a few provide any significant degree of fire protection, and of these, only five are rated as generally acceptable. With very few exceptions, the existing systems are not capable of being expanded to meet future water supply needs, and in some cases, the existing systems require upgrading in order to satisfactorily meet existing demands.

Future water supply demands in this report are based on project area populations, anticipated eco-

nomic growth in the County, and the basic parameters for residential, commercial, industrial and unaccounted for water use. Based on analysis of available information and knowledge of water use trends in similar areas, it is estimated that the average per capita *residential* – I repeat, *residential* – water use in the County will increase from about fifty gallons per capita per day in 1970 to about seventy-five gallons per capita per day in the year 2020. As far as commercial water use is concerned, available information and general knowledge of the nature of existing commercial development indicates that future commercial water use from public water supplies will average around twenty-two hundred gallons per day for each acre of commercial development.

The County has a relatively small industrial base, and is not expected to experience intensive industrial development within the study period. However, it is anticipated that almost all industries interested in locating in Putnam County will want to locate in areas where a public supply of water is available. To allow for the possibility of some moderate water use by future industrial establishments, three thousand gallons per day per gross acre developed for industrial purposes has been estimated as the potential future demand on public systems.

I would like to digress from the text of my report here to say that we converted the acreage to gallons per day by projecting the number of jobs that would be required to support the population that has been predicted, and converting these on the basis of so many workers per acre for the number of acres, and using the acreage allotted, we came up with the industrial water supply. Insofar as commercial use, we again determined it on the basis of so many acres per thousand population, what type of commercial land use would be required, and then using the commercial water use per acre requirements, we came up with the commercial use. Because all water systems experience various unaccounted for water use, fifteen per cent of total water demand has been allotted for water not otherwise accounted for by residential, commercial and industrial water use. This would be water not accounted for because of meter slippage, leakage, public use for flushing the streets, firefighting, or what have you.

Based on existing records and estimates of future average daily demands, it is estimated that the maximum daily demand on public water supply systems will approach three times the average daily demand during the early part of the study period, will gradually decline to twice the average daily demand by the year 1990, and will stay pretty well constant beyond it. It is estimated that the total year-round public water supply demand in all the project areas will increase from about 1.24 MGD per day in 1967 to over 16 MGD by the year 2020. Per capita public water supply demand, including all water uses, will increase from the present sixty gallons per capita per day to over a hundred and twenty-one gallons per capita per day by the end of the study period. This increase will be largely due to increased commercial and industrial use.

In order to determine the location and nature of facilities required to meet future water supply demands, the County-wide demands were allocated to the project areas based on their anticipated growth. We took into account the road network, and the suitability of the land for industrial and commercial development, and zoning.

Existing and future water supply demands indicate that the areas in the towns of Carmel, Kent, Patterson, Southeast, and Putnam Valley, referred to as the Eastern Putnam Project Area, are expected to develop a need for an areawide public water supply system. This need, in some instances, is already established.

The contiguous project areas in Putnam Valley and southeast Philipstown, including Continental Village, Lake Peekskill and Oscawana Lake, have a large percentage of the population presently served by

public water supply systems that need to be upgraded to meet existing as well as future water supply demand.

In northwestern Philipstown, the villages of Cold Spring and Nelsonville are served by an existing public water supply system that will have to be upgraded and expanded to provide an adequate supply for existing as well as future consumers in the villages and contiguous areas of the town. Cold Spring has a water supply that presently serves the Village of Cold Spring and the Village of Nelsonville, and they experienced difficulties during the drought period in obtaining an adequate supply of water.

Water resources in Putnam County are sufficient to meet existing and anticipated long-term demands for public water supply. I wish to stress this point. Obviously, when you look at the map of the County, there certainly is enough water here to take care of all the needs of the County. It is a question of getting to that water. Alternate sources include the Catskill, Croton and Delaware supply systems of the City of New York, several potential sites for local watershed development, groundwater, and, to a limited extent, existing lakes. The most ample sources are the New York City supplies which are conveniently located with respect to those areas of the County having or expected to develop a substantial public water supply demand. Several local watersheds, conveniently located with respect to certain project areas, are believed capable of providing an adequate supply for these areas. The desirability of developing such sources is, of course, subject to economic comparison with alternate sources of supply.

Further detailed investigations are needed to confirm the presence of groundwater sources of sufficient capacity to warrant development for project area public water supply. Existing lakes and ponds presently utilized for public water supply generally have low safe yields and are subject to increasing pollution from nearby development and recreational use. Their use as a source for public water supply is subject to adequate water quality control and is limited to the immediate surrounding areas.

The quality of water obtained from the several lakes and ponds presently used as sources of public water supply is generally acceptable after treatment. However, those bodies of water which have experienced moderate to heavy development on the watershed, or are also used for recreational purposes, are experiencing a gradual decline in water quality. While these waters may continue to be used for water supply purposes after proper treatment, such treatment may prove increasingly difficult and expensive.

Preliminary sampling and field evaluation of several small watersheds having some potential for development as a source of public water supply did not reveal any major source or type of pollution that would render the waters unfit for development. I think this goes along somewhat with what Mr. Jonas talked about. There are some potential sites for water supply development. Nothing, however, on the order of what New York City has, or really nothing on the order of what is required to serve the entire County.

The water obtained by New York City from its Catskill, Croton and Delaware systems has normally been of high quality. While the Croton Reservoirs are gradually experiencing a decline in overall water quality, the Catskill and Delaware systems are expected to maintain their excellent quality for a long time. In contrast to the Croton water quality, water delivered to West Branch Reservoir via the Delaware Aqueduct is of excellent quality. It is expected that this high quality will be maintained, and the West Branch Reservoir is, therefore, a prime source of supply for the County.

Except for local occurrences of polluted groundwater in densely populated and unsewered areas, groundwater throughout the County is of acceptable quality.

With the possible exception of water obtained from West Branch Reservoir, treatment of water obtained from surface water supply sources should include filtration. Because of the demonstrated long-

term high quality of West Branch Reservoir water, this water could possibly be used at present without treatment other than adequate disinfection. With the exception of the iron content of certain supplies, the quality of the groundwater is such that the New York State Drinking Water Standards can be met without treatment. Because of the possible contamination due to increasing development utilizing subsurface means of sewage disposal, and also the ever-present threat of contamination due to cross connection of potable and non-potable water systems, all public water supply systems, regardless of source, should provide adequate disinfection.

Alternate schemes for public water supply were developed and investigated to determine those which would best serve to meet the anticipated demands of the Putnam County project areas in the year 2020. In the Eastern Putnam Project Area, several schemes were developed, all of them being based on using the New York City Reservoirs as a source of supply, with one scheme including the development of a new small reservoir on a tributary of the East Branch Croton River to serve the northeastern portion of that project area. There is a possibility of developing a surface water reservoir in this area here (referring to slide). The economics of it were not as favorable as extending the system from West Branch. It also provides a problem in that a good deal of the watershed lies in Connecticut. This, as you can surmise, would pose quite a problem in protecting the watershed without having complete cooperation from the State of Connecticut.

The use of West Branch Reservoir as a source of supply for the entire project area appears to be the best for satisfying the water needs. Providing facilities from West Branch Reservoir is attractive because of the excellent water quality, virtually limitless supply with respect to project area demands and favorable location of the supply facilities with respect to many of the existing systems in the project area. If I remember the figures correctly, and those that were determined by the City of New York, the Delaware system under drought conditions could deliver between five hundred fifty and six hundred million gallons a day. This would all be routed through the West Branch Reservoir, normally.

We are talking about, in this project area, the use of something like thirteen out of sixteen million gallons a day that we have projected for the entire County, so that you can see that the amount of water that the County would need out of that system is approximately two per cent. If conditions arise which make using the West Branch Reservoir, difficult to implement, a sub-area approach, utilizing West Branch and East Branch Reservoirs to service the western and eastern portions of the project area, is a suitable alternative.

In the Cold Spring-Nelsonville-Northern Philipstown project area alternate methods of public water supply include connection to the Catskill Aqueduct to serve the entire project area. The Aqueduct tap would be used to supplement the existing Cold Spring supply, which is a small upland reservoir, with water from existing supply sources to be treated at a proposed Aqueduct treatment plant. Another alternative was construction of a reservoir and treatment facilities on Cloye Creek.

A third alternative was development of a groundwater supply in the vicinity of Foundry Cove to serve the project area, and the use of the existing Cold Spring water supply for standby purposes. In the Foundry Cove area we had the only real possibility of developing a large-scale groundwater supply, where at least two industries have wells with safe yields in terms of hundreds of gallons a day. This would be from an unconsolidated deposit. Elsewhere in the County, the soil mantle is generally thin, and we would have to go to rock wells in dense, crystalline type of rock. Fifty gallons a minute is a good yield from this type of rock, which really limits the development of groundwater sources for any major part of the water supply systems in this area. There is one exception, and that is the Village of Brewster, which derives its

source from groundwater, but we believe that may be to a limited extent also.

In the Cold Spring area, development of a groundwater supply appears to be the most favorable, both in terms of capital costs and unit costs of water. Should groundwater investigation indicate that this source is lacking in either quality or quantity, the best alternative would be to utilize the Catskill Aqueduct. I mentioned the reservoir in Cold Spring, but the cost of developing the reservoir and extending transmission mains to it was quite high for the size of the project area.

The hamlet of Garrison, which lies in the Town of Philipstown, was not included as a separate project area. However, since the possibility exists that a need for a public water supply system might develop in the Garrison area, alternate schemes of providing supply were developed. It was found that the most suitable source of supply for the Garrison area is that which would also serve the Cold Spring, Nelsonville, Northern Philipstown project area.

In the Putnam Valley, Southeast Philipstown project area, the sources of supply include a tap of the Catskill Aqueduct or development of a reservoir on Canopus Creek. Treatment would be required at either source. The use of the Catskill Aqueduct for the entire project area appears to be the most favorable in that it is less expensive both in terms of capital costs and unit costs of water when compared to the alternate of developing a new surface water supply.

In each of the project areas, water supply systems are proposed that will serve more than one municipality and are therefore regional in scope. The most desirable means of operation of these systems would be the establishment of a single regional type organization representing the entire project area. The creation of County water districts is recommended in this report as the most suitable means of establishing regional type water supply systems in Putnam County.

A County Water District may be established by the County Board of Supervisors, pursuant to Article 5A of the County Law, for the purpose of developing or acquiring a supply of water for wholesale and/or retail distribution to other municipalities, districts or persons within the County District. The County Water District approach has several advantages over other methods here in Putnam County. Because the district is a unit of County government, it can use the existing administrative facilities of the county, thus reduce administrative costs and can avail itself of the credit of the County in securing favorable interest rates on bonds and notes. A County Water District is exempt from local property taxes on all of its facilities, although not on real property, and this can be a significant savings in the annual cost of operating a regional water supply system. Also, the implementation of a regional water supply system may be considerably easier using the County Water District approach, as such districts can be established without regard to political boundaries.

Establishment of the proposed regional water supply systems using the County Water District approach will not be without problems, foremost of which is the refusal of the City of New York to recognize the right of County Water Districts to obtain a supply from the City's supply systems. This stand is taken by the City, despite the fact that the Administrative Code of the City of New York, which is based on requirements of the New York State Legislature, provides that any of the municipal corporations or water districts in those counties in which New York City water supply reservoirs or conduits are located have the right to take and receive a supply of water for their own purposes.

It is recommended that the County seek to have the matter of County Water Districts having the right to take water from the New York City supply system resolved prior to proceeding with the establishment of regional water supply systems. The problem here stems from the interpretation by the City, and perhaps on the other hand by the County, as to what is meant by Water Districts. The City maintains that there

were no County District laws in effect at the time that the Legislature allowed them to take water from the counties, and therefore that they only have to give water to Town Water Districts.

Construction of the proposed regional water supply systems in stages will be required in each of the project areas, as construction of facilities to serve an entire project area during initial development of a regional water supply system is unwarranted and would place an unreasonable burden on those initially charged with development costs. Accordingly, construction of the recommended facilities in each project area has been planned for three stages. Proposed first stage facilities will be capable of providing for the anticipated public water supply needs of portions of the project areas to the year 1985. Second and third stages will require enlargement and extension of facilities to meet the anticipated demands of the year 2000 and 2020 respectively.

The first stage of each regional system is extended outward from the proposed supply source toward existing demand centers. However, in some instances these demand centers are too far removed from the proposed source of supply, and it would be too costly to service them during first stage operations. In such cases, the existing water systems should be upgraded and utilized as interim facilities until the regional systems can be extended to these areas in subsequent stages. One example is the initial stage for the Putnam Valley, Southeast Philipstown project areas, which would take a supply from the Catskill Aqueduct. Eventually this will serve Oscawana Lake area. There is not sufficient demand base here to provide funds to support the necessary transmission main. Oscawana Lake, which is presently used as the water supply for some other small utilities, will have to be maintained and upgraded until such time as there is sufficient development to warrant extending the system up through here.

For the purposes of providing a measure of the total costs involved in establishing and operating regional water supply systems, we have assumed that: (1) County Water Districts will be formed in each of the project areas; (2) construction of first stage facilities would commence in 1973 and be completed by 1975; and (3) initial operations would begin in 1975. I want to emphasize that this is not a plan of action at this time. This was an assumption made to illustrate what the costs would be for developing regional systems. I want to make that particularly clear to any members of the press who may be present.

First stage costs on that basis are estimated to be as follows: for the Eastern Putnam Project Area, $8,600,000; for the Cold Spring, Nelsonville, Northern Philipstown Project Area, $867,000; and for the Putnam Valley, Southeast Philipstown Project Area, $1,355,000. These are the first stage capital costs, including land and construction. The annual costs of debt service, operation and maintenance for the first stage have been computed for the year 1975, as these are expected to be the largest costs that will be experienced for this stage of project development, and these are as follows:

For the Eastern Putnam Project Area these annual costs include the capital costs, first year of debt service; the operation and maintenance; and, in cases where the New York City supply would be utilized, the cost of purchased water. For the Eastern Putnam Project Area, the total annual cost for 1975 is $1,090,000; for the Cold Spring, Nelsonville, Northern Philipstown Project Area, $107,600; and for the Putnam Valley, Southeast Philipstown Project Area, $178,800. These are – large total costs for the present population, costs that are going to be a considerable burden.

During the initial period of system development, revenus based on water sales at reasonable rates, which might be sufficient to support a system tailored to meet only current demands, will *not* be sufficient to cover the cost of the proposed systems which have been designed to serve future needs and additional revenue derived from special assessments will be required. Based on rates that are considered reasonable with respect to those now in effect in areas of the County presently served by public water

supply systems, and based on anticipated annual water usage, the average annual residential water bill was estimated to be about sixty-two dollars in 1975.

Revenues from total water sales to all classes of consumers in 1975 was estimated and subtracted from the annual cost of the proposed systems to determine the tax support required. Based on an estimated 1975 tax base for that portion of each municipality within a project area, assessment rates were computed and applied to typical residential properties having assessed values of ten thousand dollars, fifteen thousand dollars and twenty thousand dollars, to determine the magnitude of the County Water District tax bill that would be charged for support of the District.

In addition to a special assessment to support the regional system, other costs may also be experienced by a property owner connected to a public water supply system. These costs would consist of Town Water District special assessments to cover the debt service incurred for construction of primary and local distribution mains and appurtenances. Because of the many situations which occur with respect to the various water supply costs that may be experienced, it was not feasible to provide estimates of the total water supply costs that may occur to all types of properties in each of the proposed County Water Districts.

However, in order that the magnitude of such costs may be understood, estimates of the anticipated total water supply costs by residents of several areas presently served by village water systems and Town Water Districts were prepared. I will read several of them. For the Carmel Water District No. 2, for a fifteen thousand dollar assessed property value, the County District tax bill would be $48., local tax bill would be $33., and the water charges would be $62., for a total annual water cost to residential consumer of $143.

In the Village of Brewster, a fifteen thousand dollar assessment would require a County District tax bill of $74., and a water charge of $62., for a total water bill of a hundred and thirty-six dollars.

In summary, then, the results of our study indicated the following:

(1) By the year 2020, about a 150,000 Putnam County residents are expected to reside in areas served by public water supply systems.

(2) With very few exceptions, the existing public water supply systems are not capable of being expanded to meet future water supply needs.

(3) The estimated public water supply demand is expected to increase from a present level of one and a quarter million gallons per day to over 16,000,000 gallons per day by the year 2020.

(4) Three geographically separate areas in Putnam County are expected to develop a need for a regional public water supply system. The largest of these covers most of the eastern half of the County, while the other two are located in the Cold Spring area and Lake Peekskill area.

(5) Water resources in Putnam County are sufficient to meet the anticipated long-term demands for public water supply.

(6) The most ample sources of future public water supply are the New York City supplies. Groundwater may be an important source, in the Cold Spring area.

(7) The water quality of existing lakes and ponds presently used for public water supply can be expected to decline because of increasing development on their watersheds and their continued use for recreational purposes.

(8) The water quality of New York's Catskill and Delaware systems is expected to remain very good for a long time to come. West Branch Reservoir, in particular, is considered a prime source of supply for the County.

(9) With the possible exception of water obtained from West Branch Reservoir, water obtained from surface water supplies should be treated. All water supplies, regardless of source, should be adequately disinfected.

(10) With the possible exception of the Cold Spring area, the New York City reservoirs and aqueducts are considered to be the most feasible sources of supply for regional type water supply systems. A groundwater source may prove feasible for the Cold Spring area.

(11) Establishment of a County Water district is recommended for each of the project areas.

(12) The foremost problem in using the County Water District approach will be in establishing the right of a County Water District to take water from the New York City supply system.

(13) Estimated costs indicate that establishment of regional water supply systems in the County will result in substantial water bills and considerable burdens on property owners during the initial years of operation.

(14) At the present time, little help in financing the cost of regional water systems can be expected from existing Federal programs. No financial aid is presently available from State sources.

In conclusion, I would like to stress three points which we feel are quite important to the establishment of regional type public water supply systems in Putnam County.

(1) Putnam County must establish its right to take water from the New York City supply system under the County Water District concept.

(2) Substantial financial assistance from the Federal and/or State level will be required in order to reduce the cost of regional public water supply development to an acceptable level during the early years.

(3) I think on this one Steve Estrin touched on it earlier, if the present prevailing situation, that of proliferation of small private water supply systems designed to meet only domestic requirements of minor subdivisions, is allowed to continue, it may and probably will have a detrimental effect on the establishment of regional water supply systems in the County.

In concluding, I would like to note that this study was financed in its entirety by a State grant, pursu-

ant to Article V, Part V-A of the New York State Conservation Law.

I will be glad to try to answer any questions that you may have.

DISCUSSION

Mr. James C. Harding: *What was the date of the study?*

Mr. Jacobson: The study was submitted in June 1970. It has been approved by the State, and I understand that there is a resolution being prepared for the County Board of Supervisors, accepting it on behalf of the County.

Mr. Bell: *Regarding the cost of water is the assessed value based on a hundred per cent equalization?*

Mr. Jacobson: I don't know what your equalization rate is at the present time, but this is the assessed value.

Mr. Bell: *What would true value be?*

Mr. Jacobson: The true value on this would be very difficult to say. It is thirty per cent now, so on a fifteen thousand dollar assessment, we are talking about a forty-five thousand dollar home.

I can go back to the ten thousand dollar assessment. In Carmel District No. 2, on a ten thousand dollar assessment, the total cost would be a hundred and sixteen dollars. In Brewster Heights, on ten thousand dollars, the total cost would be a hundred and eighty-two dollars. In the Village of Brewster, the total cost for an assessment of ten thousand dollars would be a hundred and eleven dollars. It is still high.

Mr. Benjamin Gilman: *How does that compare to the private companies in those areas?*

Mr. Jacobson: Most of the private water companies and most of the municipal districts are a hundred dollars or less. Brewster Heights might be slightly over a hundred dollars. Most of them are under that. So these will all be high. This comes about because you have to maintain the systems that are already there, and you are going to have to provide an expensive supply and distribution system to serve these people. Obviously, you are going to keep most of the costs that you already have, and add on top of that..

Very few of these systems, with the exception of the Village of Brewster, are completely debt-free. The Village of Brewster and the Village of Cold Spring, are the only two that don't have a local district tax bill. Now, these estimated costs indicate that the establishment of regional water supply systems in the County will result in substantial water bills and considerable burden on property owners during the initial years of operation. These costs can be expected to be considerably reduced in future years, as the revenue from water sales increases and as the tax base increases.

It should be noted that in computing the costs of regional water supply systems, we have not allowed for any State or Federal aid. At the present time, no State aid program is available, and assistance from available Federal aid programs is severely limited at the present time because of the insufficient funding of these programs. Unless adequate funds for these Federal aid programs are appropriated by the Con-

gress, it should not be anticipated that any Federal funds that may be received will serve to greatly reduce the total costs to property owners and residents.

Mr. Gilman: *Mr. Jacobson, your projected three-stage development that you have discussed ties in with the proposed County District plan that you have talked about?*

Mr. Jacobson: Yes, in other words, the plans that were developed, for instance, for the Eastern Putnam Project Area were based on the County District system taking water from the West Branch Reservoir, and branching out to serve the towns of Carmel, Kent and Southeast, and eventually into Patterson.

Mr. Gilman: *Would the entire three stages be eventually tied into one whole system?*

Mr. Jacobson: Yes. The second and third stages are really extensions of the first stage. They are all based on getting water from West Branch Reservoir, and the costs are based on the treatment plant that would be constructed in stages, the pumping stations that would be supplemented in capacity in stages.

Mr. Gilman: *You indicated that there is a more than adequate supply here. Would that also be true in 2020, with a projected, publically served population of 181,000. Would that water supply be adequate then?*

Mr. Jacobson: Yes, sir. That statement is predicated on the fact that the County can obtain the water that it needs from the New York City system.

Mr. Gilman: *That water is not being produced in Putnam County, it is coming out of the Cities Aqueducts.*

Mr. Jacobson: Of course, there is something here I haven't touched upon, and that is the fact that, where I mentioned that the total yield of the Delaware system was something like five hundred fifty to six hundred million gallons, we would only be needing maybe 13 MGD in this area. We have got to remember that by the year 2020, New York City is not going to have enough water, they are not going to be able to spare a drop until they expand their system.

Mr. Gilman: *When you talk about taking water from the City supply, are you talking about taking it from other areas, or right from the Putnam County supply for New York City?*

Mr. Jacobson: The Delaware Aqueduct discharges to West Branch Reservoir, so in effect in West Branch Reservoir you have a mix of Croton water and the Delaware River water. We are talking about taking water out of West Branch. We are not really concerned about where the water in the reservoir originated.

Mr. Gilman: *One other question I would like to ask. You talked about avoiding the proliferation of small companies. How do you propose to avoid the proliferation after you have a County Water District?*

Mr. Jacobson: The past experience has been that when you go to organize your large districts, you have to purchase these small districts, and you are purchasing a lot of facilities that you are going to immediately abandon. This places quite a burden on the formation of districts. What we would like to see is that any small systems that are developed become Town Water Districts. For instance, we served as Town Engineers in the Town of Southeast. The Town of Southeast has a requirement that a developer constructing a private water system petition to form a water district and turn the facilities over to the district at no cost. This then means that, when the time comes to consolidate all of these districts, you don't have the large burden that you would have if you had to buy these systems. Now, I have heard varying arguments from developers on this, that it is unconstitutional or it restricts private enterprise, and so forth. But the fact remains, and this is from bitter experience, that when you try to organize a water district in a small community system that has developed problems, and you tell the people that they have got to spend a hundred thousand or two hundred thousand dollars to buy the system, which they feel in their minds they already paid for when they bought the house, it is an extremely difficult task.

It would be a tremendous problem, I think, if all of these systems were to double or quadruple, and then to try to purchase them to form a county water district. I don't think you would be able to do it.

Mr. Gilman: *Has the procedure used in the Town of Southeast been tested in court?*

Mr. Jacobson: It has not been tested in court, but we have had at least two water systems constructed and turned over to the Town at the present time, and another one is in the process of being constructed, and will be turned over.

Mr. Bell: *Mr. Jacobson, from your report, and forgetting about Delaware, Catskill, and Croton supplies, what is the capacity of Putnam County to produce water, million gallons per day, from its ground and surface today? Nothing from the Delaware, Croton or Catskill, just Putnam County water.*

Mr. Jacobson: Offhand, I'm not certain. I would be very glad to dig those out for you later. But let me say this, without the Catskill and Delaware supply in this area of the County, there is still enough safe yield in these reservoirs to supply the existing and future population.

Mr. Bell: *Now, could you supply that figure to the Commission by letter, maybe, or some other way later. The second question is, what is the full capacity of development of your surface and groundwater in Putnam County, again excluding Delaware, Catskill, Croton? What can you produce here at maximum capacity in Putnam?*

Mr. Jacobson: Again, I will have to draw it from memory, but I would say surface water supply on the order of five million gallons, and I would not want to be quoted on that. We have that in the report, and I will dig it out for you. Groundwater supply, we believe is fairly limited for public water supply purposes. You might get two million gallons or so out.

Mr. Bell: *In your demographic projections you indicate a population of 181,000 by 2020. Can*

you give us a projection as to when the population will grow to a point where it will take all of the water than can be produced within Putnam County, ground and surface, excluding the New York City sources?

Mr. Caddell: Could I interject something. Something strikes me about this question. If you exclude your Croton watershed, you are excluding a good part of Putnam County water. This is very pertinent, because Croton watershed is a New York City watershed. However, it is a very large percentage of Putnam County.

Mr. Bell: *The information I am trying to get revolves around what we have had in various other counties, because right now the city of New York has unilateral control over the watershed areas upstate. You have the 1905 Act with the per capita limitation; and the other problems. We have got to find out how much can Putnam, Rockland, Ulster, Westchester, etc., produce on their own.*

Mr. Caddell: Just on its own, excluding fifty per cent of the County's watershed area?

Mr. Estrin: Let me clarify it in terms of watershed. The City of New York does not own the entire Croton watershed, only the area immediately surrounding its reservoirs. Also, let me make one other point. If we were to do that, we would have to exclude the City of Peekskill, which has a watershed of approximately forty-five to forty-seven square miles in Putnam County. But the entire area of Putnam Valley and part of Kent, use the Peekskill Hollow Brook as a main source of water. If we exclude them, they are out of water.

Mr. Bell: We appreciate that fact. That is why this is a regional thing. We have got to find the point when local supplies will be inadequate so that we can have a lead construction time. If New York City prevails in a lawsuit with the 1905 legislation, and we are faced with this, then we are going to have to have State-wide legislation.

Chairman Conway: What we want to know is what you can legally utilize. We are talking about, what water can you legally utilize now, and what is legally excluded. If we are going to be fair in a report to Putnam County, as well as all the other counties, we have got to determine exactly when you are going to be with less supply than you need to adequately service the population.

Mr. Jacobson: Mr. Bell, I want to touch on one other thing, something that you brought up, exclusive of the New York City system. The fact that their watersheds are controlled for sanitary purposes does not mean that the County could not fill another reservoir on the watershed with the same water. As I understand it, this could be done as long as the water from that new reservoir is not diverted out of the watershed. These new reservoirs could be developed, and that would be what is going on in the Haviland Hollow reservoir. That is in the Croton watershed. It is our understanding, that you could still build that, as long as that water was not taken out of the Croton watershed.

Mr. Bell: There are a few point of view on that, so we are trying to find out what the real needs are.

Mr. Jacobson: The point I am trying to make is that we can make some determinations, but there are legal points here that we are not competent to determine.

Mr. Wertz: *Of your sixty public water supply systems, how many of those are municipal?*

Mr. Jacobson: The Village of Brewster and the Starr Ridge Water District, in Southeast are municipal systems. Also we have three water districts in the Town of Carmel and three in the Town of Putnam Valley. We have one water district in the Cortland and Lake area, and we have the Cold Spring Village system.

Mr. Wertz: *Are the majority of people in Putnam County served by private wells, or are they served by public systems?*

Mr. Jacobson: About forty percent of the full-time residential population is served by public water systems. Sixty per cent are on individual private wells.

Mr. Wertz: When the planning people project a maximum population of 180,000 people to 200,000 based on the land use, it is zoned residential, what size lot is used?

Mr. Estrin: It varies from a half acre to three acres in certain communities. The projections that we have are based upon roads, supply and demand, water supply, the ability to sewer and to provide sub-surface control of effluent, as well as the fact that certain areas of the community cannot be built upon, like the seven thousand acres of Fahnestock Park. In fact, we are projecting that certain areas should never be built on such as Fog Swamp. We believe that they should be protected and never allowed to be built in or around without some form of protection. Any proliferation beyond this figure will destroy what we are best known for, our natural beauty, without any gain.

Mr. Wertz: *At the present time, do you have the power to keep out developers?*

Mr. Estrin: No, today we cannot. We are getting to the point where we hope to be able to control it by regulation. In certain instances, we are fighting against this kind of development. The County and certain communities have initiated two building moratoriums to achieve zoning and planning, one in the Village of Brewster, which was very successful, and one presently in the Village of Nelsonville, which has also proved very successful.

Mr. Wertz: *Have they been tested in court?*

Mr. Estrin: No, the developers found that it was not worth the chance of taking it to court. Whether or not we will be taken to court in the future is uncertain. But we have had them in effect, and legal counsel in Putnam believes that we could win in court. I would point out that Southeast recently won a court case on zoning for a very similar problem in that community.

Mr. Wertz: *I am wondering if you are doing what we did in Suffolk County and hoping that*

people are not going to move in. I think that it is very possible you may be talking about more people than a 180,000.

Mr. Estrin: The County Planning Board, pursuant to the General Municipal Law, has, in the last eighteen months refused to allow four subdivisions totaling almost two hundred homes to be built in the County. We have not been overruled by municipal government pursuant to that regulation. Three of those have been in the Town of Putnam Valley, the other was in the Town of Patterson for a hundred and seven units on half acres. This was tested in the courts, and the right of the County was upheld. It is presently in the Appellate Division and so far we have been upheld.

Mr. Wertz: *Has there been a noticeable increase in inmigration to the County with the development of better transportation routes?*

Mr. Estrin: We are unique, with the rail center which was planned by NTA and I-89.

But there are ways I feel that we can control it, with the County and municipal governments exercising its prerogatives. Our fear is that as we become more attractive, industry is going to try and come in quick and give us the business. We are attempting to meet this problem through our review procedures, and strong enforcement when it comes to issuing of variances, rezonings, etc.

Whenever we have overruled a municipality on a rezoning, they have tended to go with us. Suffolk and Nassau were too big to begin with. We are small enough, and we have enough time, due to the economic problems facing the nation right now, to gear up the mechanisms, not to stop growth but to control it, and to really give it the impetus where we feel we can best afford to accept it at this time.

The area with the main impetus is presently zoned effectively, I believe. There are some areas that have to be rezoned because they are areas that are residentially zoned and completely surrounded by an industrial and commercial area, which you have to pass through to get to the residential area, and we recommend that those areas be rezoned.

Mr. Wertz: *What kind of practical political pressures do you get from your public on zoning? Is there a general acceptance in this County?*

Mr. Estrin: There is a general acceptance of it, and realization in the County right now that there must be a change to a provision of industrial zoning and commercial zoning in those communities that are now totally residential, like Putnam Valley.

Mr. Wertz: *What is the average cost in the County of putting in a well for a private water supply?*

Mr. Estrin: A private well and water system today, I understand from the well drillers, is running between twelve and sixteen hundred dollars.

Chairman Conway: *You say that forty per cent of the population is served by sixty public systems. Of those sixty public systems, only ten are municipal systems. How much of that forty per cent do these ten systems cover? Or putting it another way, are the bulk of these sixty systems represent small subdivision type systems?*

Mr. Jacobson: Yes, the greater preponderance are on the order of serving one hundred to five hundred people. There isn't a system right now that serves more than three thousand people. There were perhaps three that served on the order of fifteen hundred. The rest of them are all small, and have limited capacity and service.

> **Chairman Conway:** *Has there been any effort to expand County-wide the Town of Southeast's policy requiring turnover of privately built subdivision systems, because this puts this rather high cost of water in the price of the home?*

Mr. Estrin: We have begun to recommend this, but it presents a problem very similar to municipal government accepting the town role. We are very small in terms of absolute population, in terms of revenues, to establish an ability to handle it. Even at the County level the Departments of Public Works is nonexistent. The question of providing the professional people to oversee and run it is a problem for the small municipalities. We are hoping to get this done in Kent and are discussing it on a very limited basis. It might well be that the answer for Putnam County is to go to a County-wide basis. This would be the same way we hope to solve our solid waste problem.

> **Mr. Gilman:** *How far has the County gone in exploring a County-wide water system?*

Mr. Estrin: Not very far. We have only been in the planning business full-time in the County now for eighteen months.

The County has begun to realize that it is emerging from a rural into a suburbanizing area. A major problem in the County is that it is difficult to change public attitudes. Many of our residents have come here from the Bronx, Long Island, outside or upstate, because of its rural character.

The next speaker is Mr. Robert Caddell. He is the Director of the County Health Department Division of Environmental Services, who must approve the County water systems as they are built.

PRESENTATION

Mr. Robert Caddell, *Director, Putnam County Health Department, Division of Environmental Services:* The County Health Department represents both the State Health Department and the State Department of Environmental Conservation. From the Health Department's point of view on water supply, particularly quality, and the Environmental Conservation regarding water resources.

At this point, we are the main County agency that has some control over the development of water supply in the County. I say some control, because it is not really a planning control, but a control based on what we approve and what we will recommend for approval. We are forced in some ways to go along with a lot of the bad sides of development, and the initiation of small systems which may be good relative to short-range need, but bad relative to the long-range plan.

The problems in Putnam County of water supply, relate to quality and quantity, planning and development. On quality, the majority of our water supplies, which take water from surface waters, do not filter their water. This presents a problem in many instances. The multiplicity of small supplies presents problems relating to quality: The small water supply taking its source, unfiltered, from a lake, may be good nine months out of the year, then run into taste, odor, and color problems due to algae. Chlorina-

tion is of little help; filtration is needed. Our experience has been that the multiplicity of small supplies leads to a higher probability of breakdown, at some point of treatment.

On the problem of delivering the water, small suppliers again are subject to breakdown. Residents can go for great periods of time without water, if the small supply breaks down, or the wells run dry. Where do they get the water? They start trucking it in. There are several areas around Putnam Lake, Lake Carmel, Lake Oscawana, Lake Peekskill, which were small year-round communities and now are becoming large year-round communities. These areas are almost exclusively supplied by individual wells on small lots, which also have septic systems. This presents a public health problem of water supply contamination.

I don't know what the population of the Lake Carmel area is, but I know that it is a great headache to us, because there are so many people wanting to build year-round. There is no public water supply there for the present population, yet it is right in the main population corridor. It points up the need to develop an area-wide comprehensive supply.

I would like to pose a question to the Commission. I gather from what I have heard so far that the main thrust of this Commission is to look toward providing a volume of water necessary to serve the metropolitan area, and not to solve local problems in an area like Putnam County. Am I right?

DISCUSSION

Chairman Conway: I want to re-emphasize that this is a comprehensive study of the entire region, where your needs, the current situation, and the future needs of the entire region have to be kept in mind. Any report this Commission turns in will include not only technical supply matters, which have been studied to death, but also conclusions as to the financing, legal and administrative issues for the entire Southeastern Region needs. So anybody can put to rest any feeling that has a connotation as far as city versus rural or any of the other conflicts that have historically existed.

Quite the contrary, the Commission was formed for the very reason of resolving these historical conflicts. I don't think there would be a Commission if there hadn't been the conflict which involved, as you know, some very knotty problems, probably really since the beginning of the twentieth century, when population started to expand outside of the city area.

Mr. Caddell: The big problem we see is, assuming again we can legally get the water from the New York City reservoirs, is how do we finance a county system based on future growth and capability.

Another big problem, as I see it in the County, is the multiplicity of small supplies. We have tried to take steps to restrict the development of these small supplies. The Comprehensive Study presents a plan. Can it be implemented without outside help, I think not. One thing I am trying to do is to require that every main that is built be offered for dedication. Now, this again poses some legal questions that you were discussing. This is the type of thing I think the Commission should think about. Can we legally restrict developers so that they are required to take into account the long-range approach? They can keep their wells and pump houses, but I think we want their mains in the future. I don't know if Nate's figures include purchasing those small water supplies.

Mr. Jacobson: Well, not in the capital cost. The capital cost that I gave were the costs of constructing the County Districts.

Mr. Caddell: I assume that we would be looking to a purchase takeover of these private water companies eventually.

Mr. Jacobson: Yes. That is correct. I think I indicated it was impossible to cover all circumstances. The only thing we could do was approach it from the point of view of existing districts, where we knew what the costs were.

Mr. Caddell: You were not absorbing costs for purchasing of private supplies?

Mr. Jacobson: No, we were not. I think, though, that we could state that generally the cost of financing these purchases will be on the order of the cost of financing the districts. Although they may be somewhat higher, I don't think they will be on the order of magnitude of twice as high, or anything like that. So that, when I gave various sizes of water bills, I think, based on whether you were going to have a private water supply, or an existing district that you have to continue to finance, this range of cost is going to be the same.

In other words, I said we were talking about somewhere between a hundred and two hundred dollars a year water bill, total cost. I think that is true regardless of whether you have a private system that you have to buy and refinance, or whether you have an existing district that you have to continue to finance. Chances are that the private districts will be closer to the two hundred dollar range than to the one hundred dollar range.

Mr. Caddell: Incidentally, on the private water rates, the question came up earlier. This past summer, the direction in these private water companies was to greatly increase their rates. This may be peculiar to Putnam County, but some of the private rates in the County are going up to the range that you were referring to, Nate. George just mentioned to me that he had received a water bill, he is on a private water company, of a hundred and sixty-nine dollars ($169.00) for a nine months period. I would like to refer back to something that Mr. Jacobson mentioned. It was a question of aid. Can the Commission play a role in attempting to foster aid programs of various sorts? In Putnam County, for instance, we would be trying to provide the facilities for future development. It is very difficult for the existing population to bear costs, the cost of transmission and treatment.

I know the State Health Department is looking into it. I don't know how effective they are in pushing for it.

Chairman Conway: *How much of the County is sewered?*

Mr. Caddell: A very small percentage. We have a proliferation of small treatment plants. We have only four municipal sewage plants. There is currently a comprehensive sewage study being prepared.

Chairman Conway: *Is there any problem with water quality throughout the County?*

Mr. Caddell: The quantity problem has been more of a concern in groundwater sources, particularly in these rock wells, there is decreasing water quantity.

Chairman Conway: *Are there any plans for sewering the County? Certainly, if you are going to have 200,000 people in this County, you are going to have to have more sewering.*

Mr. Caddell: The plans are the knotty problem. The plans for the sewering of the County will relate to the comprehensive study as it is prepared. How it is to be implemented? We are faced with another problem on sewering, which is, where do we dump all the sewage? We can return it to the New York City watershed. I don't know how interested they are, or in what form they are willing to take it. Both of our sewer plants will have effluents on the City watershed.

Mr. Hennigan: This means that your net removal of water from the City watershed is going to be very small.

Mr. Caddell: We will be returning all water to the City watershed.

Chairman Conway: *Are the soil conditions here favorable for recharge?*

Mr. Caddell: There is really no area for recharge.

Mr. Wertz: *On that same point, I think it was Bob Jonas who said that the groundwater is two feet below the surface of the ground? Is that correct?*

Mr. Jonas: No. I mentioned a particular soil type in which there is a high groundwater point. This was one particular soil which you would expect to have the groundwater table within two feet of the surface.

Mr. Wertz: *Most of the wells in the County would be deep wells?*

Mr. Jonas: Yes. Although there are places in the County where shallow wells would be good, notably in the Peekskill Hollow Brook area, which is the watershed of the City of Peekskill. There are other spot places at which examination of the soil survey might indicate that some shallow wells could continue to be productive.

Chairman Conway: *Has any thought been given to using Hudson River water? Is it too saline at this point?*

Mr. Jacobson: The saline count is too high in the vicinity of Putnam County to do us much good. We did consider the eventual possibility of the New York City Hyde Park development, and they are routing their tunnel down through Putnam County, it would be somewhere down through the middle of the County.

By the looks of it, from the studies made to date, it is going to come through in a very advantageous location, if taps are provided at that location. So water from the upper Hudson would be helpful to the County, but not in the vicinity of Cold Spring Village and adjacent areas along the Hudson River. The cost of desalting water would be out of order.

Mr. Harding: *Would you say from your examinations that the most advantageous new source of supply for the metropolitan area, to Putnam County would be the Hyde Park project?*

Mr. Jacobson: We didn't go into the economics in depth of what it would cost to take water from any new facility that would come down from Hyde Park. There wasn't enough information available as to what the actual cost might be, and also whether they are even going to go ahead with the project.

Right now we feel that the most advantageous source of supply is West Branch Reservoir. It remains to be seen whether, if they did develop the Hyde Park supply, what size it would be, what its initial cost would be, what the cost of water would be to the County. I would hazard a guess that the unit cost of the water to the County would be higher, and, therefore, the most economically feasible source of supply would still remain West Branch Reservoir.

There are pluses for the Hyde Park system, especially if the treatment facilities are placed in the vicinity of Hyde Park, rather than below Putnam County. If the treatment source were provided there, we would have potable water under pressure immediately available at a tap. It would eliminate some of our pumping costs.

As I mentioned before, we are talking about taking a small amount of New York City's water supply in the year 2020. I think the Counties of Putnam, Westchester, and Dutchess should wholeheartedly support the development of additional supplies, such as Hyde Park.

As Steve mentioned here, the small local hamlets are quite parochial in their attitude, and the counties are also parochial in their attitude. Now, we represent Putnam County, and we realize your problems, but in order for this Commission to succeed in getting a really metropolitan regional water supply system, the counties can no longer consider New York City as an enemy, somebody to oppose. You have to work with them, and New York City has to do likewise. A joint venture on something like the Hyde Park system would be excellent for everybody concerned, regardless of the immediate economics. In the long term, it probably will turn out to be the most economical approach.

Chairman Conway: *I would like to ask Mr. Estrin, what do you think would be the reaction of the people of Putnam County to a regional water authority for all of Southeastern New York?*

Mr. Estrin: First of all, you have to change the name. "Regional" has a very bad connotation in Putnam County. So that I think that in turn, at this stage of the game, answers the problem. I mentioned the problem we are faced with, an inner orientation rather than an outward orientation. This is extremely common in Putnam County. In fact, it is common in just about every place.

The problem here is that, if it is a good solution, adequately presented with adequate amounts of time for the people to digest it, I think it would be acceptable, but they must be given the opportunity through public hearings to fully comprehend the program. My people and I are willing to support it. I believe that the political mechanism of the County at the County level would support such a program. Support at the grass roots, at the public level, is going to present a problem, on any form of planning whatsoever.

Chairman Conway: This is not necessarily a recommendation of the Commission, and I want to make that clear, but I think this is one possible solution and we have to get a reaction.

Mr. Jacobson: I would like to enlarge on Steve's statement there. Any regional water authority, in order to go over, I think, in any of the counties, the people are going to have to be assured that they are going to have equal status with the giant down in New York City. If they don't have that assurance, you are just out flying kites, you are not going to get any place. They have got to have equal representation.

Mr. Peter Connal, *Town of Southeast Planning Board:* I think that what Mr. Estrin and Mr. Jacobson said is true. I think that the problem is that each of us approach it, even our Planning Boards do, on a very parochial basis. We are really only interested in the septic tank in our backyard and our water.

I live in Brewster Heights, in the Town of Southeast, and some years ago we had the possibility of building a sewage treatment plant. Basically, we had some septic problems which have been, by and large, cured by adequate drainage around each individual septic tank. But at the time it was told us that the new sewage plant would cost us approximately twenty dollars extra to our mortgage, so of course this was a shock to most of the people living there, who just couldn't afford another twenty dollars at the time.

So I think what we have to do, and I was really not aware of the problems that we face as a region, but more and more from the statements of the Board, I am beginning to believe that we can no longer approach it even on a County or a regional basis, it will have to be almost on a general northeast area basis.

I think that if you can adequately prepare each individual homeowner to the fact that he no longer can consider just his own individual well or small water system, but they have to approach it on a regional basis.

I think that if you can take steps, such as, Mr. Estrin and Mr. Jacobson brought out the fact that in the Town of Southeast we are asking the developers to develop the water system and then turn it over to each individual town at a cost of one dollar. In the past three years that we have been doing this, we have had no complaints by developers at all with the philosophy of turning over the water system to the Town, because they don't want to be in the water business per se. Once you tell them that this practice has been established, I don't see why it just couldn't be an interim method of obtaining water supplies.

But as far as the overall program, I think basically that we really need public relations, we need much publicity on meetings such as this, to show the individual people in the County that no longer can we think just as the Town of Southeast or Putnam County or the State of New York, because as I see it, each one of us are so interrelated that we must take into consideration Massachusetts or Connecticut.

ADJOURNMENT

Chairman Conway: Thank you for being with us.

I invite everybody here to join us for lunch, and thank everybody who contributed towards this meeting. Steve, I would like to again thank you for all you have done.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
H. Clark Bell, *Vice Chairman*
Benjamin Gilman
James C. Harding
Thomas McInerney
William Schickler
Robert Wertz

Staff

Robert D. Hennigan, *Executive Director*
Paul W. Meikens, *Director, Technical Studies and Analysis*
Stephen Lackey, *Assistant Director, Technical Studies and Analysis*
David A. Duffy, *Administrative Assistant*
Irene Baker, *Public Relations*
Harold Breon, *Water Resources Engineer*
Jeffrey Brewer, *Research Assistant*
Robert Redmond, *Staff Attorney*
Leslie Van Derzee, *Research Assistant*
Karen McCarthy, *Secretary*

PUTNAM COUNTY

County

Stephen A. Estrin, *Planning Director, Putnam County*
Robert J. Caddell, *Director, Putnam County Health Department, Division of Environmental Services*
Nathan Jacobson, *Goodkind and O'Dea, Consulting Engineers*
Robert Jonas, *Putnam County Soil and Water Conservation District*

Miles Oakley, *Putnam County Highway Department*
William Budeweek, *Putnam County Planning Board*
Daniel Fuccalla, *Putnam County Planning Board, Town of Kent Planning Board*
Carl Peatus, *Putnam County Planning Board, Town of Southeast Planning Board*

Town

Frank R. Barbarita, *Supervisor, Town of Kent, and Chairman of the County Water Commission*
Peter Coval, *Town of Southeast Planning Board*
Monroe M. Eberlin, *Eberlin and Eberlin Consulting Engineers, Town Engineers, Town of Kent*

New York City

Samuel Gofseyeff, *New York City Board of Water Supply*

Other

Nathan L. Jacobson, *Goodkind and O'Dea Consulting Engineers*
Robert S. Bryan, *Bryan & Pancio*
Jeremiah R. Dineen, *Westchester County Department of Environmental Services*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

PUTNAM COUNTY MEETING

9:30- 9:50 OPENING REMARKS

Mr. E. Virgil Conway, Chairman, Presiding

Mr. Frank R. Barbarita, Chairman, County Water Commission

9:50-11:30 PRESENTATIONS

LAND USE & POPULATION

Mr. Stephen A. Estrin, Planning Director
Putnam County Planning Board

SOILS

Mr. Robert Jonas, District Conservationist
Putnam County Soil & Conservation District

PUTNAM COUNTY WATER STUDY

Mr. Nathan Jacobson, Goodkind & O'Dea
Consulting Engineers

WATER SUPPLY PROBLEMS

Mr. Robert Caddell, Director
Division of Environmental Services
Putnam County Health Department

11:30-12:30 GENERAL DISCUSSION

12:30- 1:30 LUNCHEON

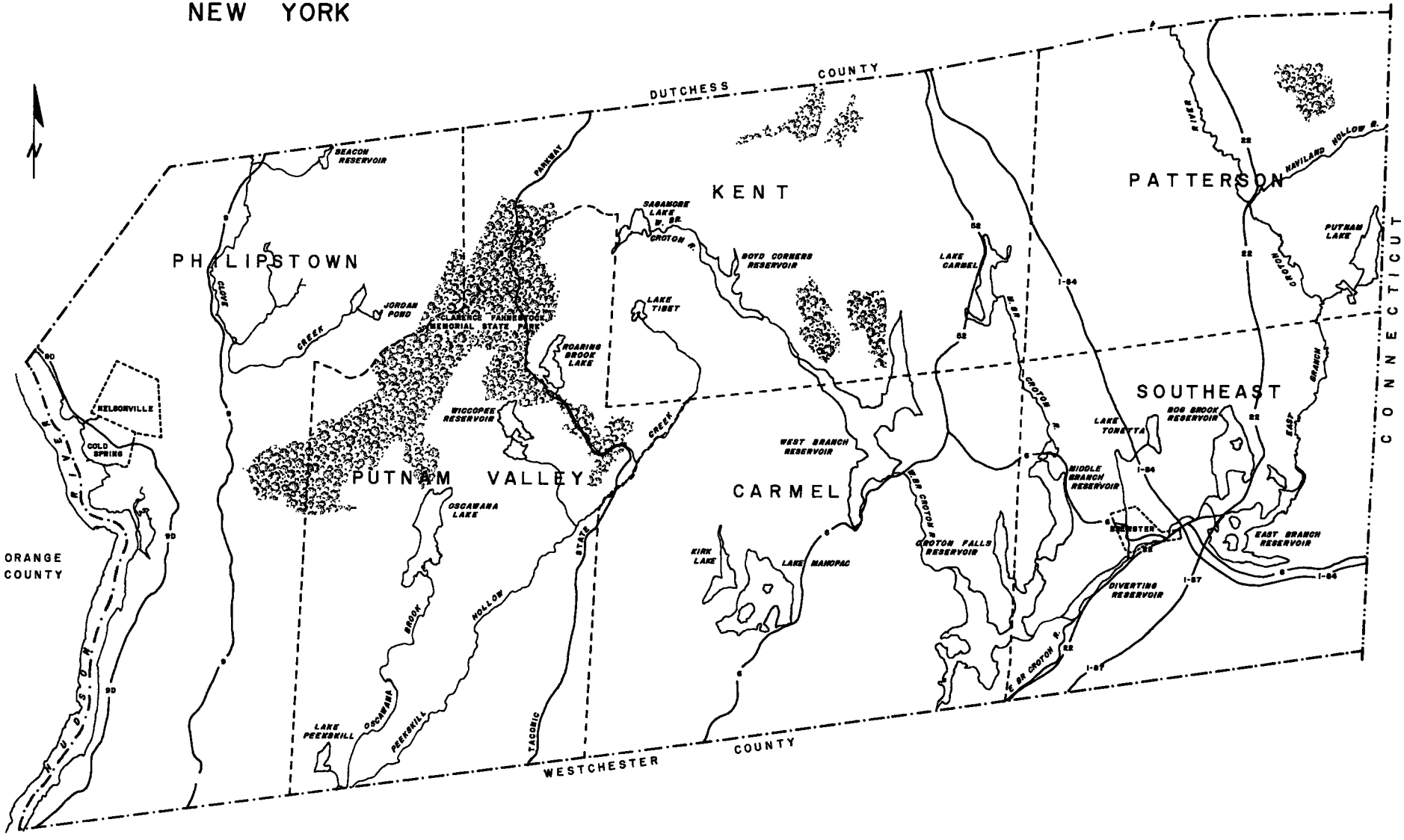
APPENDIX C

FIGURE

Figure 1 . . . . . Outline map of Putnam County

FIGURE I

PUTNAM COUNTY NEW YORK



ROCKLAND COUNTY

October 20, 1971

Nanuet, New York

ROCKLAND COUNTY CONFERENCE

OPENING REMARKS

Mr. E. Virgil Conway, *Chairman, Southeast Water Supply Commission:* I call to order this meeting of the Water Commission. We welcome you here and are very pleased to be in Rockland County.

This is one in a series of meetings with local officials in our study area. These meetings have a twofold purpose: First, they educate the Commission on exactly what the problems are in the view of the various local officials. Secondly, it provides a very important opportunity for the Commission, the Commission staff and the local officials to get to know each other, and develop a working relationship.

We depend almost completely upon the local officials to organize the meeting, and I would like to thank Dan Fried, who did so much of the organization work on this meeting. No decisions, recommendations, or conclusions have been reached. We are still in the input stage of the study.

PRESENTATION

Aaron D. Fried, *Planning Director, Rockland County Planning Board:* We have prepared a kit of items including information on population and land use. The land use map of the county is included. There is also information on the public water supply systems in Rockland County.

I will mention to start the meeting off, some basic items on Rockland County. Rockland is the smallest county in New York State. It is composed of five towns and thirteen villages and also includes twelve major hamlets.

The county has experienced quite rapid growth over the last fifteen years, due basically to little prior development before the advent of the roads that criss-cross the county now, and the development of the Thruway, and the Palisades Interstate Parkway. This combination of highways made Rockland County an ideal area for development.

Its proximity to New York was enhanced. It is only about forty-five minutes away from New York City. The population of Rockland County is 229,903, as of the 1970 census, and that is a sixty-eight per cent increase from the 1960 population of 136,803.

Rockland is the second fastest growing county in New York State. Only Putnam County has had a faster rate of growth over the last ten years. In the future we anticipate a continuing population growth to about 370,000 in 1985, and to about 450,000 by the end of this century. We expect to double our present population by the year 2000.

We expect that the rate of growth will be decreasing and estimate a six per cent annual growth over the next five or six years, decreasing to three per cent growth between 1975 and 1990, and further decreasing to one per cent growth between 1990 and the year 2000.

The population density is 2.5 persons per acre, and we expect it to rise to 5.5 persons per acre by the year 2000. Rockland County occupies the middle ground in terms of density. It is a bit higher than

Suffolk and Putnam, but well below counties such as Westchester and Bergen.

In terms of the future distribution of population, we see a varying pattern in development. We expect the town of Haverstraw to have the most explosive growth. We anticipate a density of nine persons per acre and a population of roughly forty-five thousand by the year 2000.

The Town of Ramapo, which is the largest town, will probably have a heavy numerical growth but the density will probably be the lowest in the county. The Town of Clarkstown will be the most populous, with over a hundred thousand people. Orangetown will grow very slowly until about 1980, when we anticipate that a major office complex will take root. We expect increased growth after that.

Stony Point will show a fairly good increase in terms of numerical increase in population, but is limited by topography. We don't anticipate that it will go much beyond thirty thousand people.

The villages probably will experience a very heavy rate of growth. We expect that the village population will total about a hundred and fifteen thousand by the year 2000, with some having densities in excess of twenty persons per acre, particularly the Villages of Nyack and Spring Valley. We anticipate the average density for all villages to be in the neighborhood of about ten per acre by 2000.

Right now, we only have one village that has over ten thousand people. However, we expect that by 2000 there will be five villages with over ten thousand people. These would be Spring Valley, Nyack, Haverstraw, West Haverstraw and Suffern. Some of the smaller villages, such as Piermont and Sloatsburg and Hillburn, are presently growing very slowly. Their total population is about six thousand right now, but we expect that they will increase their growth rate markedly over the next twenty years, and anticipate the total growth of the villages to rise to about nineteen thousand people. The other villages we expect will have just a moderate rate of growth, and will be well below ten persons per acre.

We also have some major hamlets in the county, principally New City and Pearl River. New City may be the largest hamlet in New York State right now in terms of population, but we expect that by 2000 it will have fifty-five thousand people, and Pearl River we expect will grow to about twenty-three thousand by 2000.

We expect continued urbanization until all of the vacant land is developed. At the present time, vacant land constitutes about thirty-three thousand acres, and we anticipate that before 1985 this will be developed. By 1990 we expect a second wave or urbanization, based mostly on redevelopment, with the villages becoming the major growth areas. The zoned capacity of the county is about 350,000 people, so the additional 100,000 we expect by the year 2000 will be through redevelopment, which will mean higher densities.

In terms of economic base, there were about 72,000 jobs in 1970. That will grow to about 106,000 jobs by 1985, which is roughly parallel to the general increase in the population. It's a bit ahead of the whole New York metropolitan area, which will show a decrease in the ration of jobs per population over the next fifteen or twenty years.

In terms of the industries in the county, we expect an increase in wholesale and distributive industries. We anticipate a decline in fabric mill and apparel products, and a continued development of subregional shopping centers, and a very significant increase in office jobs, sparked principally by the URIS complex, which is a major office expansion in Rockland County, Town of Orangetown. About one million square feet will be available by early spring of 1972 with an anticipation of going to four million square feet of office space. This would make it the biggest office complex outside of New York City.

Summarizing these points: Population will rise from the present 230,000 to 450,000 by the year 2000. We anticipate that, probably by the early 1980's, all our vacant land will be used up. At that point,

we expect redevelopment, with an increase in multi-family dwellings, particularly in the condominium co-op type of development. We anticipate continued major shopping center developments, new industrial and office parks, principally serving distributive types of industries, and a new focus on the villages for redevelopment.

That covers what I have to say. Do you have any question?

DISCUSSION

Chairman Conway: *How much of the county is presently in parks?*

Mr. Fried: About twenty-seven per cent is in parks and open space, principally the Palisades Interstate Park System, which covers the whole western area of the county. It is a very high figure and reduces available land considerably. As I say, we are the smallest county in area and the Palisades Park takes twenty-seven per cent off of the amount of land available for development.

Mr. Gerald O'Brien: *If you added the Federal and all governmentally-owned property, isn't it substantially in excess of twenty-seven per cent?*

Mr. Fried: Yes, actually if all the other public and semi-public uses are included that would add another seventeen per cent, for a total of forty-four per cent. There are two major state institutions in the county; Letchworth Village and Rockland State, which also occupy considerable acreage.

Mr. Robert D. Hennigan, *Executive Director:* My understanding is that Rockland County was a self-contained area without much connection with the City of New York, and then it underwent a transformation due to highway construction which apparently is still going on. Is this a correct impression?

Mr. Fried: No, not exactly. The first impression, yes, it was a self-contained community because basically, it was a farming community and fairly rural. The villages were small and there was no central city in the county as such, there were just some small villages. We developed after the war, without any real problem or suburban developments such as have taken place in Westchester or Nassau County.

Consequently, when we did develop, we developed with the full suburban boom, and to use RPA's terms, we're really a quintessential spread city operation here. There still is no real central focus.

However, in line with general trends of job location, I suppose we are a bedroom community to some extent of those suburban areas, but surprisingly not that much. Seventy per cent of the labor force is locally employed. Only about fifteen per cent commutes to New York City, the other fifteen per cent commutes to other counties in the area, principally into Bergen and Westchester Counties.

So, we are self-contained to that extent. But of course, we recognize that we are part of the New York metropolitan area, and are tied by all sorts of bonds to New York City. We are really not an independent operation, but in terms of jobs we are fairly self-sufficient. The patterns indicate that this might continue in the future. I think it will with URIS, a harbinger of that trend.

Mr. Hennigan: *Could you expand on URIS a little bit? I am curious.*

Mr. Fried: This is a major development for office space located in the Town of Orangetown, in Pearl River. The thought was that this combination of dense office use in a quiet rural area would spark a certain amount of office use that would come out of the city, basically the type of office use that is not associated with face-to-face operations, such as data processing centers. At this point, it is still a speculative venture. It is not designed for any particular company, but we do anticipate that, judging by the square footage involved, that it might generate 15,000 office jobs.

Four million square feet, which is the projected total, is about the size of Rockefeller Center, so it is no small complex. The two buildings that are up now provide one million square feet and will be ready for occupancy sometime early next year. If it does get off the ground, we do hope for the expansion up to the four million. The Regional Planning Association of New York City has indicated that there is a general trend towards an increase in office use in the suburban areas outside of New York City. However, this is a pretty vast thrust.

Chairman Conway: Dan, thank you for your informative presentation.

Mr. Fried: The next speaker will be Mr. George O'Keefe of the Health Department.

PRESENTATION

Mr. George O'Keefe, *Assistant Commissioner, Rockland County Health Department:* About three weeks ago, it dawned on me that I was going to be a loser today because when Dan Fried and Dr. Skelly got through there will be practically nothing left to say about water supply in Rockland County. So, I spent my time trying to bring out a few tidbits that might not be stressed by others.

One is that we actually have a hundred and eighty-seven community water supplies in Rockland County as defined by the Health Department. They include trailer parks, schools, restaurants, and similar institutions as well as municipalities. Most are very small and there are only six major water supplies in the County.

Over fifty per cent of the water comes from groundwater sources, and is not treated. We have a rather extensive surveillance program. As a county unit, we collect over fourteen hundred samples every year for bacteriological and chemical analysis. The water purveyors themselves collect another three thousand samples a year. So, we safeguard the purity of the water, and have no major problems or even minor problems with the sanitary quality of water.

The Comprehensive Water Supply Study will be described by Dr. Skelly later. It makes recommendations to meet the needs up to the year 2020. A year later we find that some of these supplies have installed additional facilities as suggested in the report. Also, the Spring Valley Water Company, which supplies perhaps eighty per cent of all the water, has embarked on a program of developing new sources of supply.

Practically all of our new residential buildings are connected to public supplies. Over ninety-nine per cent of all new residential units makes use of community water supplies, either from the villages or from Spring Valley Water Company. This is a record that the county, and certainly we in the Health Department, are very proud of.

As I mentioned before, over fifty per cent of our water receives no treatment now, but it has been mandated in New York State that as of January 1, 1973, all public supplies will have to be chlorinated.

This will be a hardship, to some extent, on some of the supplies. However, in addition to giving additional protection, it will push some of these very small suppliers out of business, because of the expense of operating chlorination equipment. This is good, since most are marginal at best. It is also a move toward regionalization.

The sanitary quality of the water is good. There are only two surface supplies that are not filtered. This includes a supply for the Village of Hillburn, which the comprehensive report indicates should eventually be abandoned; and the Pothat Water Company, which supplies the Village of Sloatsburg. Filtration improves the aesthetic quality, and adds another barrier against pollution. If you filter the water you have removed approximately ninety-eight per cent of the impurities, and then chlorination will do the final job.

If we picture Rockland County and its surface streams, we see that the majority of them flow south into Bergen County in New Jersey. New Jersey water suppliers over the state line are entitled to certain quantities of water. Simultaneously certain quantities of this surface water should be restricted for use in Rockland County.

The Health Department has opposed any transfer of groundwater supplies from Rockland to New Jersey. We feel that this is a resource that should be preserved for the people in Rockland County. We feel that the groundwater supplies in the county are not of interstate nature, and that they belong to Rockland County and should be preserved as such.

DISCUSSION

Chairman Conway: *Fifty per cent of your supply is untreated groundwater. With this rapid suburbanization, do you have a problem, as far as quality is concerned, due to sewage disposal?*

Mr. O'Keefe: Actually, we don't. We have been fortunate. In 1963, we embarked on a county sewer project which has been actively under construction since late 1964. When the next stage of the county sewer project is completed, in approximately three years, we will have ninety-five per cent of our population served by public sewers, which takes the wastewater out of the interior of the county. After it has been treated, it is discharged to the Hudson River so it is completely out of the watersheds of both surface and groundwater supplies.

Mr. O'Brien: *Could you give me an estimate of the total amount of water impounded in the county, what percentage of it is actually consumed here, as against Jersey?*

Mr. O'Keefe: My recollection is that our major source is Lake DeForest, which is a Spring Valley Water Company reservoir, and they are entitled to use ten million gallons a day for Rockland County. Furthermore, they are required to maintain a minimum flow of nine and three-quarter million gallons per day flow below their dam for use of downstream users. The Village of Nyack, which is downstream from that dam, is entitled to take three million gallons a day, which leaves six and three quarter million gallons a day that has to be supplied to New Jersey. This amounts to roughly 55% per cent of the total impounded.

Mr. William J. Schickler: *You made mention that you are taking fifty per cent of your supply of*

water from ground water. Have you noticed any depletion, as far as lower water levels? Also do you think that with this sewer program that you are going to have a further depletion of your groundwater resources?

Mr. O'Keefe: When the sewer program was being initiated, the best engineering thought was that the quantities involved were small in relation to the total recharge that would be supplied to the groundwater. To my knowledge, there has not been any appreciable depletion of the groundwater supply over the past five or ten years. Maybe Dr. Skelly will comment further on that.

Mr. Hennigan: *George, is the transfer of water out as sewage to the Hudson River of any great import to the downstream users?*

Mr. O'Keefe: Well, the county sewer system will remove about thirty-five million gallons a day. The majority of it will go to the Hudson River.

Mr. Hennigan: *We know that a sewer system will collect sewage and will also be a land drainage system. I don't know whether this has concerned anybody.*

Mr. O'Keefe: To my knowledge, it doesn't seem to be a potential problem at this time. As I mentioned, thirty-five million gallons may seem like a lot of water, but if you take the total flow of the interior streams that we are talking about, over a period of a year, then I think it is not of major significance.

Mr. Hennigan: *You're talking about thirty-five million gallons a day?*

Mr. O'Keefe: That's my estimate for about roughly twenty years from now.

Mr. Hennigan: *You talked about the requirements for the Spring Valley Water Company, in terms of the release schedule downstream. Who set that requirement?*

Mr. O'Keefe: This was set by New York State Water Power Control Commission, which is now part of the Environmental Conservation Department.

Mr. Hennigan: *This was not an interstate agreement then – but was set by the state agency?*

Mr. O'Keefe: By New York State, right.

Mr. Hennigan: I've got a point that I'd like to make. Rockland County is rather unique, at least from the Commission's experience in this area, unique from the point of view that practically all the water purveyors in this county are investor owned or private water companies. In the rest of the counties that constitute the study area of the Commission, particularly in terms of large water purveyors, there is only one or two other private water company operations of any importance. One in Westchester and one in Queens and Nassau County.

Mr. Hennigan: *Are there any natural barriers that separate Rockland County from the adjoining counties in New York State?*

Mr. O'Keefe: Well, actually, Rockland used to be part of Orange County until they found out it was too far to travel to Goshen in the horse and buggy to go to court. So they separated it into two counties along the Ramapo Mountains, plus we have a man-created barrier, Palisades Interstate Park Commissions. Geographically, we are very much related to Bergen County, New Jersey.

Mr. Fried: That's a very important element in the county's development. The Ramapo Mountains are quite impenetrable, with only the Ramapo Pass linking the Villages of Hillburn, Suffern and Sloatsburg. The only other opening is in the north, practically in Orange County, via Route 6, and that was a man-made opening.

The Hudson River borders us on the eastern side, separating us from Westchester and physically isolating the county. Even within the county a natural barrier of high ground separates the Town of Haverstraw from the rest of the county. Within the county, these two areas developed differently, and the arrangements between these two sections of the county are not too great because of this barrier. But the barrier between Rockland and the rest of New York State is very significant. As George mentioned the only unbroken border that we have is with New Jersey. I'd like to ask Dr. Skelly to make his presentation.

PRESENTATION

Dr. Michael Skelly, *Project Manager; Quirk, Lawler & Matusky, Consultants:* I would like to clear up the release requirement for DeForest Reservoir. It was set entirely by New York State, but New York State did take cognizance of the Delaware Decision in setting the release rule, so there is some basis for the release requirement. The State ruling was that 7.75 MGD must be released to New Jersey.

The scope of the study included an evaluation of the adequacy of all the water systems currently serving Rockland County. The second purpose of the study was to project the future water needs of the county, and third and most importantly, to delineate water supply projects that could provide for these needs to the year 1985, and from the year 1985 to 2020. The most important planning period was up to the year 1985, and the secondary planning period was from 1985 to 2020. It was basically a fifty-year plan.

Our population estimates indicated that by 1985 Rockland County will reach a population of 360,000, and by the year 2020, it would reach a population of 520,000. Concurrent with the population rise, we expected that the present level of water use in the county would rise from 136 gallons per capita per day; now this is total water use, it includes industrial water use, municipal water use, and private consumption - would rise from this figure to a total of 153 gallons per capita per day by the year 2020. The increased population and the increased water usage will result in a total water demand of approximately fifty MGD by the year 1985, and a demand of approximately eighty MGD by the year 2020.

The present population is served by six water utilities. There are six water utilities but there are really only five purveyors of water, since Pothat Water controls the source of supply and sells the water to the village system in Sloatsburg.

These systems range in size from Hillburn, which is the smallest, and has a developed yield of a little

over two-tenths of a million gallons per day, to Spring Valley Water Company, which is basically a regional water supply system and serves all areas of the county providing upwards of seventy-five per cent of the county's water needs. They have a developed yield currently (1968) of twenty-five million gallons per day. The total supply capacity of the entire county at that time was thirty-three million gallons per day. That is the total of the six public water supply systems. This supply capacity is adequate to provide for water needs in the county to the year 1980. However, the individual water companies do not have the balanced capacity to provide for the needs to 1980. If you take all the water and assumed one water company, you could provide for the needs to 1980. Since individual water companies will experience shortages before this time, you will require water as early, in our projections, as 1970, initially for Suffern. The report contains, by water company, a complete description of the present systems, a comparison of these systems in relation to present demands, to demands in 1985, and to demands in 2020. We then planned specific programs for each water company, to show them how they could meet their projected demands in 1985 and 2020. We found that each of the five water companies could provide for future water use by developing supplies *within Rockland County.*

However, one of the major conclusions was that they could just about make it to the year 2020. If they all pursued individual courses of action, they could provide for their water demands, but if our population projections and water supply projections are correct, in the year 2020 they would have to look outside their county for water resources to provide for future needs, beyond this date.

We therefore, in recommending the specific projects, made it a point to schedule expensive, very large projects as late as possible. This was done for two reasons. One, any population projection or water use projection that goes beyond a twenty-year planning period has a lot of uncertainties in it. Therefore, you would like to allow time to re-evaluate these projections before you commit large amounts of money and resources to a water supply system.

There was only one large water project recommended for the county. This was a pump-storage development on the Ramapo River. Now, this consisted of pumping water from the Ramapo to an off-stream reservoir and releasing it back to the Ramapo in times of low flow. You could not put a reservoir in the river itself, so this necessitated a more expensive construction involving pumping from the river into a reservoir and releasing water when needed. This project was scheduled to be implemented after 1980. This was, as I said, to allow time to re-evaluate the basic planning projections.

At the time of the study, there were no intercounty regional plans. So we felt it was realistic for the county to have an alternate plan to supply for their own needs, and not to rely solely on large regional plans. Particularly since there was no basic agreement in the Legislature, no basic design drawn up and no allocation of water or cost breakdowns. There was one plan at the time that was prepared by two engineering firms for the City of New York and Westchester County. That study recommended a regional water supply development of the Hudson River at Hyde Park. This plan allocated fifty million gallons per day of water to Rockland County. The problem there was: one, the plan was only in the report stage; and two, there was no mechanism for the county to tap into this water supply, since it is on the wrong side of the Hudson River. Furthermore, there was no cost allocation formalized to show how much the county would be charged for this water, so that they could compare it against the cost of developing their own projects.

Therefore, we scheduled our plans to be implemented so that if these regional projects become firm, the county can re-evaluate the economic merits of joining a regional system or the larger potential supply capacity of a regional system. If it seems to be more advantageous in about 1975 or 1980 to go to a

regional system, the county could abandon development of the Ramapo and go into the regional system to meet their future water supply needs. These are basically the highlights of the report. The report also contains costing of all recommended projects, broken down in terms of capital costs and operating costs and also the per capita cost that would be expected to result from these projects.

DISCUSSION

Chairman Conway: *From an engineering point of view, if you are discharging thirty-five million gallons per day where it can't be re-used by anybody else downstream, is there a feasible way to utilize any of that water?*

Dr. Skelly: Well, in Rockland County, the rock substratum presents a much different problem than Long Island where you have porous sand and gravel, so injection or infiltration is limited in Rockland County. I don't know of any ready techniques that one could use to put significant quantities back into Rockland's groundwater system.

In our projection, we estimate that the county could develop 8.5 MGD from groundwater sources. We cut this number down substantially for two reasons: Urban development would encroach upon potential good well areas. Secondly, the sewering of the county, although hard to quantify, would result in loss of some water to the groundwater system.

Mr. O'Brien: *Could you tell me the extent to which, in these extrapolations of population growth up to 2020, have you assumed that there is a sharing of this water with Jersey?*

Dr. Skelly: I assumed that the release requirement to New Jersey from DeForest would remain unchanged.

Mr. O'Brien: *At fifty-fifty percent?*

Dr. Skelly: Well it is not fifty-fifty percent, it is 7.75 MGD to New Jersey, 10 MGD of the supply goes to Rockland County through Spring Valley. Three MGD is taken up by Nyack prior to ever getting to Jersey, so it's about a 2 to 1 ratio. Now, we, in our planning projections, assume there was no reason to warrant saying that that release requirement could not change. It could very well change, but we took no credit for any waters that could be released to Rockland, in the future, because we could not quantify it.

Mr. O'Brien: *So you assume the present ratio, then, on DeForest would remain until 2020?*

Dr. Skelly: Right. We did in our report recommend increasing the yield of DeForest another 2½ MGD, and did say that the 2½ MGD would go to Rockland County and that the release rule would still stay the same.

Mr. Benjamin A. Gilman: *Mr. Skelly, has the county undertaken any studies of increasing reservoir supply in the county at all – surface water supply? I didn't see any recommendation in skimming through this. Have you made such a study and recommendations?*

Dr. Skelly: We have recommended that a pump storage reservoir be built off the Ramapo.

Mr. Gilman: *At what location would that be?*

Dr. Skelly: The diversion would be up by Turne Brook and the reservoir would be located in Orange County. We had looked at three reservoir sites, one in Palisades Interstate Park Lands, two were in Orange County. One was eliminated because encroachment had already occurred on the land – Sterling Forest had already started developing that area. The other two areas are undeveloped at present, and from a cost point of view looked comparative, so we recommend that either one of these two be further investigated, both could provide the yield that is required by the county, mainly 20 MGD. Both of these are defined in much greater detail in the main report. It's only referenced in the small summary report.

Mr. Gilman: *If these reservoirs were to be built and developed, would that take you beyond 2020?*

Dr. Skelly: No, that will take us to 2020.

Mrs. Irene Baker: *In recommending to these individual water companies the building of reservoirs to improve their own water system, do you foresee any problem in the acquisition of land?*

Dr. Skelly: Yes. In the report, one site that we suggested was in Palisades Interstate Park Commission. There is a problem of using that from a legal, political, et cetera, problem, whether or not you could build a public water supply system in the park lands. The other site is privately owned. It's undeveloped at present, the last time I was up there, which was in 1968, there was development occurring that was starting to encroach on this area. If homes are built there, this would seriously affect whether or not you could acquire the site.

Mrs. Baker: *There is a mention here of one recommendation in Orange County?*

Dr. Skelly: Right. There were no reservoir sites that we could find in Rockland County that could be developed to give the yield required by the county, so we had to look outside of the county. We looked into Orange, since we are developing the Ramapo River. You can't build the dam in the Ramapo River. You have the railroad running up the side, and two villages located adjacent to the river. You would flood them out. So you had to get the water from the reservoir and the Ramapo itself, you can't constantly draw water from the Ramapo because there are low flow periods with insufficient quantities to provide for your needs, and also if you did it that way, you would interfere with downstream users of the Ramapo, mainly at New Jersey, and Wanaque and Little Falls, where they divert water.

Mr. Hennigan: *You noted that until 1980 there is sufficient water in the county, but you might run into areas of local shortages, with particular companies or in particular service areas. Is there any kind of scheme to meet this particular situation in your recommendations?*

Dr. Skelly: Yes, we gave each water company a time chart of when they should be developing their

supplies, and we recommended specific projects. For example, the Village of Suffern, which I am informed is currently developing a new well. We recommended that a new well be developed around the year 1970 to provide for their needs. For the Village of Hillburn we made a specific recommendation to explore for a new well in the Ramapo drift and abandon their current reservoir. They do not use the reservoir all year round. They use it only during the winter months. They have temperature and taste problems during the summer, so they go back to a well at this time.

Mr. Hennigan: *Are you saying, basically, that Rockland County, is self-sufficient in terms of the water supply that is needed for the next fifty years?*

Dr. Skelly: Yes.

Mr. Hennigan: *Are the recommendations for capital improvements, in terms of unit cost for water produced, in line with general industry experience?*

Dr. Skelly: Yes. When we were doing the cost projections, the main costs, obviously, would be incurred by Spring Valley Water Company, who is the main purveyor of water, and will be the one that would have to develop the largest supply. The cost per million gallons appeared to be in the order of magnitude that they would expect at the stage of development that they are. Present water costs can't be compared because half of their developed yield is groundwater. Now, when you go to a surface water system and you go to a treatment plant, the costs are greater. We did make cost comparisons with this supply and development, and getting a supply from the Hyde Park project. We made a lot of assumptions: mainly, that Rockland would have to build its own connection to the system, that they would pay a pro-rated share of the capital cost, things of this nature, which are spelled out in the report. We found, based on all these assumptions, that the supply that they could develop within their own county was about the same cost per million gallons. But there were a lot of uncertainties attached to our estimates for the Hyde Park project.

Mr. Anthony M. Quartararo: *Has Rockland County had any experience with groundwater supplies drying up, especially when new wells are drilled nearby.*

Dr. Skelly: I don't believe so. There are areas in the county where they get little or no well water, and they are eliminating these from further exploration. The Stony Point area is an example. There was one report done on groundwater back in 1958 by the State Geological Survey on Rockland County, but the estimates of the yields, because it is rock aquifer are really unreliable.

Mr. Gilman: *Mr. Skelly, I notice your projection for 1985 shows a population of 360,000. If you were to define that to be a conservative figure, how much leeway do you have for additional population, and still be able to meet the water needs by 1980 or 1985?*

Dr. Skelly: We scheduled projects to be started prior to needs, so that they came on line at the time of need, there is some overlap.

If the population estimates, let's say in 1985, became 400,000 instead of 360,000, or conversely, if

the water usage went up higher than we expected, you would have a certain amount of flexibility there, so that you would not run short of water.

Mr. Gilman: *What population would you be able to take care of by 1985?*

Dr. Skelly: Oh, I would say on the order of about 380,000 to 400,000.

Mr. Jerry Dineen: *I wondered if you have looked at other alternative methods of supply. You mentioned possibly buying into the regional system of Hyde Park. Did you look at alternatives such as going to the Catskill Aqueduct System or Orange County, tapping a New York City source? For instance, in lieu of raising Lake DeForest?*

Dr. Skelly: We looked into the Hyde Park development. We assumed that New York City would allow us to take credit for 50 MGD on this side of the Hudson so we could tap into the aqueduct up in Orange County. So we priced out the cost of tapping into the New York City aqueducts. Now, you only can tap in at certain points, and there are mountains between. The water needs are going to be in the south. Right now there is not that many connections between the northern part of the county and the southern part of the county, so these would have to be connected. That, once again, compared favorably with developing their own supply. Then we projected the cost for a tap on the eastern side of the Hudson River.

Mr. O'Keefe: If we went to a project of taking water from some type of regional system, it would be a tremendous financial advantage to Rockland County if Bergen County, New Jersey, shared in this. Right at this point they outweigh us in water usage and population at least four to one, and probably will continue on some ratio like that in the future.

Dr. Skelly: I'd like to bring the commission's attention to this. We did another report for Northern New Jersey Water Systems for the Corp of Engineers, which evaluated the yield capacity of the various water systems in northern New Jersey. Now, one of the systems was in the Hackensack River Basin. The Hackensack extends into New York, and if you look at it as a basin type development, rather than a state or county development, you can get more yield out of the river, because you can backpump water, which legally you are not allowed to do now. So you can increase the yield of the entire basin, also the yield of individual participants in the program, without additional costs, but legal and political barriers stop us from doing this type of development.

Mr. S.A. Wyle, *Pothat Water Company: Dr. Skelly, you have given us figures on the commitment to the State of New Jersey from Lake DeForest. You also mentioned this suggested pump storage reservoir on the Ramapo. This is at the extreme opposite side of the county. Isn't there also a commitment to the State of New Jersey to take water from the Ramapo River?*

Dr. Skelly: That's right. In our estimates of the yield capacity of the Ramapo in New York State, we assumed that the Water Resources Commission would set the same type of release requirements as were set for Lake DeForest. So, we accounted for that in the computation of the yield. We allowed for a cer-

tain release, based on drainage area in New York State, which is the basis of the Lake DeForest rule. So, we didn't plan to develop the Ramapo and dry it up for New Jersey. We took cognizance of the fact that they use the Ramapo in Wanaque and Little Falls, and examined to see if it interfered with the proper use by Jersey supplies. We found that by proper coordination between the two projects, there is no reason why anybody should be short of water.

Mr. Wyle: *So you are assuming that the diversions now allotted in the New Jersey area by the Water Resources Commission, or the former Water Power and Control Commission, will be constant?*

Dr. Skelly: Right. They used a criteria of so many MGD or CFS per square mile of drainage area. This was based on the ratio or formula from the Delaware Supreme Court Decision. We took that same decision and assumed it would apply to development of the Ramapo. We feel that this is conservative, because if anything, the actual release might be lower, but I doubt if it will be higher, since we have a precedent of the Supreme Court to set the upper limit of the release.

Mr. Wyle: *If I may just ask for emphasis. The arrangement for the release from Lake DeForest was made at a time when the release from Lake DeForest was being used in Rockland County. This was not the case, however, when the arrangement for water from the Ramapo was made with New Jersey. Now, if Rockland County needs water from the Ramapo River, would it be possible to diminish the commitment to the State of New Jersey?*

Dr. Skelly: It is not on a first-come, first-serve basis that if you get downstream first, you can take all the water, or that you own all the water. This is not our system of law in this part of the country.

Mr. Wyle: *I think this is the point I am trying to reach, but could the agreement between the State of New York and the New Jersey authorities be more lenient; seeing that it was made at a time when there was no apparent need in New York for water from the Ramapo? Might it be more lenient than if it were made today?*

Dr. Skelly: Maybe, I don't know. I am not aware of any agreement between the two states on the Ramapo.

Mr. Wyle: *I also have the impression that it permits North Jersey Water Commission to withdraw twenty million gallons a day from the Ramapo. Is that correct?*

Dr. Skelly: I don't think it is a matter of New York State permitting it. The development of the Ramapo is entirely within New Jersey, and their own equivalent to our Water Resources Commission sets the pumping requirements and restrictions on their own development. I don't think New York State had anything to do with this.

Mr. Wyle: *You mentioned Lake DeForest, something about the Water Power and Control Commission.*

Dr. Skelly: But Lake DeForest lies within New York State. They were making a ruling on the allocation of waters that lie within New York State. The development of the Ramapo by New Jersey right now; it's developed down in New Jersey. New York State had nothing to do with that development.

> **Mr. Schickler:** *I am not familiar with the agreements of withdrawal from the river, but if these withdrawals are taken and the water is used and put back in the river, how does that affect the agreement?*

Dr. Skelly: Well, not being a lawyer, I would presume that the way the ruling reads is that you have to release 7.75 MGD from Lake DeForest, regardless of how much you return.

Chairman Conway: Dan, I would like to ask you to introduce any people who plan to make a statement. We are going to have to keep them fairly brief, if everybody here is to make a statement. I will leave that up to you.

Mr. Fried: If you would just raise your hand to indicate that you want to make a statement, and give your name and organization. Before we start, I would just like to mention that after lunch there will be a tour of water facilities, principally the Nyack and Spring Valley filtration plants, which was arranged by George O'Keefe of the Health Department. Of course, you are all invited to go on this tour.

GENERAL DISCUSSION

Mr. Leonard Cooke, *Chairman, Village of Nyack Water Department:* I make the same statement now that I made about ten years ago to the Supervisors of the County of Rockland. I spoke to the Board of Supervisors and asked them at that time, if they thought it would be good to have a feasibility study made to form a large water district by taking over all these water companies such as Nyack and so forth, in the County of Rockland. It would be much better for the County as a whole if the Board were to take care of all water service.

As Mr. Hennigan said, it is unique for the County of Rockland to depend on private water companies. Since this is a regional session, I think a great deal of consideration should be given to county take-over of private companies. I feel that in the future your population projections are going to prove conservative, and proper planning should be done to take care of the needs that are coming in the future. This can only be done by a large, publicly-owned water district.

> **Mr. Benjamin Gilman:** *Mr. Cooke, do you feel it would be more economical for the County to run the water system than these private companies?*

Mr. Cooke: I am quite sure it would be more economical for the County, because right now I think we have (Nyack) a fairly low rate, and we would not even have the rate as high as it is, except for the fact that we just built a new treatment plant. The needs for the Village of Nyack will be taken care of in the future, and we may be able to lower the rate again. But. a publicly-owned water facility can give a much lower rate to the public, which is the same as tax money in your pocket.

Chairman Conway: *Is the Nyack Water Supply private or public?*

Mr. Cooke: It is public and owned by the Village of Nyack.

Mr. Gilman: *Mr. Cooke, does the Village of Nyack have sufficient water supply beyond 1980, or are they also guided by this?*

Mr. Cooke: Well, we had been granted, as you will notice in the report, three million gallons per day by the Water Resource Commission. We are permitted to take that from the Hackensack River. The recommendation for the Nyack Water Company is that, before the year 1980, we should apply for a greater amount of water to be taken, which we intend to do. Our needs are sufficiently taken care of with our new water treatment plant, I would say, beyond the year 2000. The expansion of our plant to just one more filter basin, or two more filter basins, would take care of the future needs, as long as we are granted the right to take that water from the Hackensack.

Mr. James Rice, *Mayor of Suffern:* We have a three-stage project going now. We recently developed a test well of a half million gallons, which is being used now. We have an application, which I expect will be approved in a matter of weeks, for another million and a half gallon well and enlargement of water lines.

We have run into a very serious problem, unknown to us, with the Good Samaritan Hospital putting additions on, and unfortunately, my Board wouldn't give me a site plan. We didn't know what they were going to do, whether they were hooking in or how much they were going to use. They have increased their use by a hundred thousand gallons a day within the last year. This well, I hope, will be in operation by spring. We are using about a million and a half gallons a day now; that is at peak in the summer, have two and a half million gallons stored.

The second phase I expect to take out an old half million gallon reservoir and put in a million and a half gallon standpipe in its place. The third phase will, of course, be another well.

I would also like to say that I have received wonderful cooperation from the Spring Valley Water Company. I asked and received two emergency tie-ins with Spring Valley. I have one in the northeast section and one in the eastern section. Any time we run into trouble, they have always been very cooperative, and we have been able to use their water.

We do intend, when we get this new well developed, to clean out our two wells that we are using now that have been in use since about 1935, I think, so it should give us ample supply, and according to Thomas M. Reddick, I think we have something like twenty million gallons of water a day, which is ground water.

Chairman Conway: *Thank you, Mayor Rice. I take it that Suffern is also a public water supply system.*

Mr. Rice: Yes. I would also like to say here that I think we are returning eighty-five per cent of our water back into the Ramapo River through the sewage system. We are only a mile above the Jersey line.

Mr. Gerald O'Brien: *Are all of your users metered?*

Mr. Rice: Yes.

Mr. S.A. Wyle: You might say that this corner (westernmost) of Rockland County is separated, except for this narrow gap, from the bulk of Rockland County. The problems of this point of the County are peculiar to itself, and separated more or less physically from those of the rest of the County. So that, a County-wide ownership, as suggested by Mr. Cooke, I doubt would be feasible, physically anyway, to include this portion.

On the score of lower cost, my personal opinion is that the private water companies are restricted by the Public Service Commission to a return on the capital investment at the time when the facilities were built for the production of water. In the case of our little utility, that takes it back to 1896, so the value of our surface supplies is fixed at an 1896 value.

I am sure that the Spring Valley Water Company system was put into use at different stages, and if the County contemplated a County-owned system, I would think they would have to pay current values many times the cost allowed by the Public Service Commission in determining rates. So, I am inclined to think that a County-wide system would have to charge much more than is now being charged for water.

Chairman Conway: *Could I ask what section your water company is in?*

Mr. Wyle: We are in the western corner of the county along the southern border.

Mr. Samuel Gofseyeff, *New York City Board of Water Supply: Does your water company have any plans for future water supplies for your region?*

Mr. Wyle: Dr. Skelly's report said all indications are that our present sources are capable of supplying future needs up to the year 2000, and that the only improvement might be enlargement of the transmission system.

Mr. Gofseyeff: *The company has no plans for any additional sources?*

Mr. Wyle: It has, based on population predictions in our isolated area, which is much more rugged than the balance of Rockland County. It is doubtful that the general predictions, county-wide predictions of population per acre, can ever be applied to our section, so that the population predictions can be satisfied by the existing sources, which are only partially used.

Chairman Conway: Are there any other statements?

Mr. Robert Jonas, *USDA, Soil Conservation Service; Rockland County Soil and Water Conservation District:* The District has, working with our service, made a number of studies, which have been available to consultants, including studies of possible reservoir sites, which Dr. Skelly's firm used.

I would like to talk to you a little bit about soil conditions in the county, because we have completed the soil survey of the county, and in this respect, we find that most of the soils are underlain with bedrock and/or impenetrable clays at varying depths, many times fairly close to the surface. There are only a few isolated areas, such as in Suffern, where there could be penetration of surface water down to the

deep water reserves.

If we think about the thirty-five million gallons per day that will be handled by our sewage system, a lot of that will be surface water that comes into Lake DeForest and would go out of the County, down the Hackensack River, were it not diverted through homes and into the sewage system. So that, I would reinforce the judgments that have been expressed that this loss of water will not seriously affect our underground water table in the foreseeable future.

Chairman Conway: *Do you have any feeling on where this groundwater comes from? Does it come from percolation, in the immediate area, or outside of the County?*

Mr. Jonas: I think it comes from percolation over a much greater area than the County.

Mr. Gilman: *Have you made any recommendations for the development of any new water reservoir sites in the County?*

Mr. Jonas: In part of another study, we looked for reservoir sites and I think we came up with seven possible sites for storage of water, and found that all but one of them had already been so developed and so encroached on that they weren't practical. The one that we did find is mentioned and recommended in the Quirk, Lawler & Matusky Study, and was turned down. It is owned by the Palisades Interstate Park Commission. There was one other possible site on the edge of the County also in Palisades Park Commission land, but much further removed from the populated part of the County.

We also had thought of the site in Orange County as a possible multiple use site, not only for water storage for human consumption, but also to solve some flooding problems in Sloatsburg.

Chairman Conway: *Have you supplied those recommendations to our Commission?*

Mr. Jonas: Not as recommendations, no. The studies are available, and we would be glad to supply them if you wanted them.

Chairman Conway: *I think that would be important for the record, Mr. Jonas, to help the Commission.*

Mr. Jonas: Basically, these are in a recreational resource study that was made several years ago. We would be very happy to furnish you with a copy of that, which would indicate these sites.

Mr. O'Brien: *Excuse me. Have you noticed any recognizable drop in the water table level in recent years in this area, since the building of roads, and general development of the County?*

Mr. Jonas: We have been here for only six years, and we are more interested in surface characteristics. This has not been called to our attention, with one exception, and this is a drop in the level of the Mahwah River, which is controversial. There are some thoughts that it was caused by a puncturing of the clay layer by wells that allowed surface water to get into the underground layer, and, therefore, affected surface flows during dry periods. I say this is controversial, because there have been many people that are

better qualified than I am, who have stated both sides of the case.

Mr. Rice: In the four or five years of drought we (Village of Suffern) had more water in our wells than we did during normal times. I can't explain it. Also, in bad fires, or where there is a great amount of use, our levels hardly dropped at all.

Mr. Robert A. Gerber, *Spring Valley Water Company:* We are an investor-owned company and had our origins beginning in the late eighteen hundreds in the Village of Spring Valley. Since that time, we have grown substantially, especially through the fifties and sixties, to the point where we now serve about two hundred thousand people.

We tried to plan our water expansion programs well in advance of the time of need, and I think we were one of the – possibly the only large supplier in the New York metropolitan area that did not impose restrictions during the sixties' drought. We have a number of programs that we are following now to insure adequate supplies for Rockland County all the way through 1980.

We are in agreement with Dr. Skelly that when you get beyond 1980, the picture is not particularly clear as to which way we should move for our water supply. There is a need to exercise some flexibility in that regard. The Hudson River is going to be very important. It can be compared somewhat favorably with the development of the Ramapo. Both of these projects will have to stand the test of closer examination as to financial and legal feasibility. We have been aware of the studies being carried out by the Corps of Engineers in the Northeast Water Study. Their programs, to date, have not been too strong for Rockland County. I think they are making some additional studies, to look at a few more projects that would be more in keeping with the demands of Rockland and Orange Counties, as well as northeastern New Jersey.

The grand design in their study would be a fairly large regional exchange of water. Whether this will ever be possible politically is a real question. Dr. Skelly has looked into some of these aspects himself in another study, and until we have the results of all these studies, it is very hard to decide what is the proper course for the future, that is, when we get into the year 2000, might be.

Chairman Conway: Thank you very much, Mr. Gerber. Any questions?

> **Mr. Gilman:** *Could you tell us, Mr. Gerber, what percentage of your water usage comes from ground water?*

Mr. Gerber: Presently, our usage is on the order of seventy or seventy-five per cent.

We also have two surface supplies. One is from the DeForest Reservoir, the second one is in from Stony Point, where we hope to initiate a new project there to develop about five million gallons a day additional water. That project we hope to get underway rather shortly. We have a supply there that we utilize, but it is quite modest.

> **Mr. Gilman:** *Do you think that the timetable set up by the Quirk, Lawler & Matusky firm that studied this will take care of your needs through the year 2000?*

Mr. Gerber: We have no way of judging. Let me say that we are essentially in agreement, and in exam-

ining Dr. Skelly's report and in preliminary conference before that, we have all been pretty much in general agreement about the population. We are planning very definitely on a number of steps in the CPWS report, and some of those were obviously things that we were thinking about and had thought about for a number of years, but there was no necessity to put it into effect until the demand was there.

Mr. Gilman: *Well, if these steps were undertaken as set forth in the CPWS study, do you feel you would be able to supply all the needs of the population in your supply area for the next twenty or thirty years?*

Mr. Gerber: Yes, we have no disagreement there. Those particular avenues of accomplishment would bring the same result, whether that would be the way we would decide on is uncertain.

Mr. Gilman: *Would you have some different recommendations, besides this report?*

Mr. Gerber: No. As I pointed out, the only difference we have, and where the uncertainty is, is whether the Hudson River is going to be the source for the future.

Mr. Quartararo: *Have you noticed any difference in the quality of your groundwater in the last few years, due to the increased population?*

Mr. Gerber: We have noticed some slight change in the groundwater quality. The groundwater quality as of today is quite good, and the changes that we have noticed are quite minor. We have noticed a change, however.

Mr. Quartararo: *Is your groundwater untreated or do you treat it?*

Mr. Gerber: Well, there is no reason to treat the groundwater. The groundwater is of acceptable quality, except for disinfection, which we do in part now and will be doing altogether within the next two years.

Mr. Gilman: *You seem to be the biggest supplier in Rockland County. What would be your recommendation for this Commission with regard to Rockland County?*

Mr. Gerber: I would say possibly the major one on a long-range basis would be to see that in any development of the Hudson River, that Rockland County play an important part in the use of that water.

Chairman Conway: *You would feel, then, that Rockland County should share in supplies, if it were taken out of the Hudson?*

Mr. Gerber: Yes.

Chairman Conway: *If the Hudson were used as a source of supply, then the main function of the Spring Valley Water Company would be distribution.*

Mr. Gerber: That would be correct. We view this as some major undertaking by a group of people or possibly by the State.

Chairman Conway: Are there any other statements?

Mr. H. Underwood Blaisdell, *Rockland State Hospital:* At the present time, we are one of the Hackensack Water Company's better customers, to the extent of seven hundred and fifty thousand gallons a day. We do have ten wells which have been inoperable for a period of ten to twelve years now, because of lack of pumping facilities.

These wells were tested about eighteen months ago, and showed that they can produce well over a million gallons a day. The point I think that might be of interest to the Commission is that there is considerable talk now of disposing of surplus property at Rockland State Hospital, on which these wells are located, and I would question here whether it is advisable to dispose of this property without making provision for the future operation of the wells. I would think that you wouldn't want to lose better than a million gallons of water a day that is possible from them.

Chairman Conway: A very important point. Thank you very much. Any questions on this point?

Mr. Gilman: *Can you tell us what the cost of a pumping station would be?*

Mr. Blaisdell: The latest estimate we have on supplying new pumps for the ten wells was somewhere between fifty and sixty thousand dollars.

Mr. Gilman: *What is the cost of your private supply of water, what is it costing the state?*

Mr. Blaisdell: It is running around eighty thousand a year.

Chairman Conway: *That would more than take care of your present needs, if you had a pumping station?*

Mr. Blaisdell: Yes.

Chairman Conway: *Why was the program of producing your own water abandoned?*

Mr. Blaisdell: When we peaked out about fifteen years ago in population, we had eighty-one hundred patients at the hospital. At that time we were using about a million and a quarter gallons a day. At that time, with the pumping equipment which we had, we were only able to produce a little over a million gallons, so we requested Hackensack to furnish additional water. The contract that the State negotiated for them to bring in water to us required a minimum usage of seven hundred and fifty thousand gallons a day. After that, our population began decreasing. We are down to about four thousand beds now. At the same time, the pumping equipment got older, so as a result I think we are pumping just one well at the moment at the hospital, and it is because it supplies some of the outlying buildings from the line on the way into our central sump.

Chairman Conway: Any further statements?

Mr. Cooke: I would like to say just one thing. I made my statement, not for debate, and I feel that I should make a further statement to the gentleman across the way. Prior to our having to increase the rate in the Village of Nyack, we were charging three-seventy-five minimum, and the average water user in the Village of Nyack, I am speaking of a four-family usage, was running somewhere between thirty and thirty-five dollars per year. Now, any of you who have water bills can use that as a basis of knowing that municipally-owned water systems certainly have an opportunity of supplying water at a cheaper rate.

> **Mr. Gerald O'Brien**: *Can someone give me an exact percentage of users that have purchased water, versus having their own wells, in the County?*

Mr. O'Keefe: Off the top of my head, I think it was indicated in the report there were sixty-eight hundred private wells.

Dr. Skelly: The other interesting thing is that most of the County serviced by public water, practically a hundred per cent of the County, is metered in terms of public water supplies, so it is a metered county.

Mr. Fried: Appended Technical Conference indicate there were 208,000 people out of a total population of about 230,000 served by public water systems. So, we have about 22,000 served by wells.

Mr. O'Brien: So it would be sixty-eight hundred wells.

> **Mr. Hennigan**: *What is the experience of unaccounted for water within the County. What has been your experience?*

Dr. Skelly: Spring Valley's unaccounted for water is, as I recall, when we did a study, ran about twelve per cent, which is what we consider to be pretty good. The Village of Hillburn, the other end of the stick, was running, depending on how you wanted to estimate it, anywhere from 25 to 50 per cent. If you take your water usage and plot it, with time you will find that it will go up, say, to a hundred gallons per capita today, the following year down to fifty, back to a hundred. The sustained average usage is the same, which would imply that what you are getting is excessive leaks. I believe in the Village of Suffern we were talking around eighteen or twenty per cent. In the Village of Nyack, I think it was around twenty per cent. The best in the County was Spring Valley Water Company.

This is another point to bring out, that private water utilities had by and large excellent records, so that: (1) you could project future water use; (2) you could look at past historical trends; and (3) determine unaccounted for water use. Village systems, on the other hand, kept little or no records. If they kept the records, they were not in a format where an engineer could go in and readily analyze them. I think this is partly related to the fact that the private utilities require you to submit much more detailed records to the State than the Village systems.

> **Chairman Conway**: *Mr. Cooke, do you have an unaccounted for water figure on Nyack Park Water?*

Mr. Cooke: I think his figure is high. I am not certain. We have men who go continually over the lines, trying to detect any leakage. So, I don't want to dispute his figure, because I am not an engineer and I haven't made the study, but I feel his figure is high.

Mr. Rice: I think his figure is very high, because I check it every few weeks for the amount of water, daily use of water and the amount that goes through the area sewer system. We do have two large industries in Suffern; namely, Avon and Geiger, which use a considerable amount of water, and, of course, the Good Samaritan Hospital. But, as far as leakage goes, I would say that we are on the ball there.

Chairman Conway: *Would you wish to discuss the unaccounted for water?*

Mr. R.C. Frost, *Village of Sloatsburg:* We have about a five per cent loss in the Village of Sloatsburg.

Chairman Conway: Five per cent is incredibly low. I take it, Mr. Gerber, the twelve per cent figure was already stated for Spring Valley.

Dr. Skelly: This is unaccounted for water, by the way, not necessarily water leakage.

Mr. Paul Merkens, *Director, Engineering Studies and Analysis: We learned in our meetings with Dutchess County, as well as Westchester County, that the counties were approached by the Rupert Beer Company who wished to locate a facility there. However, they were turned away from both counties because there was an inadequate allowance for industrial water supply in those two counties. To anybody's knowledge here, did Rupert ever try to locate in Rockland County?*

Mr. Rice: I would like to answer that. I did everything I could to get them in Suffern. They were not turned away, they were looking for a bargain, which I wasn't about to give, and we had plenty of water. I tried quite hard to get them in the Village. They were not interested, they said that they were going to go to Westchester. I believe there were some legal shenanigans there, about the New York City Water supply.

Mr. Quartararo: That's correct. They also tried to get into Putnam County and couldn't for the same reason.

Mr. Gilman: *Has Rockland County explored any plan for developing an independent water supply? This is besides the recommendations made in the Comprehensive Water Supply Study.*

Mr. Fried: No, the Planning Board is preparing its own water study, which is based on the work done by the firm of Quirk, Lawler and Matusky.

Mr. Gilman: *Then this is the only study, essentially?*

Mr. Fried: There will be another study, which will be ours, it's being printed right now. It basically re-

flects the position taken by Quirk, Lawler & Matusky.

Mr. Gilman: *Has the County ever explored the possibility of developing some sites up the Interstate Palisades Park?*

Mr. Fried: Not to my knowledge, except as implied in this study in the pump storage system.

CONCLUSION

Chairman Conway: I want to thank everybody that participated in this very fruitful discussion this morning.

Again I want to thank you, Dan, for handling the organization, and everybody who spoke and appeared here today.

It has been a most informative conference. We will now adjourn.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
Jerry Dineen, Representative of James Harding
Herman Forster
Benjamin Gilman
Gerald O'Brien
Anthony Quartararo
W.J. Schickler

Staff

Robert Hennigan, *Executive Director*
Paul W. Merkens, *Director, Engineering Studies & Analysis*
Stephen Lackey, *Assistant Director, Engineering Studies & Analysis*
David Duffy, *Administrative Assistant*
Irene Baker, *Public Relations*
Harold F. Breon, *Water Resources Engineer*
Jeffrey Brewer, *Research Assistant*
Robert Redmond, *Staff Attorney*
Leslie Van Derzee, *Research Assistant*
Karen McCarthy, *Secretary*

ROCKLAND COUNTY

County

Aaron D. Fried, *Rockland County Planning Board*
John W. McKenna, *Rockland County Planning Board*
Leonard W. Miller, *Rockland County Planning Board*
George E. O'Keefe, *Rockland County Health Department*

Town and Village

Leonard Cooke, *Chairman, Village of Nyack Water Department*
R.C. Frost, *Village of Sloatsburg*
James P. Rice, *Mayor of Suffern*

Private Corporations

Frank Fontaine, *Lederle Laboratories, Pearl River*
Robert A. Gerber, *Spring Valley Water Company*
John E. Maphis, *Federal Paper Board, Piedmont*
Holt Winfield, *Kay-Fried Chemicals, Stony Point*
S.A. Wyle, *Pothat Water Company*

New York City

Samuel Gofseyeff, *New York City Board of Water Supply*

Other

Dr. Michael J. Skelly, *Quirk, Lawler & Matusky Engineers*
H. Underwood Blaisdell, *Rockland State Hospital*
Maxwell D. Davidson, *Chief Engineer, Palisades Interstate Park Commission*
William Cooke, *Representative of Donald Brenner, Rockland County Drainage Center*
Stephen L. Forstenzer, *New York State Rehabilitation Hospital, West Haverstraw*
Robert S. Jonas, *U.S.C.A., Soil Conservation Service*
Cornelius R. Walsh, *Letchworth Village State School*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

ROCKLAND COUNTY MEETING

Date: October 20, 1971

Place: Sheraton Motor Lodge, Route 59, Nanuet, N.Y.

9:00- 9:30	**REGISTRATION AND COFFEE**
9:30- 9:50	**OPENING REMARKS**
	Mr. E. Virgil Conway, Chairman, Presiding
9:50-11:00	**PRESENTATIONS**
	GROWTH & DEVELOPMENT *Mr. Aaron D. Fried, Planning Director* *Rockland County Planning Board*
	COUNTY WATER SYSTEMS *Mr. George O'Keefe, Assistant Commissioner* *Rockland County Health Department*
	COMPREHENSIVE WATER SUPPLY STUDY *Dr. Michael Skelly, Project Manager* *Quirk, Lawler & Matusky, Consultants*
11:00-12:30	**GENERAL DISCUSSION**
12:30- 1:30	**LUNCHEON**
1:30- 3:30	**VISIT TO WATER FACILITIES IN COUNTY**
	(arrangements by County Health Department)

APPENDIX C

TECHNICAL CONFERENCE

TEMPORARY STATE COMMISSION ON THE WATER SUPPLY NEEDS OF SOUTHEASTERN NEW YORK

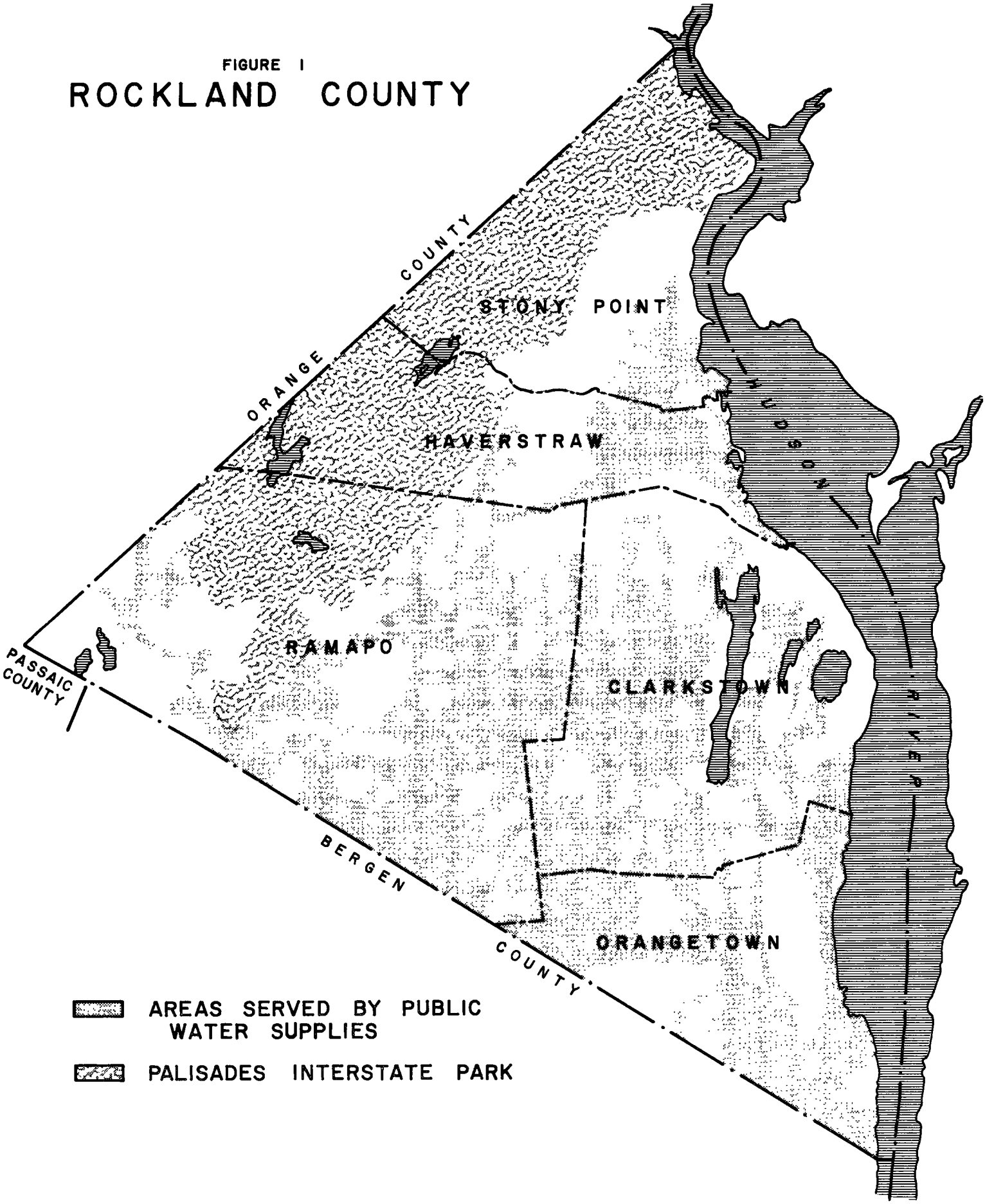
ROCKLAND COUNTY
October 20, 1971

enclosed information

prepared by: ROCKLAND COUNTY PLANNING BOARD

FIGURE I

ROCKLAND COUNTY



LAND USE

LAND USE IN ACRES 1968	Mining and Manufacturing	Retail Trade	Services - Office Wholesale Trades	Residential	Institution Semi-Public Land	Parks - Recreation	Public Facilities	Public Utilities & Transportation	Vacant	Total
CLARKSTOWN UNINC.	720	165	785	6,850	665	1,740	440	3,980	9,870	25,215
Nyack (part)	0	2	10	25	12	0	0	11	5	65
S. V. (part)	1	8	2	40	0	0	0	25	39	115
Upper Nyack	0	3	7	340	110	110	5	55	160	790
Total	721	178	804	7,255	787	1,850	445	4,071	10,074	26,185
HAVERSTRAW UNINC.	55	10	5	450	2,100	7,185	10	325	1,585	11,725
Pomona (part)	0	1	0	300	0	0	0	40	484	825
Haverstraw V.	250	20	15	225	60	225	20	135	380	1,330
W. Haverstraw	35	40	5	295	85	10	15	120	375	980
Total	340	71	25	1,270	2,245	7,420	45	620	2,824	14,860
ORANGETOWN UNINC.	550	100	470	3,870	1,625	1,375	220	2,550	3,655	14,415
Grand View	0	0	1	50	0	0	10	13	46	120
Nyack (part)	5	15	20	180	30	30	15	100	35	430
Piermont	50	4	1	90	2	15	5	63	200	430
South Nyack	2	5	0	125	70	18	25	105	50	400
Total	607	124	492	4,315	1,727	1,438	275	2,831	3,986	15,795
RAMAPO UNINC.	60	85	65	7,875	1,200	8,520	535	2,025	10,415	30,780
Pomona (part)	0	0	0	250	40	0	0	25	325	640
Hillburn	10	8	40	55	2	260	10	455	485	1,325
New Square	0	0	0	60	0	0	3	12	60	135
Sloatsburg	5	17	3	255	5	20	15	120	1,185	1,625
S. V. (part)	30	20	15	645	20	15	45	170	175	1,135
Suffern	175	10	30	510	55	125	60	130	235	1,330
Total	280	140	153	9,650	1,322	8,940	668	2,937	12,880	36,970
STONY POINT	360	25	20	1,210	165	10,630	60	465	3,610	16,545
TOTAL COUNTY	2,308	538	1,494	23,700	6,246	30,278	1,493	10,924	33,374	110,355

POPULATION OF ROCKLAND COUNTY, 1800-1970

Year	Census	Percent Change	Year	Census	Percent Change
1800	6,353	–	1890	35,189	27.0
1810	7,758	22.1	1900	38,298	8.9
1820	8,837	13.9	1910	46,873	22.4
1830	9,388	6.2	1920	45,548	-2.8
1840	11,975	27.6	1930	59,599	30.8
1850	16,962	41.6	1940	74,261	24.6
1860	22,492	32.6	1950	89,276	20.2
1870	25,213	12.1	1960	136,803	53.2
1880	27,690	9.8	1970	229,903	68.1

POPULATION OF ROCKLAND COUNTY BY TOWN, 1900-1985

Town	1900	1910	1920	1930	1940	1950	1960	1970	Projection 1985
Clarkstown	6,305	7,980	7,317	10,188	12,251	15,674	33,196	61,653	96,100
% Change	–	26.6	-8.3	39.2	20.2	27.9	111.8	85.7	55.9
Haverstraw	9,874	9,335	9,027	11,603	12,443	12,979	16,632	25,311	56,600
% Change	–	-5.5	-3.3	28.5	7.2	4.3	28.1	52.2	123.6
Orangetown	10,456	14,370	14,284	18,029	26,662	34,554	43,172	53,533	71,900
% Change	–	37.4	-0.5	26.2	47.9	29.6	24.9	24.0	34.3
Ramapo	7,502	11,537	11,709	16,321	18,007	20,584	35,064	76,702	121,400
% Change	–	53.7	1.4	39.3	10.3	14.3	70.3	118.7	58.3
Stony Point	4,161	3,651	3,211	3,458	4,898	5,485	8,739	12,704	24,000
% Change	–	-12.3	-12.0	7.6	41.6	12.0	59.3	45.4	88.9
COUNTY	38,298	46,873	45,548	59,599	74,261	89,276	136,803	229,903	370,000
% Change	–	22.4	-2.8	30.8	24.6	20.2	53.2	68.1	60.9

Source: U.S. Bureau of the Census

SPRING VALLEY WATER COMPANY INCORPORATED

(Parts of the Towns of Clarkstown, Orangetown and Ramapo)

SERVICE CLASSIFICATION NO. 1 – PRIVATE OR DOMESTIC PURPOSES

Service Districts Nos. 1, 2 & 3

Quantity Used in the Quarter (cubic feet)		Per Thousand Cubic Feet
First	10,000	$7.10
Next	90,000	6.10
Next	900,000	4.30
Over	1,000,000	2.80

NOTE: Where bills are rendered monthly, one-third of the quantities above will be used in computing the charges.

Service Districts Nos. 1, 2 & 3

Minimum Charge

Size of Meter	Water Allowance (cu. ft.)	Quarterly Charge
5/8 Inch	1,050	$ 7.50
3/4 Inch	1,500	10.65
1 Inch	2,700	19.17
1½ Inch	5,100	36.21
2 Inch	8,400	59.64
3 Inch	15,900	106.98
4 Inch	26,400	171.00
6 Inch	51,900	327.00
8 Inch	84,000	525.00

SERVICE CLASSIFICATION NO. 3 - PRIVATE FIRE PROTECTION

Service Districts Nos. 1, 2 & 3

Size of Meter	Monthly Charge
2 Inch	$ 6.00
3 Inch	17.00
4 Inch	22.50
6 Inch	35.00
8 Inch	65.00

Source: Spring Valley Water Company, Inc.

WATER SERVICE RATES IN ROCKLAND COUNTY
BY PRINCIPAL SUPPLIERS

SPRING VALLEY WATER COMPANY INCORPORATED
(Parts of the Towns of Haverstraw and Stony Point)

Service District No. 4

PRIVATE OR DOMESTIC PURPOSES

Quantity Used in the Quarter (Cubic Feet)		Per Thousand Cubic Feet
First	12,000	$5.70
Next	28,000	5.02
Next	60,000	3.15
Over	100,000	2.40

NOTE: Where bills are rendered monthly, one-third of the quantities above will be used in computing the charges.

Minimum Charge Size of Meter	Water Allowance (Cubic Feet)	Quarterly Charge
5/8 Inch	1,200	$ 6.84
3/4 Inch	1,600	9.12
1 Inch	2,800	15.96
1½ Inch	5,200	29.64
2 Inch	8,400	47.88
3 Inch	16,000	88.50
4 Inch	26,400	140.70
6 Inch	52,000	246.75
8 Inch	84,000	347.55

PRIVATE FIRE PROTECTION

Size of Meter	Monthly Charge
3 Inch	$14.58
4 Inch	22.91
6 Inch	41.66

Source: Spring Valley Water Co., Inc.

PUBLIC WATER SUPPLIES IN ROCKLAND COUNTY

Area Served	Water Use (mgd)*	Average Supply Capacity (mgd)	Population Served	Source	Owner
Hillburn	0.05	0.35	1,000	Wells, Surface	Village of Hillburn
Nyack, South Nyack; Central Nyack; Upper Nyack (3/4), and West Nyack (Part)	1.60	1.60	15,000 plus	Surface	Village of Nyack
Sloatsburg and part of hamlet of Ramapo	0.27a	0.75b	2,820 200 (approx.)	Surface	Pothat Water Co.**
Clarkstown and Orangetown (almost all); Ramapo east of the Ramapo Mts. except Suffern	14.68	27.20	152,800	Wells, Surface	Spring Valley Water Co.
Towns of Stony Pt. and Haverstraw (parts)	2.74	3.00	29,700	Wells, Surface	Spring Valley Water Co.
Suffern	1.3	4.00	7,528	Wells	Village of Suffern
COUNTY TOTALS	20.64	36.90	208,500 plus		

* Million gallons per day. Water use (mgd) includes all water supplied to the distribution system and is comprised of water used by the customer (metered) and losses in the distribution system (unaccounted for water).

** Pothat (owned by Ramapo Land Company) sells water to Sloatsburg, which distributes it through its village-owned system. The Land Company furnishes water to its own tenants free of charge.

a. Sloatsburg now averages approximately 400,000 gpd as it now supplies the New York State Thruway.

b. Sloatsburg's engineers estimate reservoir productivity one mgd plus.

Sources: Spring Valley Water Co., Inc., Villages of Nyack, Hillburn, Sloatsburg, Suffern.

MUNICIPAL WASTE WATER TREATMENT PLANTS IN ROCKLAND COUNTY

	Design Capacity (Gals. per day)	Present Flow (q.p.d.)	Discharged Into
CLARKSTOWN			
Rockland County Sewer District No. 1	10,000,000	8,000,000	Hudson River
Upper Nyack	165,000	180,000	Hudson River
Sewer District No. 13 (The Dells)	70,000	70,000	Hackensack River (a)
HAVERSTRAW			
Haverstraw Village	1,000,000	700,000	Hudson River
West Haverstraw	350,000	650,000	Minisceongo Creek (b)
Joint Regional Plant	4,000,000	(under const.)	Hudson River (c)
ORANGETOWN			
Orangetown Sewer Dist.	8,500,000	5,500,000	Hudson River
Nyack	1,000,000	820,000	Hudson River
South Nyack	500,000	500,000	Hudson River
RAMAPO			
Suffern	1,500,000	825,000	Ramapo (a)
Dexter Park Sewer Dist.	100,000	45,000	Pascack Brook (a)
Saddle River Sewer Dist.	50,000	48,000	Saddle River (a)
Orchard Hills Sewer Dist.	50,000	40,000	Mahwah Brook (a)
Sewer District No. 62	100,000	75,000	Mahwah Brook (a)
STONY POINT			
Stony Point Sewer Dist.	1,000,000	400,000	Hudson River

(a) To be abandoned upon completion of the necessary trunk sewers in Stage 3 of the Rockland County Sewer District's construction plans.
(b) To be abandoned upon completion of Joint Regional Plant.
(c) Construction scheduled for completion early 1971.

SUFFOLK COUNTY

March 12, 1971

Hauppauge, New York

PREFACTORY NOTE

The Suffolk County meeting was the first meeting of the Commission. The minutes here are a summary of the session taken from a tape recording. In subsequent meetings a verbatum stenographic record was kept. This explains the difference in the record between the Suffolk minutes and the minutes of the other local meetings.

SUFFOLK COUNTY CONFERENCE

INTRODUCTION

Mr. E. Virgil Conway, *Chairman,* opened the meeting with a few comments about the purpose of the Commission, i.e., to study the water supply situation in the Southeastern portion of New York State and determining possibilities for meeting the water supply needs for the foreseeable future – that this was the first of a series of meetings the Commission is holding with local officials in order that the Commission can be informed about the water supply and related matters. He expressed his appreciation for the local assistance in setting up the meeting and participation of local officials. Mr. Conway then introduced members of the Commission.

Mr. Conway introduced Mr. Hennigan, Executive Director of the Commission, who said the Commission is interested in getting the feel of the local situation, establishing cooperative arrangements between the Commission and local water management officials. and in becoming educated.

POPULATION AND ECONOMIC FACTORS

The first speaker was Mr. Lee Koppelman, Director of Suffolk County, Department of Planning. Mr. Koppelman explained the regional comprehensive development plan for Nassau and Suffolk Counties concentrating on the Suffolk County situation. The plan is based upon projected growth and the major controls and constraints, which are the natural resource base of land and water, mass transportation and housing.

It is anticipated that the population of Suffolk County, which is now 1.1 million, will increase to 1.7 million by 1985, and reach 3 million by 2020. It is recognized that population extrapolation 50 years in the future are extremely speculative. A water and land use plan has been developed in line with population and economic projections. Possible future developments, such as a cross sound bridge, have been factored into the planning consideration. The comprehensive plan has been accepted by Suffolk County and a formal resolution calling for adoption has been introduced into the County Legislature. This action is of great significance since it represents one of the few times that a local legislative body has made such a commitment.

Mr. Koppelman made the point that he felt that the plan was unique in that it is predicated fundamentally on a water resource base. It was the feeling of the planners that this represented the basic control and constraint. The plan reflects a development pattern directly related to the availability and distribution of the water supply. He further commented that he was concerned that Nassau County will reach a water supply crisis by about 1980, but that they have shown no inclinations to participate in the shared plan approach, particularly as it relates to water supply. Mr. Koppelman cited the adoption of the regional plan, the Holzmacher water supply report, recent formation of the Department of Environmental Protection, and the existence of the Suffolk County Water Supply Authority and its expansion

program as indications of the responsive and progressive attitudes of the people of Suffolk County.

He cited two (2) current problems:

1. Certain conservationist elements are attacking the Holzmacher report (Water Supply Plan). The plan was based entirely on environmental constraints. The people that the county officials assumed would support the program have become opponents. They are questioning whether we are doing enough. There seems to be a built-in conflict between certain conservationist elements and engineers. Actually, the study is based on an engineering analysis which determines the water supply needed and water availability, identifies environmental problems and recommends additional work. The issue should be how to develop a program which will minimize environmental impact, simultaneously meeting the water supply needs of Suffolk County. Attacking the report just makes no sense.

2. Suffolk County has found it impossible to establish a regional water resource planning board under the existing legislation due to the lack of interest of Nassau County, and the unique water resource situation on Long Island. Existing legislation calls for the establishment of local water resources planning boards on a watershed basis. The main thrust of the existing legislation is the design and construction of multiple use impoundments for better utilization of surface water. The watershed and surface water orientation of the existing legislation is not applicable to Long Island. Administratively, the State has said that they will approve the formation of a regional planning board if it includes both Nassau and Suffolk Counties. However, Nassau has refused to cooperate. If Nassau would agree, the simplest thing would be to designate the local bi-county Marine Resources Committee as the regional board. Suffolk is interested in the state program because it provides for 75% state aid for a water resource planning program.

Mr. Koppelman implied that something should be done to mollify the conflict between the conservationists and the engineers over the water plan, although he offered no specific suggestions. However, he did recommend that the existing state legislation governing the establishment of regional water resource planning boards be amended to accommodate the Long Island situation and allow Suffolk County to establish such a board on its own in view of the intransigence of the Nassau County people. Mr. Koppelman's presentation was followed by a number of questions and discussion.

WATER SUPPLY FACTORS

The next speaker was Mr. John Flynn, Commissioner of the Department of Environmental Protection, who discussed water supply development and use factors. Mr. Flynn explained that Long Island is composed of unconsolidated material deposited on bedrock. The unconsolidated material ranges in depth from a few hundred feet to 2,000 feet. The bedrock slopes from west to east and from north to south, which means the unconsolidated deposits become deeper as you proceed east and south from the northwest corner of the island where bedrock is exposed on the surface. In Suffolk County the unconsolidated deposits are a thousand or more feet in depth.

There are three (3) major aquifers or layers of material which contain groundwater and are used for water supply purposes. From surface to bedrock they are the upper Glacial aquifer which is mostly course sand and gravel, the Magothy aquifer which is less course sand, gravel with clay lenses, and the Lloyd aquifer which is adjacent to the bedrock. The Lloyd aquifer is overlaid with clay which separates it from the Magothy aquifer. Other conditions of minor significance along the south shore include the Jameco aquifer and a clay deposit known as Gardiners clay. These aquifers are filled with fresh water

under the island and for a certain distance under the ocean and Long Island Sound where the hydrologic balance results in a fresh-saltwater interface where the water in the deposits changes from fresh to saltwater.

Under natural conditions, the best quality water and most economic to obtain comes from the Glacial aquifer. This aquifer, course sand and gravel, acts as a natural filter and the permeability of the aquifer is so great that large amounts of water can be withdrawn from a single well with small head loss or draw down. The next best aquifer for water is the Magothy. This requires deeper wells and permeability of the aquifer is less, meaning power cost is higher. The quality of the water is less desirable, being higher mineralized and may contain iron and other undesirable constituents. The Lloyd aquifer requires the deepest wells and represents a relatively limited source. Because of contamination of the Glacial aquifer, particularly by cesspools and sewage, its use is limited. Consequently, the major freshwater resource is the Magothy aquifer. Some 80% of all wells draw from the Magothy.

Suffolk County is 920 square miles in area with a water budget area of 647 square miles. The water budget area is substantially smaller because of the exclusion of portions of land adjacent to the coast which is unavailable for water supply use. Precipitation is the only source of water supply. It averages 42" a year, some 20" are lost to evaporation, transpiration and runoff. Because of the porosity of the subsoil, only 5% of the precipitation runs off, the remaining 95% percolates through the ground into the groundwater reservoir. Approximately 630 million gallons per day are recharged. An estimated 464 MGD can be withdrawn from the groundwater aquifers without over-drafting the supply. If the County was completely sewered by the year 2020, safe yield would exceed demand by 85 MGD. Stated in another way, this assumes a withdrawal of 379 million gallons per day for water supply use with discharge of the used water to the Atlantic Ocean or Long Island Sound. If the County remains unsewered, there would be a safe yield of 343 million gallons per day over demand. Stated another way, this means withdrawing 379 million gallons per day for water supply use, 36 million gallons per day being treated in sewage plants and discharged to the Ocean or Sound, and the return to groundwater via sub-surface sewage disposal systems some 343 million gallons per day. However, failure to provide sewage treatment would be disastrous since the levels of polluted water would penetrate deeper and deeper in the fresh water resource and eventually it would be unusable. Furthermore, sub-surface and under-flow water discharged to streams, bays and oceans would deliver these pollutants to these locations.

Withdrawal of water for consumptive use, that is, withdrawal without return, even within the safe yield estimate of 464 MGD, does not mean that the subsurface hydrologic condition would remain the same. It simply means that the County would not be mining water, but rather would limit the take to the annual replenishment. However, such a withdrawal would drastically affect sub-surface hydrologic conditions.

At the present time, with practically total return of freshwater, groundwater elevation under the high ground is some 75 feet above sea level. This level decreases with the land as it approaches sea level. This elevation of water provides a natural pressure differential resulting in the flow of fresh water continuously to points of discharge to streams or along the coast line. If the total safe yield was withdrawn, the 75 foot groundwater elevation above sea level would re-stabilize somewhere in the neighborhood of 25 feet above sea level. (This would reduce the outflow of groundwater, reduce or eliminate the flow in some streams, reduce the level of certain lakes and have an unknown effect along the shore line because of the lack of groundwater under-flow. There, changes in flow could change the environmental conditions, particularly by increasing salinity in the bay and water adjacent to the coast line. The effects of

this are not known at this time). These circumstances show the interrelationship of water supply and waste water disposal and needs for total resource management so that the water supply needs of the County can be met and desirable environmental conditions maintained at the same time. Recycling is not particularly new in Suffolk County; it is a fact of life.

Mr. Flynn also referred to the heat that was being generated by the conservation groups in the County. He said that it felt strange to be under attack from the conservationists when he devoted most of his life to the environmental protection of the water resources of Long Island. He thought it would be very desirable if the conservationists' attitude would be more responsible and if they would furnish facts as well as highly charged emotions.

The next speaker, Mr. Aldo Andreoli representing Dr. Leone, Commissioner, Suffolk County Department of Health, was particularly concerned with water quality. Mr. Andreoli is an engineer with the Department. He stated that increasing nitrates are a growing concern in Suffolk County, as is continuing pollution from private and public sewage disposal systems. Action to eliminate individual systems must be accelerated, and existing smaller treatment plants, which now number 45, should be consolidated into an overall county sewage collection and treatment system. Furthermore, treatment methods must be used so that any discharge into the groundwater used for water supply purposes meets drinking water standards. Other concerns of the Department include pesticide use, solid waste disposal and private water companies. They believe that the present method of solid waste disposal, which is mainly sanitary land fills, are a real danger to water quality because of lack of effective management and control. The Department recommends that the County address itself to establishing some centralized method of solid waste disposal. Since various pesticides used in the County will eventually reach the groundwater, some control methods are indicated. The County Water Authority should institute a regular program of buying all the small water companies which do not provide dependable service or effective supervision. At least 15 of these companies, which are the most poorly managed, should be purchased immediately. Mr. Flynn and Mr. Andreoli then responded to a number of questions.

INSTITUTIONAL ARRANGEMENTS

The next item on the program concerned institutional arrangements. The first speaker was Mr. Herbert C. Koehler, Assistant General Manager of Suffolk County Water Authority, representing Mr. Weinfurt, General Manager. Mr. Koehler gave a brief description of the present system and plans of the Suffolk County Water Authority.

The Authority was set up by state legislation in 1931. The primary purpose was to prevent New York City from developing a water supply in the County. In 1951 the statute was amended and the Authority was given life and authority to begin operation. The enabling statute prohibits selling water outside the County.

The Authority has no taxing power of its own and must maintain its capital and operation program within its revenue structure, based on charges for water service. The initial capital program was 10 million and total debts now approximate 23 million dollars. These capital funds are provided by the sale of revenue bonds supported by water rates. The Authority became operational mainly through the purchase of existing water facilities. Since that time, the Authority has carried out a program of system extension and further acquisitions. In order to expand capital capabilities, the Authority has entered into agreements with local municipalities similar to lease purchase arrangements whereby the bonding authority of

the municipalities can be utilized for distribution system extension. In the early years, there were significant rate differentials in the Authority service area due to the acquisition of various systems with differing rate schedules. In 1958 water rates were made uniform throughout the service area. This resulted in a 16% increase in revenue at that time. Since 1958, some 13 years, the basic rate schedule has remained the same. Indications are that rates must be increased in the near future. The average annual cost of water per household is about $54.00 at the present time.

At the present time, the Authority has 176,000 customers, servicing some 65% of the county population, or approximately 715,000 people. About 9,000 new customers are added each year (35,000 – 40,000 people). The facilities include 94 well fields and 242 wells with a total pumping capacity of 258 MGD.

There are 10 district offices with the operating center in Bayshore. Special studies on groundwater resources are carried out in cooperation with the Geological Survey and State agencies. All customers are metered; the per capita consumption is 90 – 100 gallons per day, with some areal differences. The Authority is investigating automatic meter registration, hoping to eliminate meter readers, although the state of the art is not too far advanced. The existence of thousands of meters now in use would mean that such a program would have to be phased in over a number of years. As a demonstration project, some 200 automatic meters have been installed which permit exterior reading by means of a plug-in on the outside of the house.

The long-term plans of the Authority are to become the sole water supply agency in the County. This will come about by the extension of the present system, and the acquisition of the remaining private and municipal systems in the County. A number of questions were asked and discussion took place after Mr. Koehler's presentation.

Mr. Robert Holzmacher, Engineering Consultant to the County, explained the comprehensive water supply study and report prepared by his form for the County. The report determined needs, availability of the water resource, and a recommended program for development and distribution. He noted that at the present time the public water supplies in Suffolk County include 19 municipal water districts and systems and some 56 privately owned water corporations, in addition to the Authority. Many of the systems operated by private water corporations are very small and generally unsatisfactory. Mr. Holzmacher reviewed the information relating to safe yield and the impact of use on the subsurface hydrologic regimen. He further noted that in his study a model was developed to study the movement of saltwater into the freshwater aquifer under extreme pumping conditions. It was found that it would take 300 years for the saltwater interface to move inland 30 miles into the Magothy aquifer. Consequently, they concluded that saltwater intrusion into this aquifer is not the serious problem it was thought to be a few years ago. It was also stated that his feeling is that the water supply projection is conservative and more precise knowledge will indicate that the yield will be higher. Reference was made to the criticism of the report by some conservation groups. He noted that he was reporting facts and assessing needs and the study was just this. One of the issues in the County was possible environmental degradation due to water withdrawal and altered conditions, particularly in Great South Bay. He questioned whether there was any basis in fact for this concern and noted the great change in salinity which had taken place in Great South Bay over the years, due to the changes in the openings in the barrier beaches. He further noted that a study in 1907 by Hazen showed a fluctuating salinity in Great South Bay with a ratio of 2-1/2 to 1 between high and low concentrations. This raises questions relative to the effect of salinity on the proper growth of shell fish in the Bay. He felt that certain concerns had some basis in fact, but likewise felt that

some of them were just irresponsible, unsupported judgments. He called for further in-depth studies concerning the problem of the ecology of Great South Bay and other coastal waters due to the change of salinity brought about by loss of freshwater discharge from the underground aquifers.

One real danger was the deterioration of the quality of the groundwater, particularly the threat from nitrates. In sampling data, this rate is steadily rising. It has become very serious in Nassau County and is likely to become serious in Suffolk County, but no action has been taken. It has been recognized that the Glacial aquifer has been seriously polluted and this pollution will spread to the other aquifers under present conditions.

At present, the water yield on the island is sufficient to meet the needs. A long-range plan is needed for the proper location of well fields to insure a high quality water and to minimize distribution costs. There are water deficiency areas in some parts of the County, particularly in the eastern forks which will require re-distribution of the water resource to serve these areas. However, with proper development and control, Suffolk will be a surplus water area and undesirable environmental effects can be minimized.

He recommended that a Department of Water Resources be created and include the Suffolk County Water Authority, the Division of Waste Water Collection and Treatment, a Division of Water Quality Control and the Division of Marine Coastal Waters. This would put all water resource elements in a single agency and hopefully provide an institutional arrangement which can effectively manage the water resources in Suffolk County. He further suggested that within the next decade, the Department of Water Resources purchase 56 private water companies. Also operational control of the remaining municipal water districts should best be left open with the final decision as to take over to be based on public referendum of each affected water district.

The growing consumptive use of water for water supply purposes and the need for sewage collection and treatment is a serious matter. Attention must be given to a program to minimize drastic hydrologic changes in the underground aquifers. Since sewage collection and treatment is a necessity for pollution control, groundwater management is possible through importation of water from outside, injection of treated wastewater by injection wells or recharge basins, or by discharging highly treated wastewater directly at the shore line or into ponds and streams. In the latter case, streams and ponds may have to be artificially perched by sealing the bottom, to be sure the water stays as surface water and does not readily seep into the ground. Mr. Holzmacher's feeling was that discharging highly treated wastewater at the shoreline would probably be the alternative of choice. He pointed out that recharging wastewater directly into the ground was still experimental, was very expensive, and that every recycling cycle added 300 – 400 mg/l of dissolved solids which would result in an undesirable build-up of dissolved solids. By discharging the treated wastewater into the streams, lakes and bays along the coastline, it will be possible to reduce nutrients; furthermore, the dissolved solids of the wastewater would be of no consequence since the wastewater would be going into waters with very high natural dissolved solids content. In addition, this procedure will help to maintain a fairly stable environmental condition by providing a natural freshwater input to the bays, lakes and streams. This will also allow the County to maintain the existing lakes and streams which would tend to disappear as the groundwater table was lowered.

In reference to the distribution system, he recommended that the County follow a plan which provides differential pressure zones, with well fields located to minimize development cost, maximize yield and insure high quality. These recommendations coincided with the administrative recommendation for a single water agency throughout the County. He strongly recommends that a sewage collection and treatment system be developed as soon as possible in order to protect water quality and prevent fur-

ther deterioration of the present situation.

Since Suffolk County will be a water surplus county for a number of years, it is possible to furnish Nassau County surplus water as a temporary measure. The only hang-up technically is the need for larger water mains which are not used in the County because of the availability of sources, e.g., the largest main now used in the County is 16" in diameter. The Nassau situation presents a similar problem as well as the administrative problem of multiple systems without centralized control or direction.

Questions and discussion followed.

INFORMAL DISCUSSION

The meeting was then opened for informal discussion and the issues of regionalization and exportation of water were raised. The general reaction was that the NEWS study recommendations for the export of water to Nassau County, or a direct connection with the New York City for water exchange in both directions, will probably not be politically feasible.

Some discussion centered on the existing groundwater overdraft in Queens County, and the approaching like situation in Nassau. Some recognition that a regional approach is necessary under strong State leadership was apparent. No specific suggestions were offered. The Queens overdraft situation was discussed, as was the failure of the state agency to control or prevent this. The two private corporations involved do not meter individual customers. New York City has refused to furnish water to these two companies.

After final questions and discussion by the Commissioners and officials, the meeting was adjourned. Lunch was hosted by the Commission at the Heritage Inn.

INSPECTION TRIP

In the afternoon an inspection visit was made to a recharge basin. Mr. Philip Cohen, of USGS, explained the recharge basin research program. He noted that there were 2100 basins on Long Island and the USGS had instrumented 3 of these basins in order to make a technical evaluation of their design, function and effect on groundwater. At the basin visited, exact measurements of the tributary area was made and records are kept of flow into the basin and the quality of the water. The level of water in the basin is continually measured and a well has been installed in the bottom of the basin to measure the effect on the groundwater of the recharge operation. The measurements are put on tape and data recording is timed to be taken simultaneously so comparable data is available for analysis. Although a sample of three basins out of a total of 2100 is small, the study represents the first attempt to quantify and analyze the design and use of recharge basins on Long Island.

SUMMARY

Suffolk County is in the position for being a water surplus area for the foreseeable future, providing proper technical administrative and regulatory controls are developed to insure effective development and use of the water resource with adequate protection of the local environment. In order to accomplish these ends, there should be a single water agency in the County who can operate an effective water system, provide for sewage collection and treatment with a high level treatment of waste water, with the dis-

charge of such water to surface streams and coastal areas to maintain environmental balance.

A continuing dialogue must be established and maintained between all interests in the County so public opinion will support the needed programs. The role of Suffolk County in a regional approach induces a negative response indicating an area of sensitivity. However, this role should not be overlooked. It might be possible to make a much better use of the entire groundwater resource, particularly the storage potential of the unconsolidated deposits in a regional scheme. Use of the storage capacity in the Long Island area is an intriguing possibility. It could pave the way to some imaginative water resource development plans.

In addition to the oral presentations, a number of reports and other supporting data were furnished by the speakers for Commission study.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
Herman Forster
James C. Harding
Gerald R. O'Brien
Anthony M. Quartararo
John J. Santucci
William J. Schickler
Robert C. Wertz

Staff

Robert D. Hennigan, *Executive Director*
Paul W. Merkens, *Director Engineering Studies and Analysis*
David A. Duffy, *Administrative Assistant*
Nelda M. Martin, *Secretary*

SUFFOLK COUNTY

County

John V. N. Klein, *Chairman, County Legislature*
John M. Flynn, *Commissioner, Department of Environmental Control, Suffolk County*
Lee E. Koppelman, *Department of Planning*
Aldo Andreoli, *Suffolk County Health Department*
August Guerrera, *Suffolk County Water Authority*
Herbert C. Koehler, *Suffolk County Water Authority*

Other

Randolph M. Stelle, *New York State Department of Environmental Conservation*

Walter C. Waterman, *New York State Department of Environmental Conservation*
William A. Keane, *Department of Public Works, Westchester County*
Edwin E. Harris, *U.S. Geological Survey, Albany*
Phillip Cohen, *U.S. Geological Survey*
Samuel C. McLendon (Holzmacher, McLendon & Murrel), *Consulting Engineers*
Robert G. Holzmacher, *Consultant*
Joseph R. Risdell, *G.S.B. Audubon Society*
V.S. Royce, *Newsday*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

SUFFOLK COUNTY MEETING

Date: March 12, 1971

Time: 9:30-12:30 – Conference and discussion
1:30- ? – Facilities inspection

Place: Auditorium Conference Room, Planning Building, Suffolk County Center
Veterans Memorial Highway, Hauppauge, New York

Tentative Program

9:30 OPENING REMARKS

Mr. E. Virgil Conway, Chairman
Commissioner John M. Flynn, Suffolk County
Mr. R.D. Hennigan, Executive Director

9:45 LAND USE – ECONOMIC – DEMOGRAPHIC FACTORS

(Present and Future)

(a) Population - numbers - growth - distribution
(b) Land Use Patterns
(c) Economic Base - projections
(d) Impact of Future Developments

e.g. 1. Cross-Sound Bridge
2. A Fresh Water Sound

Lee Koppelman, Consultant
Department of Planning

10:15 WATER SUPPLY DEVELOPMENT AND USE FACTORS

(a) Hydrology
(b) Geology
(c) Quantity - demands - availability
(d) Water - Wastewater interrelationship
(e) Quality

1. Natural
2. Wastewater Disposal
3. Salt Water Intrusion
4. Health Considerations

John M. Flynn, P.E., Commissioner
Department of Environmental Protection

George E. Leone, M.D., Commissioner
Department of Health

10:45 **BREAK**

11:00 **INSTITUTIONAL ARRANGEMENTS**

(Management and Financing)

(a) Operating Agencies
1. Suffolk County Water Authority
2. Municipal Systems
3. Private Systems

(b) Long Range Plan
1. Holzmacher Report

(c) Constraints to Implementation

Louis Weinfurt, General Manager
Suffolk County Water Authority

Robert G. Holzmacher, Engineering Consultant to County

Commissioner John M. Flynn

11:30-12:30 **ISSUES, PROBLEMS AND NEEDS**

(a) Possible Topics for Discussion
1. NEWS Study Recommendations
2. Regionalization
3. Recycling

4. Desalinization
5. Utility Orientation
6. Joint Water - Wastewater Management
7. Others

Informal discussion between Commission and Suffolk County people.

12:30-1:30 LUNCHEON

1:30-3:30 VISIT TO WATER FACILITIES

(a) Possibilities

1. Well Field
2. Rechange Basin
3. Rechange well for waste water
4. Other

ULSTER COUNTY

May 26, 1971

Kingston, New York

ULSTER COUNTY CONFERENCE

OPENING REMARKS

The meeting was opened by Mr. E. Virgil Conway, Chairman, at 9:30. He noted that this was the third meeting of the Commission with local officials and we were delighted to be in Ulster County and appreciated the opportunity to meet with local officials to discuss water supply and related problems. Mr. Conway then introduced other members of the Commission and Commission Staff. He noted that some members of the Commission, particularly the legislative members, were not present and advised that this was due to the continuing legislative session and the fact that the attendance of the legislature was required during the intensive activity which was then current. He particularly noted that Assemblyman H. Clark Bell sent his regrets but his attendance was an absolute necessity in Albany. Senator Rolison and Assemblyman Gilman also sent their regrets.

Mr. Conway explained that the purposes of the meeting was to educate the Commission and bring the views of the local officials to the attention of the Commission members. He expressed thanks for local assistance in setting up the meeting, particularly to Harry Edinger who made the local arrangements. He also noted that he had some pressing duties that required his presence in Albany, both on Commission and non-Commission matters and probably will have to leave before the Conference was concluded. He then called on Harry Edinger for a few words who was filling in for Peter Savago, Chairman of the County Legislature.

Mr. Edinger welcomed the Commission to Ulster County and said that he had planned the meeting to be relatively informal and that a group had been gathered that was knowledgeable and representative of the water supply problems in Ulster County. He then introduced the local people in attendance. The Chairman then called on Mr. Hennigan. He expressed his thanks to Harry Edinger for setting up the meeting and noted the purpose of meetings with local officials. The Chairman then called on Mr. Herbert Hekler, Director of Planning, to talk about "Land Use – Economic and Demographic Factors in Ulster County.

PRESENTATION

Mr. Herbert Hekler, *Director of Planning, Ulster County:* With Greene County, part of the Albany metropolitan region, to the north and Orange County, part of the New York City metropolitan region, to the south (Figure 1), Ulster County is like a skirmish line in the Irish Wars. Ulster County contains some 1040 square miles, more than 730,000 acres, which is about the same size as the state of Rhode Island.

The County topographically consists of mountains and river valleys. The major mountain areas are the Catskills, which occupy the northern and western parts of the county. The Shawangunk Range, which runs in a north-easterly direction between Rondout and Wallkill Valleys and extends from mid-Ulster County to Pennsylvania. The third range, which is much smaller, is the Marlborough Range, which lies

between the Wallkill Valley and the Hudson River and is oriented in a north-south direction. In between the mountain ranges are the areas that have been settled for development and this follows the basic stream pattern.

The major streams and river valleys are the Esopus which rises on the northerly flank of the Catskills and flows in a northeasterly direction. It is intercepted by a New York City reservoir, the Ashokan. Below the Ashokan it continues as a tiny stream to the Hudson River. The second stream system is Roundout Creek which rises on the southern flank of the Catskills. It is intercepted by the New York City water system, at Rondout Reservoir. It then flows southeasterly, and eventually northeasterly towards Kingston to discharge into the Hudson River. The third system is the Wallkill which rises in New Jersey, flows through Orange County and discharges to Rondout Creek in the vicinity of Rosendale. There are two distinctive features to these river systems. One is that they are the low ground between relatively high mountain ranges. The Wallkill between the Marlborough and the Shawangunk, the Rondout between the Shawangunk and the Catskills and the Esopus which lies between two ranges of the Catskills. The second particular characteristic is the preemption of water use in the highlands at the expense of the people in the lowlands. New York City reservoirs are located on the upper reaches of both the Esopus and the Rondout. The Wallkill is slightly different. However, it traverses considerable territory before entering the county. Water is drawn upstream particularly for agricultural use which reduces the available water downstream considerably.

The major population center is the city of Kingston with 25,000 people. Other important settlements are New Paltz, Ellenville, Highland, and Saugerties. The pattern of development came about due in great part to the Delaware-Hudson Canal. The Canal was built early in the 1800's and connected the Hudson River to the Delaware at Port Jervis. The Canal was the means of transporting coal from the Pennsylvania coal fields to New York metropolitan areas. It was significant locally because it opened up the county for growth and development. It began at Kingston and went straight up the Rondout Valley. It also provided transportation for agricultural products and was a basis of a ship building industry.

Important industries at that time were hay for New York City, bluestone, natural cement and ice which was chipped out of the lakes and rivers in the area. Unfortunately, horses were replaced by the car, mechanical refrigeration replaced the ice, bluestone became too expensive to use in houses, and natural cement was replaced by Portland cement. This lead to a period of decline in Ulster County. This period of decline coincided with the discussions and negotiations on the development of the Catskill water supply for New York City. Between 1910 and 1920 the county population dropped 17,000, about 20% of the total. From 1920 to 1950 the county was static. The main output of the county was water to New York City, and young people to areas of better opportunity. After World War II growth and development began again.

The Thruway was built giving the county good access to other areas. Some major industries began to locate in the area, the prime one being IBM who constructed a plant employing 5500 people. Between 1950 and 1960 the population increased by 26,000 or 29 per cent. From 1960 to 1970 there was a further increase of 22,000, a 19 per cent increase. This was relative rapid growth. It was due in great part to the growth of the State College at New Paltz and to the IBM plant, and the satellite operations which these induced. Predicting future growth is chancy at best. However, there seems to be agreement that there will be constant growth and that the present population of 141,000 will rise to a population ranging from 187,000 to 212,000 within the next twenty years. We feel that a projected population of 200,000 is reasonable.

How will this population be distributed? We have prepared a comprehensive plan for 1985 (Figure 2). The main areas of growth will be in the Kingston-Saugerties area. This is our main industrial heartland. The second important growth area is New Paltz. This is tied to the growth of the State College which has a present enrollment of 8,000 students. Estimates for the future indicate a university considerably larger. The third area for growth will probably be in the lower Wallkill Valley. This is one of the most spectacularly beautiful areas still unspoiled in rural New York State close to the metropolitan area. Because of its isolation and lack of connection to the Thruway, the area is still rural with dairy and horse farms. One of the big unknowns that may have a dramatic and undesirable effect is the planned Stewart Air Base development, only 6-8 miles away.

The economic base for the county rests primarily on manufacturing. Out of a total work force of 32,000 there is a manufacturing work force of about 15,000. The second major activity is agriculture, with the county being number one producer of apples and corn in the State of New York. The third important element is recreation and tourism. This is not the commercialized operations charcteristic of part of the Catskills, although there is some of that. A substantial part of it is second homes for summer occupancy. There are over 5,000 summer homes in Ulster County. This is a quiet type of investment but has great significance as a tax base. The fourth major economic element is the State College. It is the second largest employer we have. In summary then, as we project our future growth, the main elements will be the electronics industry, agriculture, institutional growth particularly the college, and recreational development. With these basic factors as background, I would like to discuss some of the planning considerations which we used in developing the land use plan.

Two things helped to form our basic approach. The first is that the county has very, very poor soils. It is just one big rock pile with a few exceptions in the valley. This explains why we are such a fruitful area for a watershed but a terrible place to try to build houses. The second factor was that we have adopted a basic policy of trying to preserve the rural character of the area. This character makes the area an attractive place for people to come. The inner play of these two factors, that is the poor soil conditions and the open space objectives of the county led to the policy of encouraging clustering of population into existing urban areas where they can be provided with essential services, mainly water supply and sewage disposal. Since the groundwater resource is practically non-existent, we are dependent to a great extent on the New York City aqueducts. In view of this, we are especially concerned about per capita water limitation imposed by New York City and its impact on future industrial growth.

We also feel that recreation is a natural function of this region. There are some 133,000 acres of state owned land in the county. It is hard to believe that such a wilderness area exists with such proximity to the New York metropolitan area. In addition, there are thousands of acres of lands on hillsides which would be fine for summer homes if placed on large sections (5 – 10 acres). In order to encourage the recreational potential of the area a basic need is water for recreation. Our basic water resources have been preempted. Ashokan Reservoir with 8,300 acres of surface and 40 miles of shoreline could be a tremendous recreational resource not only for us but for the entire state. However, under existing policy such use is extremely limited. The reservoir can be used for fishing and you can use a flat bottom boat. However, it can't be used for general boating, for sailing, for picnicking or swimming. We think the time has come to consider the use of the Ashokan Reservoir for multiple purposes including recreation, flood control, and stream regulation. A more effective use of the existing water resource gets us into the whole question of riparian rights which is a quagmire. Nobody seems to know who owns the water or what their rights are. Water is used and removed with little consideration of overall impact. Regulation is in-

complete and the state must recognize its responsibility to regulate the water resource use for the maximum benefit of all.

Another point that should be raised is the effective land use control and management particularly in the more rural areas. This would be to insure the maintenance of water of high quality.

DISCUSSION

Mr. Robert D. Hennigan: *What is the present population of Ulster County?*

Mr. Hekler: 141,000.

Mr. Hennigan: *What percentage of the land area is state owned?*

Mr. Hekler: About 20% of the total land area is in government ownership. The Catskill Preserve has 133,000 acres of state owned land, 6,700 acres of state land in the Shawangunk Mountains, New York City reservoirs take about 10,000 acres, the Thruway takes quite a piece of local land. It adds up to roughly about 150,000 acres out of 731,000 acres. However, I think I should point out that some 40% of the county is included in the Catskill Park wilderness area and that hills and mountains cover 2/3 of the land area in the county.

Mr. Hennigan: *You mentioned pre-emption of water use. Is there any control or regulation of flows downstream from the New York City reservoirs?*

Mr. Hekler: There are no controls to my knowledge. Downstream from the reservoirs we have had situations where the stream has practically run dry and in other instances we have had problems with floods. During periods of low flow or low releases, other takings from the streams, particularly for agriculture, frequently takes all the water. I think that informally the city tries to maintain some type of reasonable stream flow below Ashokan but there is no formal arrangement. We have had floods downstream. The Federal Government is now spending about $3 million for flood projects to protect a shopping center downstream. Obviously, some type of reasonable regulation should be enacted which allows from some multiple use of the reservoir to provide reasonable low flows and to protect against possible floods.

In the upper Esopus above the Ashokan reservoir diversions from Schoharie result in a very positive conservation act since it insures a continuous flowing stream which is available for use as a recreational resource. However, one of the problems here is the whole question of riparian rights.

Mr. Hennigan: *When you refer to riparian rights are you mainly concerned with the consumptive use of water taken from streams, for example, for irrigation purposes?*

Mr. Hekler: Yes. Because of our grandfather's action at the turn of the century we now find that we do not have sufficient water below the impoundments, which means that we have to provide very high treatment for sewage. This situation should be remedied.

PRESENTATION

Mr. Harry F. Edinger, *Director, Environmental Sanitation, Ulster County Health Department:* Problems of hydrology and geology have been covered to some extent. Information and data from the Board of Water Supply is available and covers the situation in some detail. One thing that the Commission should keep in mind is the drought of the '60's demonstrated that the safe yield of the existing supplies was much lower than originally estimated, some 28% less. As a practical matter New York City has captured most of the available water supply in the county. Most of the local supplies depend on smaller watersheds in the Hudson Valley and in the other valleys. As you come down to the lower terrain good storage areas are limited particularly in areas that are likely to develop. Storage is a real problem.

We estimate that in the next 50 years the county will need an additional 50-60 MGD and this cannot be developed locally. Because of the fact of the population decrease communities manage to get by on their old water supplies until about 1950. During the drought of the '50's some 18 out of 38 public water supplies were on emergency sources at one time or another. We were in bad shape. We went to the Hudson in two places, at Highland and at Marlborough. During two summers, one for some 90 days and the other for 130 days we used Hudson River water, with chlorination only, from these two intakes. However, the drought did stimulate water supply construction and development and the county proceeded to develop additional supplies. Permanent taking points and treatment plants were constructed at Highland and at Port Ewen. These plants were built on austerity budgets. However, they are serving their purpose very well and will be in operation for a number of years. It was our feeling that our solution would be the Hudson River but the drought of the '60's and the acts of the legislature prohibiting impoundments has raised serious questions about this; because of the low flow in the Hudson and the lack of upstream storage mitigated against large capital investments for river supplies.

During the drought of the '60's we made out very well. Largely because of the construction during the '50's. We thought that we were going to be in a serious problem with Kingston, particularly due to the IBM demand. However, the rains came and alleviated the crisis. As a matter of fact we had two floods in August and October because of too much rain. The October floods established records for the area.

Everyone recognizes that Ulster County is tied to New York City as far as water supply development and taking is concerned. We are not so naive as to believe we can carry our own in the face of a larger metropolitan development. This was recognized by the legislature of Ulster County when they designated the planning board as a responsible agency to carry out the comprehensive water supply study. During the development of the comprehensive studies in Ulster County, there were similar studies in the other counties of the region. We made several attempts to try to get the studies dovetailed and interrelated particularly the Westchester and New York City study but were not able to do so. Consequently, the comprehensive report prepared for Ulster County is one that is not based on too much cooperation from other agencies. The implementation of our plan requires, of course, cooperation from the city. Since the two major city aqueducts are in the county we have readily available all the water we need. The amount needed is so relatively small that it is probably within the accuracy of the meter used to measure the flow in the conduits.

Use of the Hudson River with uncontrolled flows becomes less and less attractive to us and furthermore requires us to develop a water supply at elevation zero and then raise it to elevation 400+ feet for distribution. It is not cheap water.

Speaking of water quality, particularly the health considerations, we are moving into an era where

these will not be the prime consideration, the ecology-conservation interest will dictate policy more than the health considerations. Control of communicable diseases plateaued out in the mid fifties. The death rate is static at 6-10 per thousand. Nothing we have done since has changed this. We no longer have the outbreaks of disease as we used to have.

The question of streamflow is of paramount importance and was touched upon by Mr. Hekler. I would reiterate for emphasis the fact that water supply diversion from the upper reaches of our local streams and increasing consumptive use have created a really critical situation for us. It is my understanding that New York City bought and paid for the riparian rights downstream from the dams based on 100% taking. In addition, the City exercises control through the New York City watershed rules and regulations on the watersheds of the two reservoirs. These rules and regulations control the disposal of sewage and wastewater. The County Health Department has worked closely with New York City in the enforcement of these rules and regulations. This represents somewhat of a restriction on land use. However, no one has ever sued New York City on this basis nor has the City ever taken a watershed rule violation to court. Another problem we had was the problem of disposal of sewage from New Paltz since we have got to operate on the basis that there would be no flow in the Wallkill River. The whole question of riparian usage must be better defined.

People in this county really don't have the tax base to establish any water supplies and the major water supply issue is how to best use the New York City aqueducts and tunnels to meet the water supply needs of the area. The use of the city aqueducts creates certain problems. For example, the city is shutting down the aqueducts at 4:00 this afternoon for inspection purposes. It will be reopened at 8:00 p.m. tomorrow. This results in a 28 hour shutdown. In order to meet this problem at New Paltz we provide for four days of storage on the system. On the one previous shutdown we managed to go six days without any difficulty, but it is a problem that must be considered with the use of the aqueducts.

DISCUSSION

Chairman Conway: *In other words, you do use water from the New York City aqueducts at the present time?*

Mr. Edinger: Yes, the law provides for this.

Chairman Conway: *You couldn't tap it though for large scale industrial use, could you?*

Mr. Edinger: No, I think the law specifically excludes industry.

Chairman Conway: *Can you only tap the aqueducts for an emergency source?*

Mr. Edinger: No, you can tap the aqueducts for a permanent source of supply for the municipality, however, the taking is limited to the current per capita use formula. In New Paltz we had to extend the village boundaries in order to count the heads of students. There are two things that vitally concern us. One is the per capita limitation imposed by the city, the second is preservation of water quality in the aqueducts so we do not have to treat the water.

Chairman Conway: *You take from the section of the Hudson River that is rated "A". Is the water always of acceptable quality?*

Mr. Edinger: Yes, it has. Historically it has always been good. This has been demonstrated by the fact that we could use it by chlorination only as demonstrated in the '60's.

Chairman Conway: *What does it cost to develop a supply from the Hudson as compared from a gravity supply upstream?*

Mr. Edinger: The cost of water at the two small plants is $70-$80 per million gallons. The cost of raising it 450' is about the same. It makes New York City water, even at the new proposed rate, less expensive.

Chairman Conway: *What is the main source for rural people? If they can't get groundwater and there is no public water supply, what is the other alternative?*

Mr. Edinger: This is a real tough problem. Most wells are of limited yield and frequently produce a poor quality water. We have had developers put in small supplies and use them to sell property. Lately we have noticed many people coming in and buying these small supplies, for what purpose we are not sure.

Mr. Anthony M. Quartararo: *You are allowed to tap into the New York City aqueducts with a per capita limitation. If the municipality grows, say increasing the population, will the City allow you to increase your taking?*

Mr. Edinger: Total taking is limited to the population within the municipal boundaries based on the last census. As it increases there will be a corresponding increase of water that can be drawn. However, this doesn't answer the problem of urban sprawl around a community. The limitation does result in problems.

Mr. O'Brien: *Is there any chance of providing impoundments in Greene County to the north?*

Mr. Edinger: No, because Greene County drains away from Ulster County. The actual boundary between Ulster and Greene County is right along the top of the mountains.

Mr. William C. Schickler: *What is this per capita limitation?*

Mr. Larios, *Brinnier and Larios Consulting Engineers:* Under the water supply act of 1905, the city can limit takings to the per capita consumption as used by the people of the City of New York. This is arrived at by taking the total consumption in the city and dividing by the population. According to the 1960 census the per capita limitation is 154 gallons per person per day. This then is the amount of water that New York City will allow based upon the last official census.

Mr. Samuel Gofseyeff: I might add that the per capita consumption based on the 1970 figures is 178 gallons per capita per day.

Mr. Schickler: *In other words, if the town of Saugerties formed a water district and included the village they would have a tough problem trying to figure out how much water they can get due to the definition of municipality.*

Mr. Gofseyeff: You have to work by municipality not by a group of municipalities.

Mr. Hekler: The per capita consumption limitation, since it is an overall figure would include a certain amount of water for industrial and commercial use. Ordinarily the normal residential per capita usage would be 90-100 gallons per capita while the city limitation was 154 gpcd and is now 178 gpcd.

Mr. Schickler: *In other words a water district would just have to take the water assuming that the 178 gallons per capita would take care of their needs. They might then be short for industrial demands.*

Mr. Edinger: This is why we believe that the little treatment plants along the Hudson will continue to have some value.

Mr. Quartararo: *Is the act worded so that New York City has first preference and if there is a crisis local users would be shut off first?*

Mr. Edinger: As long as there is water available we can have it although we have never really reached this point.

Mr. David Mesches, *Chairman, Ulster County Planning Board:* They can't cut us off, we have a right to the water. Any county or municipality through which the aqueduct passes has a right to this water and the municipalities are named in the original act. However, they can impose restrictions providing they are also imposed on New York City. The point concerning industrial water use is that we could never build another major water use industry if we have to depend on the New York City water supply.

Mr. Merkens, *Director, Engineering Studies & Analysis: How is IBM presently supplied, by Cooper Lake?*

Mr. Cloonan, *Superintendent, Kingston Water Department:* IBM is supplied by the City of Kingston whose supply comes from Cooper Lake.

Mr. Conway excused himself to return to Albany and asked Mr. Quartararo to act as Chairman.

Mr. Larios, *Brinnier and Larios:* I don't intend to read the CPWS study in any detail, but will talk from a summary, copies of which are also available. Mr. Edinger and Mr. Hekler covered many points of the material but I have a few points I would like to make. We studied every possible source of water to serve the county need. We have estimated that we will need an additional 50-60 MGD in the next 50 years. As part of the study we made a detailed geological analysis looking for groundwater supplies. We found that there was insufficient groundwater to justify any development. Existing groundwater supplies are, in

fact, beginning to fail. We then looked at development of new surface supplies. We found first of all that the available sites were limited and second of all that this county did not have the fiscal resources to undertake any large scale surface water development. The next choice was the Hudson River. The Hudson River is treatable water. However, the costs escalate due to the cost of treatment and the cost of pumping to higher elevation. We then took a long look at the Catskill and Delaware aqueducts and came to the conclusion that they would be the most economical and best sources of water for long range development. We decided to divide the county into service areas which would be county water districts. We were not sure if the Board of Water Supply would accept these districts as municipalities under the water supply act. We conferred with Commissioner Maguire and got the impression that they would so qualify. The proposed service areas and sources are included in the appendix (Figures 3 and 4). When the plan is implemented we would use City of New York water for all areas except for Highland which would stay on the river, and Kingston which draws from Cooper Lake. We would use the other river treatment plants until they needed replacement and then phase them out.

What we are saying is that all of the water for Ulster County should come from the City of New York system, either the Delaware or Catskill aqueducts except for the Cooper Lake supply. The amount of water we are talking about is a drop in the bucket compared to the New York City supply. If we try to tell the people in Ulster County that we have got to spend large sums of money for a Hudson River treatment plant, when they can see Ashokan in their backyard, we don't have a very saleable project. We tried to coordinate our study with the other studies in the region but did not meet with much success. The per capita figure imposed by the City can be a restraint on industrial development and became an issue for the college at New Paltz. In fact, we had to get state assistance in order to furnish a water supply to the state college. One of our major recommendations is included in the summary report and reads as follows:

> The existing municipal, private and investor owned water systems must be purchased by the proposed Inter-Municipal Districts and a County Water District formed to administer all phases of operation within the Inter-Municipal Districts.
>
> It is recommended that the newly formed Southeast Basin Water Commission create a Water Authority which would purchase all existing City of New York water supplies. This action would do away with the Water Supply Act of 1905 which placed restrictions on takings from the City Aqueducts, will broaden the tax base and make water from the existing Catskill and proposed Adirondack Reservoirs a mutually acceptable source of supply for both Upstate counties and the City of New York.
>
> This Authority, which should not be tax exempt, would also have jurisdiction over all takings from the Hudson River and insure that any massive takings from this source, as proposed by the City of New York, are replenished by waters from proposed reservoirs on watersheds in the Adirondack Mountains.

We feel that if the people are going to have the water they need, some type of institution will be necessary which will operate the New York City system as a true regional water supply.

DISCUSSION

Mr. Schickler: *Apparently the only problem in this 1905 act is that it precludes obtaining water for industry from New York City. Is that right?*

Mr. Larios: Yes.

Mr. Hennigan: *What you are saying is that the City of New York's existing water supply system should be recognized as a regional system and not solely as a New York City system?*

Mr. Larios: That is correct.

Mr. Hennigan: *Who establishes the assessed evaluation and the subsequent tax on the facilities of the city? What do they amount to in terms of the overall tax revenue picture in the county?*

Mr. Larios: The realty taxes. Are you talking about water?

Mr. Hennigan: *No, I am talking about the regular advalorem taxes that are assessed against the facilities and property of the city of New York which are located in the county.*

Mr. Larios: Every local town assessor assesses the property and this varies from town to town. For example, the town of Hurley and the city went to court over the assessment. The court found that the town of Hurley had overassessed and should pay back some $18 million to the City. The reply of the town of Hurley was for the city to take over the whole government and provide all services since they did not have the money to pay back. This did not happen since an agreement was negotiated. The problem here was that the city property was assessed at 45% of the true value and the rest of the town at 22%. The purpose of that lawsuit was to compel the town assessor to assess all properties at the same rate.

Mr. Hennigan: *In other words the taxable value of these properties was set by the court.*

Mr. Larios: Yes, as far as the town of Hurley was concerned.

Mr. Hennigan: *Did the State Board of Equalization and Assessment get involved in this?*

Mr. Larios: It was very complex. They are involved but the whole situation finally went to court in the Hurley case.

Mr. Quartararo: *I am interested in the question of dependability of supply. Mr. Edinger mentioned this in talking about the New Paltz supply. How do you face up to this?*

Mr. Larios: We don't think that shutdowns would bother us very much. We will provide for it in system storage. In case of crisis we would have to go into some type of emergency arrangements.

Mr. Merkens: *Have any forecasts been made on industrial water needs? Would this problem be mitigated with the county districts?*

Mr. Hekler: With the use of the county districts the importance of the per capita restriction would become less and since we recommend that all the service areas be in a single county district, I don't think we would be in trouble except for a major water using industry.

Mr. Edinger: Heavy industry, you may want to remember, can always go to the river if necessary.

Mr. Larios: One thing that bothered us particularly when the City of New York came out recommending a large Hudson River taking was how this would affect our ability to take from the river. If we are going to allow New York City to preempt all available water resources they must take on the job of supplying us with water.

Mr. Schickler: *You figure you will use, in the year 2020, 46.5 MGD, and that only 2 MGD will be for industrial purposes.*

Mr. Hekler: This would be extra for the larger water using industries. The regular smaller industries would be served through the normal allotment.

Mr. Edinger: I would like to interject one thing. In any regional plan you are not going to be able to foresee everything. I think the day when industry can come into a community and say give me water is gone. Kingston has a yield from their watershed of 6-7 MGD. They are using about 3½. This is the only commodity the city has to sell. This reserve will be dissipated very quickly if there is not a backup plan to supply future development. Now every developer wants to settle around Kingston and get water from them.

Mr. Quartararo: *The per capita limitation is really the major point of controversy here, correct?*

Mr. Larios: I think that is correct. However, if we deal with a large enough population unit such as the county, sufficient water would be supplied under the per capita arrangement to provide for modern industrial usage.

Mr. Hekler: We only get in trouble when the city insists on dealing with the smaller municipal subdivisions of the county such as villages and towns. This would be similar to dealing with a neighborhood in New York. In order for the per capita limitation to be fair and to afford sufficient water we must deal in large enough blocks of population such as county or multi-county regions. The difficulty in supplying water to New Paltz is an example of the mindless application of a limitation.

Mr. Hennigan: *What definition is used for municipality? Is there a special definition in the water supply act?*

Mr. Larios: It is not defined by the act except to say municipality. In discussions I have had with Com-

missioner Maguire and some of his legal staff we contended that a county district was a municipality under the act and they said that this was probably correct.

Mr. Hennigan: *In your recommendations would all the proposed service areas be included in a single county district?*

Mr. Larios: That is correct. The whole thing would be a consolidated county district.

Mr. Hennigan: *I get the feeling that these relations and negotiations are carried out in a hostile conflict atmosphere.*

Mr. Edinger: No, we all live together.

Mr. Hennigan: *There is a whole set of interlocking relationships involved here including tax levied on the city's facilities, services provided by the city, riparian rights, and basic controlling statute. How big an employer is the city water system?*

Mr. Edinger: At Ashokan, about 115 people.

Mr. Hennigan: *Do you think it would be a fair statement to say that when the water supply act was passed in 1905 that nobody envisioned that the upland watersheds such as Ulster County would ever become populated and urbanized?*

Mr. Larios: I don't know but the city of New York held all the high cards at that time and nobody up here was willing to fight for a more equitable situation. Revision of the water supply act of 1905 is long overdue.

Mr. Hennigan: *Is there much of an issue here on the pricing question? Who decides what price the City of New York will charge for water?*

Mr. Gofseyeff: The City of New York sets the price in negotiation with the user. The present rate is 120 dollars per million gallons and the proposed increase is set at 147. Public hearings are now being held.

Mr. Quartararo: *I thought the Public Service Commission approved the rates.*

Mr. Gofseyeff: I have never seen them involved. They regulate only private companies. It is my understanding that some municipalities are not even paying the present rates. The whole situation will probably go to court.

Mr. Schickler: *What provisions of the water supply act of 1905 do you think have to be changed to meet the needs of the County of Ulster?*

Mr. Larios: We think that provisions should be made to insure continuity of service, to eliminate the per

capita restriction or make it more flexible, and to establish an equitable system for setting rates. In other words, provide for the administration of the system as a real regional water supply which recognizes the primary claims over the water resources of the people living in the source area.

Mr. Hekler: Not with the act but with the water quality in the aqueducts. I agree our economic study is based on using water from the aqueducts with chlorination only. We are concerned that every effort be taken to insure that water quality is maintained to make this possible.

> **Mr. Hennigan:** *Can you reconcile the more intensive use of Ashokan Reservoir for recreational purposes with maintenance of water quality in the aqueduct?*

Mr. Larios: We didn't give this much consideration in our study. However, I am sure that reasonable recreational use could be made without having much effect on water quality in the aqueducts.

> **Mr. Hekler:** *Could I ask the Commission what the policy is on other reservoirs as far as other uses are concerned? Is there variation from county to county?*

Mr. Hennigan: There are different policies in different parts of the country, as a matter of fact. All of the Finger Lakes are used for water supply and they are all intensively used for recreation. Some have complete treatment for water supply and some have chlorination only.

> **Mr. Mcrkens:** *Putting aside the public health considerations for a moment, is the operation of a reservoir such that you could have reasonable recreational use? I have the impression that the drawdowns are rather extreme which would mitigate against recreational usage?*

Mr. Hekler: This would be a variable and would have to be considered in the site selection for beaches for instance. Sometimes it might be necessary to restrict recreational use in favor of water supply needs. However, this would not ordinarily be the case; it would be a rare occurrence. In other words, under normal conditions recreational use could be well tolerated in most situations.

Mr. Larios: I would like to emphasize our recommendation and note that this is one more factor in favor of a state or regional agency operating the entire water system. Some of the fluctuations in Ashokan are done for purposes which involve only the City of New York. At times they draw from various sources of the system and we find it hard to understand the purpose of rationale. The operating agency should be one which has a sense of responsibility to everybody in the region and not just to the City of New York.

Mr. Hennigan: Let me review some of the points that have been raised. What you are saying is that there are no groundwater supplies that can be developed in Ulster County. The development of surface water supplies has been maximized and that further development would be too expensive as a local enterprise and furthermore there are limited sites for surface water impoundment. Because of this you have decided to recommend that you should depend on the city system and aqueducts for future water supply needs. This is estimated at 46+ MGD within the next fifty years. Some of the issues that have been raised include the per capita restraint the city puts on takings. the issue of pricing and how it is established, water

quality, continuity of service, the question of riparian rights particularly below impoundments, and multiple use operation of the reservoirs.

Going to the Hudson River was evaluated and was rejected for two reasons. One is the fact that a sea level supply with treatment from the Hudson will cost twice as much as gravity upland supply. In addition, massive takings from the Hudson to supply New York City raises questions as to the suitability of this source for other users. A related issue is the question of the taxes levied on the city facilities within the county since this represents a financial resource.

Mr. Edinger: *Some time ago some State Commission made a proposal to change the riparian rights downstream. Was anything ever done on that?*

Mr. Hennigan: Some proposals were advanced mainly based on the idea that excess water, that water over and above average flow, was not subject to riparian claims and could be drawn off and used for another purpose. This never got any place; the opposition was tremendous. We have very little law concerning control of water. The state has authority over allocation of water resources between municipal subdivisions but plays a judicial role. However, they do control all takings from the groundwater on Long Island. This leaves only case law which is pretty sketchy in this state.

Mr. Edinger: *Would it be within the province of this Commission to restudy or reopen this issue?*

Mr. Hennigan: Perhaps insofar as it would have some relation to our mission. A study has been done on this by Professor Farnam of Cornell Law School. He cites all the current cases and has come up with suggested revisions. I think it would be appropriate for us to review his study and see if it has particular applicability to our mission.

Mr. Schickler: *Isn't it necessary to go through a state agency for a water taking?*

Mr. Hennigan: This is true only on Long Island. The remainder of the state is only subject to state control of takings for municipal purposes. Private or industrial takings are under no control at all.

Mr. Cloonan: The City of Kingston evaluated the availability of the Hudson River some 10 years ago. However, we found that the costs were prohibitive.

Mr. Hennigan: *How did the city weather the drought of the '60's?*

Mr. Cloonan: We got through the drought of '64 because we were completely metered.

Mr. Hennigan: *What happened to the consumption when you metered your system?*

Mr. Cloonan: In 1957 the consumption averaged 6 MGD and this included a campaign of three months of extreme conservation of water. One year following metering consumption dropped to 3.56 MGD. Part of this reduction was due to less water use by IBM of about 500,000 gallons per day.

Mr. Merkens: *Do you feel that most of this reduction was due to reduction by consumers or improved leak detection or improved management?*

Mr. Cloonan: In 1957 we did a complete leak detection survey of the system and leakage was very small. I would say that most of the reduction was done by conservation by individuals.

Mr. Hennigan: *Who owns the meters?*

Mr. Cloonan: The large ones are bought by the consumers and the small domestic meters are bought by the department.

Mr. Hennigan: *You install and maintain meters for an annual charge?*

Mr. Cloonan: Yes.

Mr. Hennigan: *How high did your chlorides get in your Hudson sources during the drought?*

Mr. Edinger: It got up in the high teens. It was higher in one part of the river than another. We never got to the point where they really became an issue. We did have a problem though with dropping water levels in the river. We were required to lower intakes in order to always make sure that we have water over the intakes.

CONCLUSION

Mr. Quartararo thanked all the local people for their help and cooperation and adjourned the meeting at 12:10.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
Herman Forster
James C. Harding, represented by J.R. Dineen
Gerald R. O'Brien, Jr.
Anthony M. Quartararo
William J. Schickler

Staff

Robert D. Hennigan, *Executive Director*
Richard F. Estes, Jr., *Director, Management Studies & Analysis*
Paul W. Merkens, *Director, Engineering Studies & Analysis*
Nelda M. Martin, *Secretary*

ULSTER COUNTY

County

David Mesches, *Chairman, Planning Board, Ulster County*
Herbert Hekler, *Director, Planning Board, Ulster County*
Dr. William C. Taylor, *Commissioner, Health Department, Ulster County*
Harry F. Edinger, *Director, Environmental Sanitation, Health Department, Ulster County*

City

Edmund T. Cloonan, *P.E., Superintendent of Kingston Water Department*

New York City

Robert J. Niedzielski, *New York City Department of Water Resources*

Lyle L. Proper, *New York City Department of Water Resources*
Samuel Gofseyeff, *Board of Water Supply, New York City*

Other

Augustus S. Brinnier, *P.E. Consulting Engineer, Brinnier & Larios*
Christus J. Larios, *P.E. Consulting Engineer, Brinnier & Larios*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

ULSTER COUNTY MEETING

Date: May 26, 1971

Time: 9:30-12:30 – Conference and discussion
1:30- 4:00 – Facilities inspection

Place: Legislative Chamber, Ulster County Office Building
244 Fair Street, Kingston, New York, 12401

Tentative Program

9:30 **OPENING REMARKS**

Mr. E. Virgil Conway, Chairman
Mr. H. Clark Bell, Vice Chairman
Mr. Peter J. Savago, Chairman, County Legislature
Mr. Robert D. Hennigan, Executive Director

9:45 **LAND USE – ECONOMIC – DEMOGRAPHIC FACTORS**
(Present and Future)

Mr. Herbert Hekler, Director
Ulster County Planning Board

10:15 **WATER SUPPLY DEVELOPMENT AND USE FACTORS**

(a) Local Resource Conditions
(b) County Plan for Water Development

Mr. Harry Edinger, Director
Environmental Sanitation
Ulster County Health Department

William C. Taylor, M.D., Commissioner
Health Department

Mr. Christus J. Larios, Consulting Engineer

10:45 **BREAK**

11:00 **INSTITUTIONAL ARRANGEMENTS**

(Management and Financing)

(a) Operating Water Agencies
(b) Long Range Plan
(c) Constraints to Implementation

Mr. Harry Edinger, Director
Environmental Sanitation
Ulster County Health Department

Mr. Christus J. Larios, Consulting Engineer

Mr. Edmund T. Cloonan, Superintendent of Water, Kingston

11:30-12:30 **ISSUES, PROBLEMS AND NEEDS**

(a) Possible Topics for Discussion

Informal discussion between Commission and Ulster County people

12:30- 1:30 **LUNCHEON**

1:30- 3:30 **VISIT TO WATER FACILITIES**

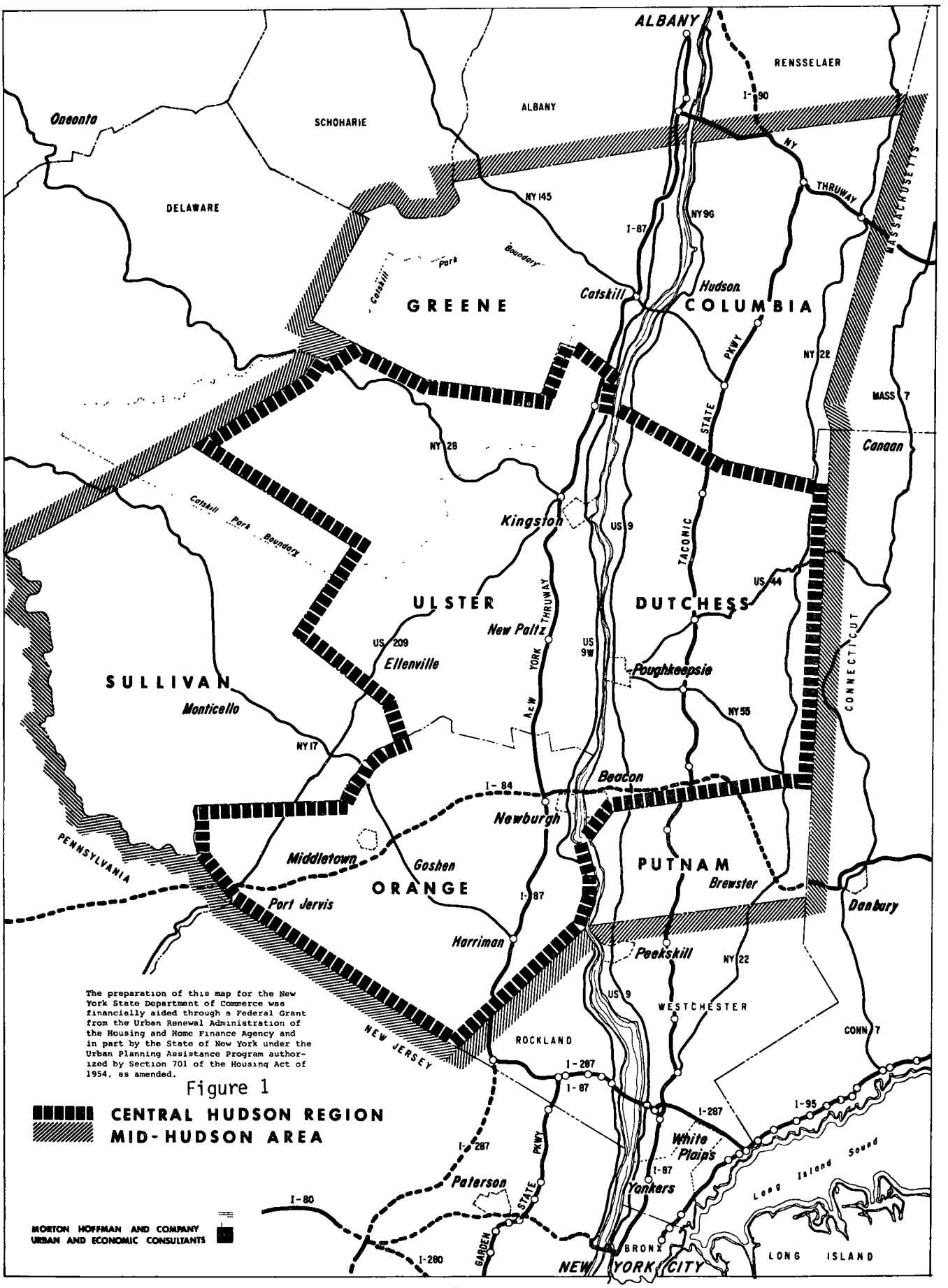
1. Hudson River Plant (Port Ewen)
2. Cooper Lake Supply (Kingston)

APPENDIX C

FIGURES

Figure 1 . . . . . Central Hudson Region Map
Figure 2 . . . . . Land Use Plan 1985
Figure 3 . . . . . .Hudson River and NYC Reservoir Supplies
Figure 4 . . . . . Map Proposed Service Areas

CENTRAL HUDSON REGION

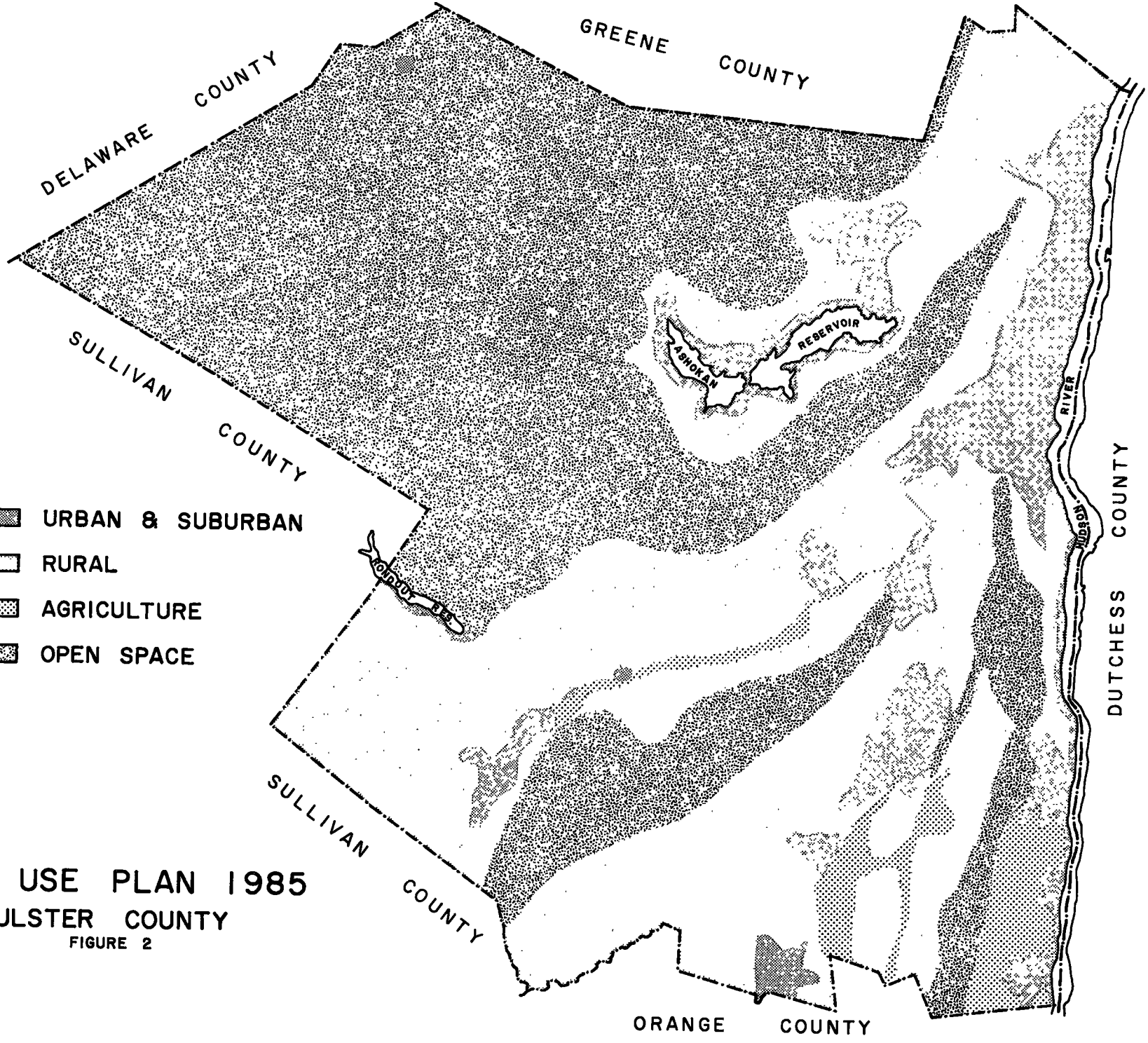


The preparation of this map for the New York State Department of Commerce was financially aided through a Federal Grant from the Urban Renewal Administration of the Housing and Home Finance Agency and in part by the State of New York under the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954, as amended.

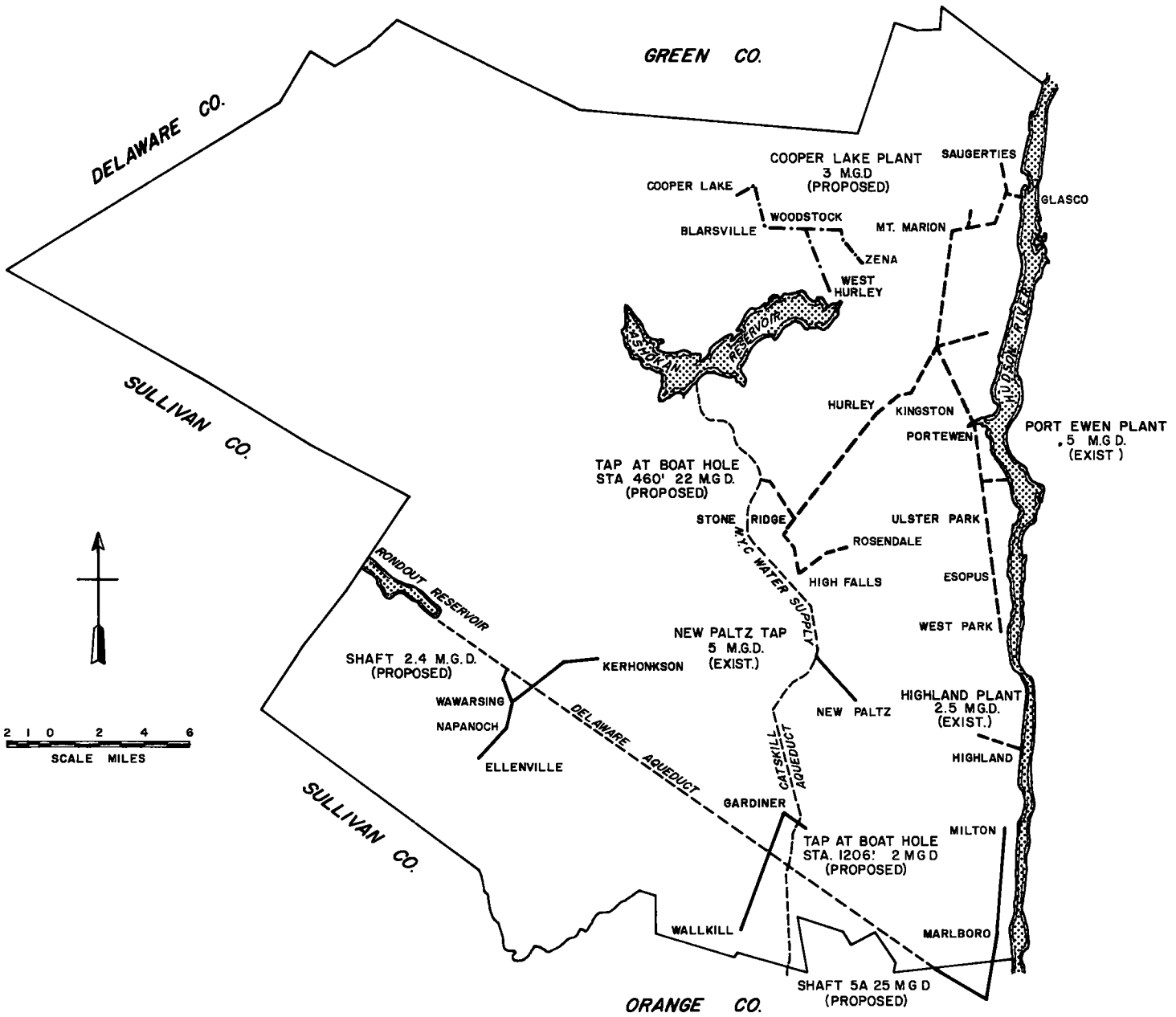
Figure 1

CENTRAL HUDSON REGION
MID-HUDSON AREA

MORTON HOFFMAN AND COMPANY
URBAN AND ECONOMIC CONSULTANTS



LAND USE PLAN 1985
ULSTER COUNTY
FIGURE 2



—— NEW YORK CITY AQUEDUCT

—·—·— COOPER LAKE SUPPLY

– – – – HUDSON RIVER SUPPLY

HUDSON RIVER AND N.Y.C. RESERVOIR SUPPLIES

FIGURE 3

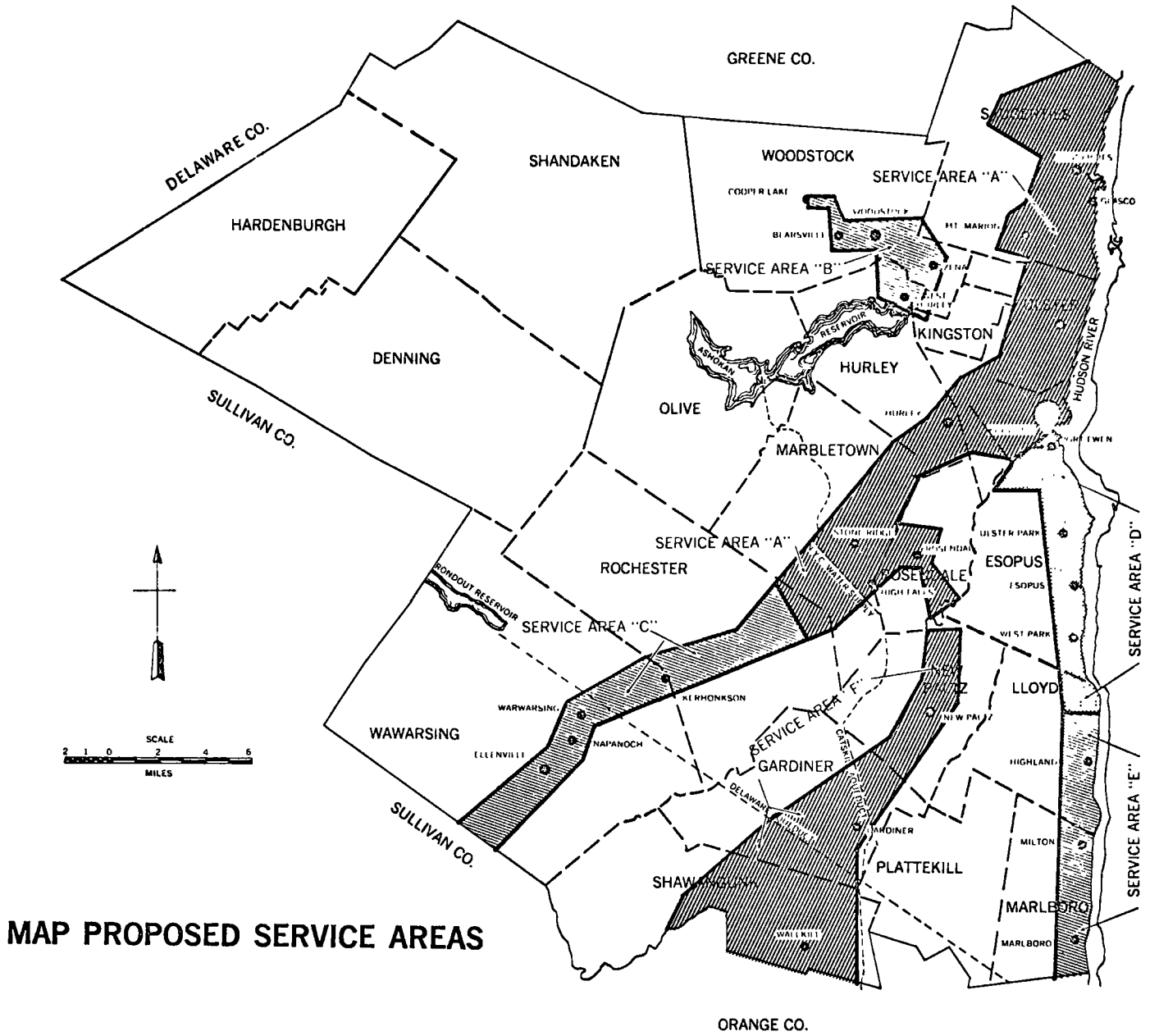


Figure 4

Area A City of Kingston, Towns of Saugerties,Ulster, Kingston, Hurley, Marbletown, and Rosendale.

Area B Town of Woodstock and hamlet of West Hurley.

Area C Towns of Wawarsing and Rochseter.

Area D Town of Esopus.

Area E Towns of Marlborough and Lloyd.

Area F Towns of Gardiner, New Paltz, Shawangunk, and Plattekill.

WESTCHESTER COUNTY

June 25, 1971

White Plains, New York

WESTCHESTER COUNTY CONFERENCE

OPENING REMARKS

Mr. E. Virgil Conway, *Chairman, Southeast Water Supply Commission:* opened the meeting at 9:55 a.m. "We are delighted to be in Westchester County since this is one of the main elements in the Commission study and service area. This is the fourth of a series of meetings that the Commission is holding in the various counties within its jurisdiction. Previous meetings were held with Suffolk County, New York City, and Ulster County. These meetings came about because the Commission felt that it was very important to visit each of these areas and to have an opportunity to discuss with the local people the problems and situations relative to water supply. The meetings have served both as an education for the Commission and also to acquaint us with the local situation and enter into a give-and-take on an informal basis. This is not a closed meeting, but at the same time it was not a public meeting. If any members of the press are present they are welcome to stay. I would like to thank Commissioner Harding, Bill Borghart, and Jerry Dineen for their help in setting up the meeting." The Chairman then called on Mr. Edwin G. Michalien, County Executive, for some informal remarks.

Mr. Edward G. Michaelian, *County Executive, Westchester County:* Thank you very much Mr.Conway, members and staff of the Commission, and others who are here to participate in this meeting. I am delighted to welcome you to Westchester County and hope that your stay here will be valuable. It looks like today will be another record for heat. This emphasizes more than ever the necessity for an adequate water supply of potable water and its utilization. I wanted to make reference to some of the problems faced by our county, problems that are probably common to practically every other county in Southeastern New York. The major problem has been the increasing population, urbanization, and increased per capita water use. Demand for more water has grown tremendously due to the increasing population but also due to increasing water use brought about by affluence and the increasing number of water using appliances. I remember the drought of the middle '50's when the question of adequate water supply was first raised in a serious manner and this was followed by the drought of the mid '60's. In January 1966 the entire storage in the city of New York watersheds went down to about 27% of the capacity and this induced a great fear of catastrophe. Fortunately, the drought broke or we would have been in very bad straights indeed.

In 1965 Mayor Wagner and I importuned the state through the Governor to allocate approximately $1½ million dollars for water supply studies; first for New York and Westchester County and then for all the counties in this Southeastern area. These studies were undertaken and the results are in, in practically all instances. I am sure your Commission is aware of this work.

However, we have not seen any real movement towards the solution of water supply for the metropolitan region. One proposal raised objections on the part of conservationists, particularly to the construction of impoundments in the Adirondack Park. Since then we have been going along without any development of a new large water source to insure against future droughts. Today is a case in point. With the

heat wave of the past ten days the city of White Plains, which has an adequate water system, is experiencing serious pressure drops throughout the city. The need for additional water is one of the paramount problems that worries us who have responsibility for seeing that we have an adequate supply of water for the future. This is of particular concern to elected officials and even more so with the careerists; people like Jim Harding who has been at this for a number of years, George Natt, our former water agency director, and Bill Borghard who will be our new Commissioner of Environmental Facilities. We are greatly concerned about the lack of movement with respect to the additional source of water needed.

Another pressing problem which is part of the responsibility of this Commission is the proposed increase in rates that the City of New York has promulgated, which increases rates about 60-70%. We are trying to reach some sort of agreement with the City of New York and the matter is now in litigation. One hearing was held on May 11 and has been adjourned for four months. In the interim we are gathering data and statistics. *These are two current problems: the need for additional water and the need for some type of regional system administration.* If we could get a resolution of these issues we would be very happy. May I again thank the Commission for the opportunity of saying a few words to you. I hope that your presence here today will be very fruitful and that the deliberations would bring the desired results. Once again, welcome to Westchester.

Mr. Robert D. Hennigan, *Executive Director, Southeast Water Supply Commission:* I would like to reiterate the remarks of appreciation the Chairman made to Jim Harding, Bill Borghard and Jerry Dineen for their aid and assistance in setting up this meeting. This is the fourth meeting we have had with local officials in the Commission study area. We plan to meet with all in the next several months. The results of these meetings to date have been excellent. They have been fruitful in terms of information provided and the education of the Commission people and staff, and most importantly from the point of view of establishing a strong interface between the Commission and local water management officials. We approached this assignment on the basis that the place to get the real story and to find out the facts was from the local people who are involved in water supply programs. It is a truism that the man who knows the most about the job is the one who is doing it.

Chairman Conway then asked Commissioner Harding to present the local speakers.

Mr. Harding introduced Mr. Peter Exchweiler, Commissioner of Westchester Co., Department of Planning.

PRESENTATION

Mr. Peter Eschweiler, *Commissioner of Planning:* Ladies and Gentlemen, I welcome the opportunity to present to you some background information on Westchester County. I would like to cover the questions of: Where we are today? Why have we grown that way? What are the future growth prospects and where will this growth most likely occur within the county? I will use several charts that I have which I think will present this information in an easily understandable form. After the presentation I would be glad to answer questions.

Westchester is one of New York's smaller counties in area but one of the larger counties in total population. The area of the county is about 450 square miles, ranking us about 54th in size. The 1970 population is 894,000, ranking us 4th in population. As you can see from the map (Figure 1, Appended) the county has somewhat of an hourglass shape. The most narrow portion separating the county into two

unequal subportions, the largest in the north and the smallest in the south. The narrow section of the county, or the middle of the hourglass, is roughly defined by a line from the Tappanzee Bridge at North Tarrytown on the west to the Westchester County Airport located south of Armonk on the east. 80% of the county population is south of that line and 20% is to the north. The land area in the county is approximately the reverse; 70% of the area is north of the line and 30% is south. Population growth has been slow in the past decade, about 1% a year since 1960. The greatest density as you would expect occurs in the southern part of the county, the most densely populated community is the city of Mount Vernon with 17,000 people per square mile. The least densely populated community is the town of Pound Ridge in the north with about 163 people per square mile.

There are 44 separate communities (Figure 2, Appended) for planning purposes in Westchester County. Each of these communities has a planning board, a zoning board, a zoning ordinance, a master plan, and its own municipal objectives. These objectives are frequently parochial and do not extend beyond the boundaries of municipalities. There is competition among the communities for different types of development and land use, since non-residential development is the best producer of taxes. Consequently, communities entered into competition with a rather disastrous effect on coordinating planning. The county planning department has as its mission the responsibility to knit these 44 communities together and induce in them a county-wide interest. Figure 2 shows the various municipalities in Westchester County. The cities have about half the population with the remainder split evenly between the villages and towns. In addition, there are 43 school districts in Westchester, none of which have boundaries conterminous with municipalities.

Development of Westchester has been influenced primarily by three factors: terrain, water and accessibility. The terrain of the county is shown on this contour map (not included in minutes) and is colored so that the lower elevations are colored in the cooler blue and green colors and the higher elevations in the yellows and browns, the colors getting warmer and darker as the land rises. I bring to your attention the valley structure of Westchester County. Southern Westchester is a series of parallel valleys like a piece of corduroy oriented in a north-south direction. These valleys have channel development up along the lines of least resistance to the valley floors. Transportation facilities have followed these lines of least resistance and the communities are grouped along these transportation corridors (Figure 1). Urban development of Westchester County radiates finger-like from New York City along the north-south corridors of Westchester County. You will notice that there are very few east-west corridors. This creates a problem of east-west movement and is a constraint on changing the pattern of development. It is even more difficult in northern Westchester where north-south travel is somewhat limited and east-west travel is extremely limited.

Development is also influenced by the slope of the land and on this map (not included) we have colored in those areas where the steepness of the slope will inhibit the area, the darker the area, the steeper the slope and the less chance for development. Again, the land unsuitable for development is much greater in the north than in the south. The next map (Figure 3, Appended) shows the surface drainage system in the county. Water and sewer facilities are generally available in the lower part of the county but not in the northern sector. Existing zoning patterns show the influence of terrain, water, and accessibility. On this chart (not included) the yellow colors show the residential areas deepening with the denser population, the red-brown areas show commercial land, the blue areas are public land. Again, you can easily pick out the finger pattern radiating from the city and the various communities and development corridors preserved over the years. The open areas include public land, golf courses and water

supply land for the city of New York, all of which are lands not subject to intensive development. Because of our planning activities we are able to define where opportunities for new growth will most likely occur. By plotting these ares which are likely to receive utility service, we come up with a development pattern for the next two to three decades which we will call an urban format. This map (Figure 1) is really a summary of the existing developmental situation in the county and a projection of what, in our judgment, the future will hold. This is the land use plan. It has been certified as meeting HUD requirements for area-wide comprehensive planning for water and sewage services.

That is a brief run-through of county development. Perhaps there are some questions.

DISCUSSION

Mr. Hennigan: *How are you approaching land use control in the Croton watershed, particularly as it relates to probable impact on water quality?*

Mr. Eschweiler: It is under local municipal control at this time. The county does not have any direct control over land use other than as an advisor. Let me turn back to the Croton Basin map for just a minute. Communities in the Croton Basin (Figure 3 and Figure 1) that have planning responsibilities include the towns of Yorktown, Sommers, North Salem, Lewisborough, and portions of the towns of Bedford, Pound Ridge, New Castle, and Cortlandt. That part of the town of Yorktown north of the reservoir is substantially urbanized. About 15 years ago a conscious policy was adopted to try to develop a balanced community by stimulating higher density growth. This was in the area where public water and sewer facilities would be available. In other towns the denser areas of population will be where the transportation facilities exist. So that for planning purposes we anticipate the western part of the Croton Basin will urbanize. The remainder will be low density and probably not a problem.

Mr. Harding then introduced the next speaker, Mr. William G. Borghard, P.E., Deputy Commissioner of the Department of Public Works.

PRESENTATION

Mr. William G. Borghard, *P.E., Commissioner of Environmental Facilities:* The Croton River (Figure 3) is the largest surface water supply in the County with about half of its total drainage area of 375 square miles within the county. Other important streams used for water supply include the Byram River for the Village of Mount Kisco, Peekskill Hollow Brook for the City of Peekskill, the Mamaroneck River for the Village of Mamaroneck and the Town of Harrison, and Grassy Sprain and the Saw Mill River for the City of Yonkers.

Geologic conditions in the County eliminate groundwater as a major source of potable water. The underlying rock strata are dense impervious formations close to the surface, with limited voids and seams for percolation and storage of groundwater. Although used to some extent for individual homes and small public water systems, groundwater supplies, in most of the County, are generally not the principal supply for large purveyors. Most wells have low yields and troublesome quality. (Primarily caused by hardness, iron, manganese and low Ph.). The potential for developing future wells of over 1 MGD in the County is not favorable, and this type of development has not been considered in long-range plans for additional supplies.

As can be seen in this chart (Figure 4) of total consumption, well production, local surface water supplies, and New York City sources – well water contributes on an average less than 4% of the water produced in the County.

Local surface water sources are decreasing as a factor from over 40% in 1950 to about 25% in 1970. The increasing importance of New York City sources is indicated by the diverging lines on the charts. Since 1963, *over 70% of water consumed in the County came from New York City sources.*

Continued dependence on New York City or regional sources is represented in projected total draft (Figure 5) for County use for the next fifty years. Total consumption is estimated to increase from 150 to 290 MGD with local sources providing only 20% of the demand in 1975 and only about 5% in the year 2020.

This future decrease in local sources is based on probable retirement of older production wells and treatment facilities, increased costs of treatment as local watershed lands become more populated and as production costs for local water become excessive compared to New York City or regional sources.

As this drop in local water production accelerates, the supplemental source becomes more of a regional problem than strictly a New York City upland supply as in the past.

The County, with a multiplicity of local governments including six cities, 18 townships, and 22 villages, has similar characteristics in its institutional arrangements for purveying water.

Over fifty separate water districts (Figures 6-9) operate and maintain sources of supply and distribution systems ranging in size from 20 accounts to the largest supplier: the City of Yonkers with approximately 32,000 accounts and serving an estimated population of 225,000.

Several small housing developments in the northern sector of the County have privately owned water systems. However, the two largest privately owned systems, the New Rochelle Water Company and Port Chester Water Company, service heavily populated areas in the southern portion of the County (Figure 6). New Rochelle with approximately 28,000 accounts serves an estimated population of 163,000 and receives about 6 billion gallons from New York City and 1 billion from a surface supply at Pocantico Lake. Port Chester Water Company (with a source of supply from the Greenwich Water Company in Connecticut of about 2½ billion gallons a year) has 9,800 accounts to serve an estimated 50,000 persons in Rye, Port Chester, and the Town of Rye.

Consumption by the 18 smaller privately-owned water companies amounted to about 5 MGD in 1969 (Figure 7).

The four major municipalities dependent exclusively on New York City sources are the City of Mount Vernon, the Town of Greenburgh, and the Villages of Scarsdale and North Tarrytown, as indicated on this chart (Figure 8). The other five municipalities (Cortlandt Water District No. 1, Elmsford, Hawthorne, Valhalla and the Stanwood Water District) have smaller consumption that combined amounts to about 1.2 MGD average.

The City of Peekskill with local source, the Peekskill Hollow Creek, Village of Croton-on-Hudson with well water sources, and Village of Mt. Kisco relying on wells and Byram Lake, are the three major systems without regular New York City sources (except for emergency use in the case of Peekskill) (Figure 8).

Thirteen municipalities, as shown, have both local sources and New York City sources, most of them being very heavily dependent on New York City water.

The County has set up two County Water Districts (Figure 9). Water District Number 1, recently put into service a 48 inch transmission main acquired from the City of New York as an *auxiliary* source of

supply for the Cities of Yonkers, White Plains, Mount Vernon, and the Village of Scarsdale in cooperation with those municipalities.

The District has concluded a rehabilitation of the transmission main at the cost of 2½ million dollars – including master chlorination facilities recently constructed at Kensico Dam. The rehabilitation included, cleaning and cement – lining twelve miles of 48" cast iron pipe originally installed in 1880 by New York City as its first aqueduct from the original Kensico Dam and Reservoir.

County Water District Number 2, has recently taken bids in excess of 2.4 million dollars for construction of the Amawalk treatment plant. This treatment plant, with 8 MGD initial capacity and designed for expansion to 14 MGD – will treat water from Amawalk Reservoir to supply several existing Water Districts in the Town of Yorktown, and, in the future, other areas in the Towns of Somers, Bedford, North Salem and Lewisboro. The need for filtration underscores the difficulty of controlling watershed areas as building progresses up-county.

The comprehensive water supply study for Northern Westchester County by its consulting engineers, Metcalf and Eddy, recommended the formation of County Water District Number 2 with future expansion into other areas (Figure 10, Appendix C) and transmission lines to bring water eastward from the Amawalk filtration plant.

I am sure this Commission will find the same relationship in other Counties of your study area such as – Ulster, Orange and Putnam. Large portions of their drainage areas contribute to the New York City water supply system – and, by the same token, many counties are dependent (and will be even more so in the future) on New York City reservoirs and aqueducts to provide water for future expansion.

The basic right of upstate communities to take water from the New York City system is set forth in the Water Supply Act of the Administrative Code of the City of New York – enacted in 1905. Under this statute, the communities listed (they include all Counties in which the City collects, stores, or transports water) have the right to take City water, in gallons per day, not to exceed the per capita consumption in the City, times the population of the community taking water. The basis for establishing rates to be charged by the City, were also set forth.

In essence, the City is empowered to set the costs of water at a fair and reasonable charge agreeable to the parties. In event of non-agreement, the City Charter stipulated that either party could petition the State Water Resources Commission to fix such fair and reasonable charge after hearing both parties.

We are now involved in just such a rate case hearing being conducted by the State Department of Environmental Conservation. The City has requested that Department to adjudicate the basis for rate setting by the City in supplying water to upstate communities. The City has requested increases in rates from 70 dollars per million gallons for Croton water to 124 dollars (80% increase); and from 105 dollars per million gallons to 148 dollars for Delaware-Catskill system water (40% increase). Numerous communities have objected to the proposed rate increase.

The per capita restrictions of the 1905 City Charter complicates the use of New York City water even further, and in connection with the City definition of "Municipality or Water District" encumbers this County in flexibility in dealing with the City for greater supply.

A small municipality in need of a New York City source of supply, must go to the nearest aqueduct or shaft and possibly traverse another municipality with its supply line. Without several municipalities cooperating and cross connecting their systems, the one unit then is entirely dependent on one tap and one aqueduct. In many cases, this adds to the cost and dependability of the water supply. Some communities, for instance, rely exclusively on the new Croton Aqueduct so that shutdowns for repair or inspec-

tion create hardships. This dependability could, and probably will, become even more serious in the future as these aqueducts age and repairs require shutdown and interrupt flow.

With proper cross connections between local municipal water systems, this problem could be alleviated by having auxiliary sources from Croton Reservoir, Delaware Aqueduct or local sources to supplement a system that has as its primary source a tap on the Croton Aqueduct.

This problem of dependability of supply can only be corrected by large water districts with inter-municipal cooperation. Under the present statute, such operations are difficult and sometimes impractical.

County Water District No. 1, is an example of inter-municipal cooperation which has provided additional supply but under restrictive terms and conditions by the City of New York. The participation by four large users of water in this area (Yonkers, White Plains, Scarsdale and Mount Vernon) made possible the creation of this Water District that now provides an auxiliary supply (from Kensico Reservoir) for the four participants.

The recently implemented County Water District No. 2, is another example of inter-municipal cooperation to create a new source of water. In this case, the new supply from Amawalk Reservoir will be the prime supply; supplemented by smaller sources in several of the participating water districts.

We look to this Commission to study the problems created by the statute enacted in 1905 by the City of New York, with a view toward a broader application of per capita and being less rigid in general requirements. Per capita consumption, as defined in the City Charter, should be studied very carefully by this Commission. Under present application, upstate communities are deprived of their rights to a systematic and orderly development of their lands that allows for hospitals, schools, and industries.

Westchester (and I am sure this Commission will find Ulster, Orange, Putnam and other counties in similar circumstances in your study area) must have an adequate water supply for *all* their needs: whether it is a housing development, a corporate headquarters, a public utility or other large users of domestic water that may be desirable or necessary for the economy and well-being of the County.

By providing adequate utilities, (including, and most important, water and sewage systems) good transportation and environment, we would expect to be considered for corporate headquarters or other desirable development by industry.

Our experience during the mid-sixties of a prolonged drought resulted in severe restrictions on water use. It showed that we now have a shortage, and a similar drought would be more damaging because of population increase and higher per capita need.

Basically the situation in Westchester County is:

1. Westchester depends largely on New York City for its major share of water.

2. The County does not have the potential to develop sources from wells or surface supplies. The County's major surface supply is being used by New York.

3. The present management of water resources is restrictive and cumbersome.

4. We have a shortage of supply.

WE *RECOMMEND* TO THE COMMISSION CONSIDERATION OF:

1. Immediate development of additional water supply for the area.

2. *Provision for regional management of water resources.*

3. *Application of the New York City per capita formula "on a County-wide or Regional basis".*

DISCUSSION

Mr. William C. Schickler: *What are the rules and regulations governing obtaining water from New York City? You mentioned something about a per capita basis. Could you give us a little more detail on that?*

Mr. Borghard: There are two major requirements: (1) the amount of water furnished shall not exceed the per capita allowance as established by per capita usage in the city of New York; and (2) the City will only deal with municipalities, and they define municipality as cities, towns, or villages, excluding the county, county districts, or private users. The per capita figure that governs is determined by taking the total amount of water used by the city of New York on an average day and dividing it by the population. In other words, we are talking about the average per capita usage in a community of over seven million people with a variety of water uses and demands spread out over a large area. I think it must be recognized that in specific neighborhoods in the city of New York such as residential, commercial, or industrial, there would be wide fluctuations in the per capita consumption, some lower than the average and some higher. Taking this New York City broad base per capita figure and applying it to small neighborhoods in Westchester County, which in most instances is what the municipalities are, results in an impossible situation. Mr. Biros from Tarrytown will speak on this later. We had a number of small communities in Westchester that have large water use facilities such as hospitals, hotels, industry, or power stations. The actual population served by these facilities is much larger than the resident population in the municipalities which is under the per capita constraint of the city.

An example of the policy to deal only with municipalities, as defined by the city, as illustrated by my experience with the New Rochelle Water Company. The city would not do business with the water company, only with the communities served by the company, the main one being the City of New Rochelle. In order to get around this each of the communities served designated the city of New Rochelle as their agent and the City of New Rochelle in turn designated the water company. Operationally, this means that if any new plans are developed for new connections all that must be handled through the City of New Rochelle thence to the City of New York. This is very cumbersome and inefficient. At one time the city imposed the requirement that there be an airgap between any system connected to the New York City system; in other words a physical break was required between the two systems. This resulted in the construction of an air break facility in the Town of Eastchester. A large storage facility under the pump station was built which allowed water to flow from the city aqueduct and then in turn be pumped from the storage facility into the receiving system. This insured that no water would go from the receiving system back into the aqueduct. The funny part of it was that the water in the connecting system was also city water and what we were doing was preventing the mixing of Catskill water with Delaware water which is done as a matter of course all over the system. It was a very expensive thing to build and made no sense at all.

Mr. Anthony B. Gioffre: *What is the future prognosis on water supply?*

Mr. Borghard: We have already had some droughts so we know that there is a shortage. Our water demands are rising and a repeat of the '60's drought will result in a worse condition than pertained at that time. The population has increased, the per capita use has gone up, and we are 70-75% dependent on the New York City system. If we have another drought our few surface supplies will dry up, well capacity will drop, and we will become more dependent on the New York City supply. We are tied completely to the New York City supply.

> **Mr. H. Clark Bell:** *You indicated in 1970 about 70% of your county-wide demand comes from New York City. What does that represent in million gallons per day?*

Mr. Borghard: Roughly 70 MGD. We are now using about 100 MGD in the county.

> **Mr. Bell:** *In the year 2020 according to your planning, the county of Westchester would depend on upstate waters for 95% of their supply. What would that represent in MGD?*

Mr. Borghard: We are talking about 290 MGD for the year 2020.

> **Mr. Bell:** *In other words, you are looking for an increase in supply of 160 MGD fifty years from now. You talked about regional management. Could you expand on that?*

Mr. Borghard: Well it would probably be somewhat analogous to the present way the state regulates well supplies on Long Island. They control all water takings for any purpose. However, in our situation we have the development of a water source that extends many miles upstate through many counties serving a large number of people and the state regulatory control is minimum. It is controlled by one unit of government. The City of New York approaches it from a very narrow and parochial point of view based on the assumption that it is their water and all other users must occupy a secondary position. This may have had validity at some time but no longer does.

> **Mr. Bell:** *You indicated that some of the villages are serviced by water that comes from Connecticut. Do they own land in those watershed areas?*

Mr. Borghard: The Greenwich Water Company that serves them does.

> **Mr. Bell:** *When you are talking about a regional concept would your concept or idea go as far as a Federal compact, since we have to share watershed areas like the Delaware?*

Mr. Borghard: No, I don't think I was thinking that far. Of course, there is a regional study, the NEWS study, that is now underway and will come up with some suggestions for regional institutional arrangements, but I don't know how quickly this will come about. Thinking more in terms of New York State probably a new regional arrangement would be desirable but we are probably a long way from that.

> **Mr. Bell:** *Just one further question. Do you have any specific recommendations for revision of the per capita formula?*

Mr. Borghard: We would like to see the elimination of it. I think the most reasonable approach would be to take either a county-wide or regional-wide area for computing the per capita figure outside the City of New York. This would at least have the virtue of being comparable somewhat with the way the city arrives at that figure, and it would eliminate the problem of a small community with limited population and large water consumers such as a power plant.

Mr. Bell: *Would you include the factor for example of state university facilities, industries, or other unique situations?*

Mr. Borghard: Yes, there should be some allowance for that.

Mr. James C. Harding: Mr. John Biros is going to speak later and is a real expert on that issue.

Chairman Conway: *You are really saying that you couldn't have much more industrial or commercial development in the northern part of Westchester under the present per capita formula.*

Mr. Borghard: That is right for any development that would require large amounts of water. No small community could bring in any large water consuming industry without running into difficulty.

Mr. Harding: It is even worse than that. If you do what the city wants you to do you couldn't build a hospital or school in any of these communities.

Chairman Conway: *You said you needed additional supplies. Isn't it really reallocation of the supplies that are coming from upstate New York?*

Mr. Borghard: We need additional supplies. It has been indicated by studies that we also need better management of the existing supplies.

Chairman Conway: *Additional supplies wouldn't be solely for Westchester. Isn't that correct?*

Mr. Borghard: That is what I visualize. I don't think you can say 'Let's take care of Westchester'. We have to be concerned about the entire region.

Mr. Gerald O'Brien: *What percentage of the users are metered in the county?*

Mr. Borghard: All of the systems in this county are metered.

Mr. Herman Forster: *Why does the Croton supply require filtration?*

Mr. Borghard: The watershed is becoming more urbanized. This has adversely affected water quality particularly the question of color and eutrophication related to algae and weed growth which impart taste and odor to the water. This is a common experience and is accelerating in the Croton watershed.

Mr. Forster: *Isn't this the same situation that you face in other sytems?*

Mr. Borghard: This will happen to any of the lakes where the watershed is becoming urbanized.

Mr. Hennigan: *How is county district No. 1, which took over and rehabilitated the old New York City 48" line to provide a supplemental supply to a number of municipalities, financed?*

Mr. Borghard: The communities served have provided the monies to defray the cost to the water district.

Mr. Hennigan: *In other words they use enough water from the system to finance the system?*

Mr. Borghard: There are basic charges with municipalities that are committed to defraying the cost of the districts regardless of the amount of water you use.

Mr. George Natt, *Retired, formerly Director of Water Agency, Westchester County:* Each community agreed to a certain percentage of cost when the district was formed. Most of the money was advanced prior to the completion of the project. There probably will be some county bonds issued before the project is complete and I would note that there is about a 50% federal grant involved.

Mr. Hennigan: *Is there any difference in your dealings with the city, whether you take the water from existing reservoirs or from a conduit?*

Mr. Borghard: No, the situation is basically the same.

Mr. Harding: I am going to call on George Natt later and he will go into some of these questions in some detail.

Mr. Hennigan: *In most of the other meetings we have had, the issue of small privately owned water companies has been raised. It was discussed in Suffolk, Ulster, and as a matter of fact, in the New York City meeting. I would be interested in any ideas or thoughts you have relative to this particular element in the situation. In Suffolk and in Ulster County there was strong feeling that some public agency should assume ownership and operation of these supplies.*

Mr. Borghard: We have two large companies and a number of smaller supplies. As far as I know there is no problem with the management or operation. I am not sure about the really small companies.

Mr. Calvin E. Weber: I think Bob is talking about small subdivision systems. We have quite a number of them in the northeast part of the county, some serving only 10 or 20 homes. We do have operating problems and the operation and management is very poor, frequently non-existent.

PRESENTATION

Mr. James C. Harding, *Commissioner:* I have been working with water supply in Westchester County for

almost fifty years. This involved a close connection with the New York City supply and I have some pretty strong convictions. However, I will try to soft pedal as much as possible. First I would like to describe the steps which led to the appointment of the Commission.

The origin goes back to 1965 when Ed Maguire, Chairman of the Board of Water Supply for New York City, met with county executive Michalien and myself and discussed the water supply situation. We considered the possibility of getting state funds to make a report on the possibility of obtaining new sources of supply for New York City and Westchester County, and in fact, for the whole region. An application was submitted to the state to do this in September of 1965. It was approved and in May of that year the contract was handed to three engineering firms to do the study. They were Metcalf & Eddy, Hazen & Sawyer, and Malcolm Pirnie Engineers. The report was completed and submitted in August of 1967. It recommended that a major new source of water be developed from the Hudson River in the amount of 500 million to 1 billion gallons per day. It further recommended the construction of upstream impoundments to insure that this volume of water was readily available and of acceptable quality. In June of 1968 the report was submitted to Governor Rockefeller, Mayor Lindsay, and County Executive Michalien and signed by the State Commissioner of Health, Dr. Hollis Ingraham, by Commissioner Maguire, and by myself. The report summarized the problem, discussed various remedies and recommended that a committee or commission be formed to consider the following matters:

(1) the availability of reservoir locations in the Adirondacks,

(2) the willingness of the state to construct and operate such reservoirs as required under the state constitution,

(3) the municipal purposes which may be served by such reservoirs,

(4) a method of financing the project, both capital and operating costs,

(5) the establishment of a time schedule to insure that water needs are met.

In other words, outline the action needed to insure that 2/3 of the state's population has sufficient water for the next 50 years. As I see it, New York and Westchester County are faced with a serious and immediate water supply problem. We are talking about the future, we are also talking about the present, right now. This is particularly significant when you consider the fact that a large scale project will take 10-20 years to develop. It is going to take a long time to develop additional sources of supply. We don't want to go through another crisis like we did in the '60's. Westchester cannot develop a supply of its own from within the county or the area immediately adjacent thereto. Bill Borghard touched on that subject so I don't need to go into that further. All of the water supplies in the county with any consequence have already been developed. There isn't anything else. In addition to additional water, the management question is paramount. You have heard of the talk and discussion on the per capita formula and the troubles it causes. Other speakers will develop the subject more fully. Another point that needs to be emphasized is the action of the City of New York in not recognizing the county or county-wide districts as municipalities. If they did and we could treat the county as a whole, we could have no trouble meeting the per capita restriction. John Biros will address us later on that.

Some 2-3 years ago the Army Corps of Engineers retained the firms of Metcalf & Eddy and Hazen &

Sawyer and prepared another report which is known as the NEWS report. As far as I know this report has not been submitted in final form. The original recommendations of the consulting engineers and Army engineers was that a large supply be developed on the Hudson River. The first study, funded by the state with the help of Bob Hennigan, recommended that upstream reservoirs be built, the first choice being a site near Indian Lake known as Gooley, and the second choice being a number of smaller reservoirs. The NEWS Report recommended that the first choice would be the development of an expanded reservoir at Hinckley. Hinckley is located just north of Utica and is used for flow regulation on the barge canal. Part of the expanded reservoir would be in the Adirondack Park. However, the dam and most of the impoundment would be outside the Park. I have personally inspected this site and it is not an area of particular beauty. It is covered by second growth and the development is limited to trailer camps and some shoddy houses. The Corps of Engineers first choice was Hinckley; their second choice a development on the Hoosic River north of Albany; their third choice was Gooley. The Corps of Engineers is now investigating the feasibility of obtaining a less reliable way of obtaining water by flood skimming the Hudson. In essence this means using the Hudson as a source of supply for only a portion of the year holding other parts of the supply system in reserve. I am not too familiar with the details but they will be available before this Commission goes out of business.

I would like to call on some of the other people in the water business who are here today. The next speaker will be James Neary who is Water Works Superintendent in the City of Yonkers. He is also Chairman of the Westchester Water Works Conference which includes all the water superintendents in the county.

Mr. James Neary, *City of Yonkers:* The City of Yonkers has spent approximately $2.3 million of its own funds, together with a grant of $1.3 million from the Department of Housing and Urban Development to construct a new rapid sand filtration plant and pumping station along the Saw Mill River Parkway in Yonkers to treat both Saw Mill River water and also the Grassy Sprain Reservoir supply, and a one (1) million gallon per day (MGD) well source. Presently, we are filtering 6 MGD from Saw Mill River and 4 MGD from the Grassy Sprain Reservoir. This plant has a normal capacity of 10 MGD and a maximum of 15 MGD.

Since 1904 the City of Yonkers has been using the Saw Mill River water as a source of water supply through the use of a slow sand filtration plant, but at periods of high turbidities following rainfall runoff, it was necessary to close the intakes and suspend operations from this plant until the water cleared sufficiently again to resume operations. This plant operation also took a great deal of manpower since it required about ten men to clean each slow sand bed per week.

The City of Yonkers also used Grassy Sprain Reservoir as a source of water supply since 1876 and simply chlorinated this supply at the gatehouse at the reservoir and pumped this water into its water distribution system. The Grassy Sprain Reservoir watershed is densely populated and this pointed out the need for filtering this source of supply instead of merely chlorinating it, and this is presently being done at our new filter plant.

In 1956 a well was drilled at the tube well pumping plant site in an attempt to augment our sources of water with an underground supply. In 1966 the City of Yonkers spent $52,512.00 to hire a firm of consulting geologists and a test well drilling program was started in an attempt to augment its sources of water supply by attempting to develop underground sources of supply. None of these proved successful since the City of Yonkers is not noted for any great underlying quantities of water in its subsurface

strata. It also spent $70,000 to hire a firm of engineers to make a pitometer survey of the entire water distribution system, to determine underground leakage, pump efficiencies and accuracy of the water meters of the large consumers to determine unaccounted for water and the inside conditions of various water mains throughout the City.

I point out the above program, together with the expenses involved to the City of Yonkers, to highlight the fact that the City of Yonkers, through its own funds, has attempted to develop a water supply source to augment that which it must buy from the City of New York. These supplies, at best, will only yield approximately 50 per cent of that necessary for the City of Yonkers. The remaining 50 per cent must be made up from purchases from the New York City system; since there are no sources of water supply that the City of Yonkers can look to the future. The City of Yonkers uses an average of 28 MGD.

In the drought of the mid 1960's, the local supplies available to the City of Yonkers were also affected by the lack of rainfall. We believe that the problem of adequate sources of water supply for the City of Yonkers exists now and that there can be no hesitation to explore all possible means for future water supply sources.

Mr. Harding then introduced Mr. Victor Cordy, Assistant Village Manager, Village of Scarsdale.

Mr. Victor Cordy, *Village of Scarsdale:* The discussion so far has been mainly about little communities with some large water users which are sometimes placed in jeopardy because of the per capita limitations imposed by the city. Scarsdale has some water problems. Scarsdale is rather affluent and strictly residential. We have no industrial or other large consumers of water. The population is approximately 19,200 and we have 5,000 water customers. We do not have our own source and are dependent on outside sources completely. The primary supply to the village is the New Rochelle Water Company, who in turn obtain their water from New York City. Frequently, when New Rochelle cannot supply us we take water directly from New York City. The village was particularly hit with the drought of 1965. Prior to 1965 the village was averaging about one billion gallons per year consumption. In 1965 it was reduced to 894 million gallons and in 1966 further reduced to 707 million gallons. During the peak of the drought from July to August of 1965 we reduced the consumption by 54%. This was done by strict enforcement of the restrictions which were imposed by the city of New York. It was well policed and thus the reason for the high percentage reduction. The Village had the possibility of wells investigated by Malcolm Pirnie Engineers and it was determined that it was not feasible, so this was not explored any further.

In Scarsdale most of the homes are beautifully landscaped. Many of them have automated lawn sprinkling systems. This investment was based on the assumption that they would be supplied with an adequate amount of water. In 1965 water use restrictions limited sprinkling to six hours a week between the hours of 1 and 3 in the morning. Furthermore, many of the homes are air-conditioned and as you would expect, there are a large number of swimming pools. During the drought many of the residents had wells drilled at an investment of between five and ten thousand dollars. There was a considerable loss of lawn, shrubbery, and trees due to the sprinkling restriction. Our position is that we have the physical capability and the financial ability to give the people in Scarsdale an adequate supply of water. We are willing to pay a fair price. We are being pushed by the per capita limitation and would like to see something done to take this restriction away. You have to do something and do it now. The suggestion of a regional water system should receive serious consideration. When the individual municipalities come down to negotiate with New York City, they don't have much of a chance. Scarsdale was the first community that was required to provide an airgap between our system and the city system. This was expensive and

was completely unnecessary. The gap was really between two portions of the regional water system.

Mr. Cordy was followed by Mr. John A. Biros, Superintendent of Public Works, Village of North Tarrytown.

Mr. John Biros, *Village of North Tarrytown:* The Village of North Tarrytown, a community of approximately 9,000 people, is located on the Hudson River, 25 miles north of New York City and is bounded on the south by the Village of Tarrytown, the west by the Hudson River, the north by the unincorporated area of the Town of Mount Pleasant and on the east by large estate holdings. Within these confines, the Village of North Tarrytown has the industrial complex of the General Motors Assembly Division with a working population of 5,000 people, 64% of whom come from northern Manhattan and the Bronx; the Phelps Memorial Hospital, serving an area in excess of 32 square miles, a central high school with a population in excess of (1200) pupils serving Tarrytown, North Tarrytown, Archville and Pocantico Hills.

The Village of North Tarrytown is and has been experiencing two types of drought; an artificial one caused by a unilateral interpretation of legislation and the other, a natural drought due to demand exceeding the available supply. I would like to discuss the artificial drought first.

Communities in Westchester are governed in their taking of water from the New York City aqueducts, by the New York City Administrative Code, specifically Section K51-42 and for purposes of this discussion paragraph "e" which states:

> The daily quantity of water which may be taken and received by any municipal corporation or water district under the provisions of this section, shall not exceed the quantity calculated by multiplying the number of its inhabitants as shown by the last preceding census of the United States or the last state or official municipal census by the daily per capita consumption in the city of New York. (Formerly Section K41-420 amended by L1939, ch. 357; renumbered by L1963, ch. 100 Section 1389.)

This paragraph is simple and we feel expresses the sentiments of our early state legislators. It shows their appreciation for the Westchester County's generosity in sharing its water resource with its neighbor – New York City.

But now, in an interpretation offered by the Department of Water Resources, paragraph "e" permits New York City to compute their per capita on an estimated population, on a monthly basis and based on an unmetered supply while each municipality (not the County of Westchester, which is in fact a municipal corporation) must use actual population figures and further, no municipal corporation or water district may serve water out of its district boundaries.

What is the practical effect of this interpretation? I would like to cite two examples for your consideration. The Ruppert Brewing Company had decided that for their own purposes, a move from New York City was imperative, and chose a site in Carmel, N.Y. The above mentioned interpretation was brought to bear and the Ruppert Brewing Company was without water. At this point, the State Legislature saw fit to add paragraph "f" to the administrative code for this special case. Upon application again refused, Ruppert Brewing Company left New York State.

The second example I offer, still awaits solution. The Union Carbide Corporation sought to develop several hundred acres of land purchased in the Towns of Greenburgh and Mount Pleasant within sight of

Tarrytown's Water Supply reservoir. Again, the aforementioned interpretation precludes service to the Union Carbide Complex by the Village of Tarrytown, and for that matter by the Town of Greenburgh or by the Town of Mount Pleasant.

With the above situations and our own problem of being accused of exceeding our per capita quota and being billed at the rate of $700/mg for water whose last agreed to rate was $70/mg – the Village of North Tarrytown, in order to make a clarification of paragraph "e" of the Administrative Code, introduced, thru its representatives in the legislature Senator Gordon and Assemblyman Ceroskey, (Senate intro No. 1722 and Assembly intro No. 3057) which in effect would have added paragraph "g". (Copy appended). It is our understanding that Senator Marchi would not permit this legislation out of his committee on New York City affairs and so it died.

The drought of the sixties, we are, of course, joined by the County of Westchester and the City of New York. The facts, figures and details are well set forth in a study entitled Comprehensive Public Water Supply Study for the City of New York and the County of Westchester (CPWS-27) dated August, 1967 by the eminent professionals of Metcalf & Eddy – Hazen & Sawyer and Malcolm Pirnie Engineers and paid for by the New York State Department of Health.

To the six recommendations as outlined in the summary of the above mentioned study, we subscribe whole heartedly since their implementation would solve the water supply problems of the Village of North Tarrytown, the County of Westchester, and the City of New York. I would like to suggest that a state authority type of structure might be the most appropriate for the ownership, financing and management of this recommended project. Also, that the proposed Hinckley Reservoir redevelopment be the first step in the development of the Hudson River-Hyde Park project. Hinckley reservoir, being so close to the border line of the "forever wild" boundary, would meet with the least amount of resistance. On January 22, 1970, I appeared before the Temporary State Commission on the future of the Adirondacks in a meeting held in New York City. (A copy of the presentation is appended). The purpose of my appearance was to suggest to the preponderance of those appearing, conservationists, that we, the practical engineers and they, could cohabit within the provisions of the constitution and I noted that Article XIV of the State Constitution, though it champions the "forever wild" concept, also provides that not more than 3% of the Adirondack preserve be used for water supply purposes and further, that the implementation of the CPWS-27 report recommendations would not reach this limit.

By letter, dated March 5, 1970, (also appended) Arthur Crocker, President of the Association for the Protection of the Adirondacks, I was informed that the 3% figure quoted in the Constitution, applied to only 10% of the lands of the Preserve and, therefore, the proposed development was a substantial amount. Mr. Crocker, however, does admit to the fact that his figure of 10% has not been verified, but it has not been challenged, it must be proper.

This, then, appears to be the old numbers game and I would like to suggest that the "common good" must take precedence over any special interest groups. It seems incongruous that a state such as New York, rich in water resources almost entirely within its own boundaries, should be faced with a perennial lack of water to a majority of its populace.

Again, gentlemen, I want to thank you for this opportunity to speak, and as past Chairman of the Westchester Water Works Conference, I am especially pleased that Governor Rockefeller, at the request of the Conference, saw fit to appoint Jim Harding to this Commission. I do not believe that you can find a man more cognizant of the water supply problems of Westchester than Jim.

Mr. George Straub, *Westchester Joint Water Works:* I represent the Westchester County water system which covers the largest area of any district in the county. However, due to its lower population, it ranks third in its production of water. The Westchester Joint Water Works was organized under a special act of the legislature in 1927, which was known as the Joint Water Works Law. It was supposed to be a model law, but the financial requirements were such that only one other joint water works was formed in the State of New York under this statute and that is the Sandy Creek-Lacona district, comprising two small villages on the border of Oswego and Jefferson Counties. Our present organizational set up is obsolete and we should be reorganized either as an authority or as a county water district. We were formed to serve the town of Harrison, which is about 2/3 of our district and an unincorporated section of the town of Mamaroneck, the Village of Mamaroneck, fringe areas around the city of Rye and New Rochelle. Our service area completely surrounds the Village of Larchmont. However, it is not part of our district at the present time. We are now actively considering their inclusion. They do not have specialized facilities which our organization can furnish.

This is a suburban area of fine homes with little commerce or industry, which account for about only 5% of the demand. Among these, the largest customers are six country clubs, several plastic extrusion plants, a research laboratory and some large suburban type office complexes. The largest residential demand is represented by Manhattanville College, the new purchase branch of the State University, and some apartment houses, very few of which have been constructed in recent years because of zoning restrictions.

The waters of the Mamaroneck River, a small stream that rises in White Plains and flows southerly into Long Island Sound, have been impounded at the northern entrance to Mamaroneck Village since the 1880's and used for water supply to this area. A new rapid sand filter plant was built at this site in 1927 with a nominal capacity of 5 MGD. The engineers had optimistically made plans to double this capacity, but it was soon found that the reliable flow in the stream in the summertime was so low that even 5 MGD could not be realized. Consequently, a siphon was immediately constructed to carry water from Kensico Reservoir into the upper reaches of the river. This wasteful system continued until 1938 when a new pumping station, pipe line, and underground storage tanks were constructed on the shore of Rye Lake, the eastern arm of the Reservoir, to replace the siphon. This added another 8 MGD.

Historically, there had also been a slow sand filter plant on a small stream in Pelham, but this is part of the story of water supply to Mount Vernon which was a part of the system until 1925. This plant was abandoned due to the construction of the Hutchinson River Parkway. The remainder of the site is a County Park.

The section of Harrison in the west was supplied independently by two wells on the boundary of White Plains. One of these is virtually unusable. They produce very hard water which has been insufficient for their needs since the 1930's, at which time an additional main was laid to the Rye Lake system of the Westchester Joint Water Works. They now have an additional pumping station on Rye Lake which supplies most of their needs from New York City sources.

For several years prior to 1959, it was necessary for the Water Works to institute severe restrictions on usage in the summertime. At times the Mamaroneck source was shut down completely for lack of water and there was total dependence on the New York City source of only 8 MGD.

In 1959, a cross county pipe line was completed from shaft 22 of the Delaware Aqueduct in northeastern Yonkers with a capacity of 16 MGD. This gives us total resources of 29 MGD to meet system peaks of 15 MGD in the summertime. Since the capabilities of the Mamaroneck system are often 0 at

that time, we essentially depend totally on New York City with a capability of 24 MGD from the other two stations.

Nevertheless, we have been called upon to help our neighbors. Yonkers has a connection to our cross county pipe line, the New Rochelle Water Company has two connections, and we are prepared and contractually obligated to meet the entire demand of the Village of Larchmont if they cannot use their primary source. The latter is a filter plant on the Sheldrake River. The raw water source there is very poor and abandonment has been contemplated for many years.

Due to deterioration of the raw water quality and, even more, its inadequacy, it was planned to abandon the Mamaroneck River in 1959. Luckily, however, this was not done immediately. We used the plant to its maximum throughout the six years of drought in the 1960's in order to save water for New York City, although we were compelled to institute restrictions on use by our agreement with the City.

Our whole history has been one of inadequate supply since the 1920's. Our available resources have been used to the utmost. Even since 1959, when we thought we had provided for supply beyond the year 2000, we were hit by the inadequacy of our primary source, New York City.

Some interesting statistics indicate that we have risen in demand in the last ten years from a per capita of 108 in 1961 to 145 gpd per person in 1970. This was held to a lower figure by restrictions in the drought years, but it appears from the figures since that emergency that we will probably never again fall below 140 gpd. Our people demand water for their modern dishwashers, washing machine, swimming pools, air-conditioning, and most particularly, lawn and garden sprinklers. We would like to remain in a position to meet these demands.

Commissioner Harding then called on George Natt to tell about the experience that the county had trying to develop a desirable supply of water for Grasslands, a county institutional development. Mr. Natt was formerly with the NYS Water and Power Control Commission and was Director of the County Water Agency for a number of years. Grasslands is a county building complex, containing a hospital, jail, old folks home, and certain other county institutions. Mr. Natt's responsibility was to investigate additional water for Grasslands.

Mr. George Natt, *Grasslands:* The county plan is to eventually expand the Grasslands complex. In anticipation of this we tried to implement a plan to get more water from the New York City system to serve the expanded areas. All the water now used at Grasslands comes from the Catskill Aqueduct. Early this spring the city had a program which necessitated draining the Catskill Aqueduct for several extended periods of time, the longest of which was 45 days. During the shutdown when the aqueduct was dry a new intake could be put into the tunnel to serve Grasslands at a considerably lower cost than if the new intake was to be installed when the aqueduct was running full. We plan to put in a 12" connection and replace an existing 8" pipe. I wrote to New York City to obtain permission to do this. Included in the application was the plan design to carry out the program. At the present time Grasslands has been using on a normal day about 400,000 gallons of water. The so called resident population (people to be considered in applying the per capita formula) consists of people who work and sleep there, not patients in the hospitals, not people in the jail, not nurses and staff. However, we do include the people in the old folks home. As I recollect we have about 1,000 residents at Grasslands with an actual population to be served of 5,000. New York City came back with a very quick response stating that based on their interpretation of the population of Grasslands we are only entitled to use about 100,000 per day as compared to actual usage of 400,000 gallons. We were emphatically advised that the county must immediately start

to cut back water use at Grasslands to comply with the per capita restrictions based on the resident population. Furthermore, we were advised that since we were exceeding the per capita allowance no permission would be given to make this new connection for expanded operations at Grasslands. Consequently, we lost the opportunity to put this connection in at least cost while the aqueduct was dry.

In order to comply with the New York City advisory the county would have to shut down some of the operations at the complex which would be impossible. On the contrary the county has plans to expand the Grasslands operation.

When Grasslands expands according to the new plan the county will have to go into the new aqueduct. This will be done at a much higher expense than could be done just a few weeks ago. In the communication that we received from the city they reiterated their position that Westchester County was not a municipal corporation under the law, and therefore the county as, even for Grasslands, is not entitled to any water from the city. However, they continued, the city inadvertedly made this agreement with the county to service Grasslands many years ago, and they would abide by that agreement and continue the water service with the understanding that it was to be continued under the city's interpretation of the law.

Commissioner Harding then summed up what Westchester County water works people were interested in:

1. To increase the source of water supply big enough to provide for New York City, Westchester, and such other municipalities in the region. We don't particularly care where you get it but we need it quick and we need a large supply.
2. We would like some agencies set up to administer the system. We are willing to pay our share of the cost of development. However, we would like representation in the administrative structure. Our dealings with New York City, and I have been dealing with them for many years, have been very unsatisfactory. Most of the difficulty has been due to the per capita limitation but also includes other matter such as rates, connection into the aqueducts, etc. The former department of water supply gas and electricity was very unreasonable, although we do get along well with the Board of Water Supply. We would hope that the Commission in its deliberations can come up with something that will ease the situation. Even if a supply of 1 billion gallons of water per day is developed, if we have to work under the present administrative set up, it won't function.

At one time in order to get around the per capita limitation problem, we proposed the idea of forming the whole county into a county water district for the purpose of purchasing water from the city using the entire county population to determine water to be furnished. The Deputy County Attorney, Jim Russell, is present and I would like to ask Jim if he would say a few words on what happened to this proposal.

Mr. Eugene E. Russell, *Deputy County Attorney:* I really can't add much to what Jim and others have said here. The city of New York refuses to recognize Westchester County as a municipality. Personally, I don't think that we can function trying to do business as all these small water districts and municipalities unless we can figure out some way to put them together and compel New York to deal with us as a single entity and the water supply problem will simply worsen.

DISCUSSION

Mr. Anthony B. Gioffre: It looks like the people who are dependent on New York City supply are in trouble.

Mr. Harding: Don't think you are safe from water supply problems where you live, Senator.

Mr. Gioffre: I understood we had an adequate water supply from the company that serves the entire portion of the city of Port Chester and 90% of the city of Rye and 90% of the town of Rye.

Mr. Harding: There is a question about this in the report made by Hazen and Sawyer about two years ago which studies that there was not sufficient water in the Port Chester-Rye area and requested that a connection be provided from the New York City supply at Rye Lake to serve Port Chester and Rye.

> **Mr. John J. Santucci:** *It seems like we have a dichotomy. We talk about regional water supplies or regional approach and when we come into Westchester County you have a large number of agencies in the water supply business. If you are honestly interested in a regional approach, why not start with your own county?*

Mr. Russell: I think it must come to that. However, at the moment we have these separate systems and the attempt to form the county water district was a move in the regional direction.

Mr. Harding: Individual water systems can still function as the basis for water distribution. We feel that water should be purchased by the county from New York City. In other words, the county would buy the water in the first instance, sell it to the local systems and pay New York City. However, New York City won't recognize us as a municipality. Let me cite an example. In County Water District No. 2 we are proposing to build a 3 million gallon filter plant partially located on New York City property. New York City said fine, but we can't sell you any water because you are not a municipality. This county district has a large portion of the Town of Yorktown. The way we have worked it out is that the city will sell the water to the Town of Yorktown. The Town of Yorktown in turn will sell the water to the county. The county in its turn will sell the water back to the people in Yorktown within the district. This is the only way that New York City will allow us to pursue the venture. This has got to go down as the ultimate in silliness, and brings disrepute on all local government.

> **Mr. Santucci:** *I think that this is something that could be worked out by reasonable men.*

Mr. Harding: Well that is one of the problems that we have with New York City. In County District No. 1 the city won't bill us as a water district. Yonkers, Mount Vernon, Scarsdale, and White Plains all of which are in this district, are billed separately by the city.

> **Mr. Gioffre:** *What is their reason for refusing to deal with Westchester County?*

Mr. Russell: I think it is because of the per capita limitation. It does not bother us in the high population municipal subdivisions but in the smaller areas where you have large water consumers it is impossible.

Mr. Santucci: *Jim, can you explain how you can get more water by being a county district rather than by all these separate systems?*

Mr. Harding: Yes, on the whole the per capita use in Westchester County is within the New York City limitations. In other words, the per capita consumption of Westchester County on the whole is less than that of New York City. However, we have individual communities, for instance, the town where the Indian Point Atomic Energy Plant is located. This plant requires a lot of water which is furnished from a small district. It greatly exceeds the per capita limitation. A good share of the current generated here is to serve the City of New York. But the City refuses to recognize us. At North Tarrytown when this same issue came up a number of years ago concerning the General Motors plant we said that we needed more water, the answer from the city department at that time was close it down.

Mr. Gioffre: *What percentage of the workers employed there live in the city?*

Mr. Harding: Between 60 and 70%.

Chairman Conway: Jim brought up an important issue and the power plant is a good example. The city needs more power; it doesn't want plants within the city limits. At the same time it refuses to recognize needs of plants located outside the city limits. It doesn't make much sense.

Mr. Santucci: In many areas all we are doing is supplying water for lawn sprinkling and that is not fair. It is an imposition on a supply system in days of shortage. For instance, the gentlemen from Scarsdale said that the people there need water for swimming pools, air-conditioning, and lawn sprinkling. I don't consider that a very high priority use.

Mr. Cordy: Scarsdale has many large estates worth $150-200,000. Their per capita income is around $40,000. These people spend a lot of money on their homes and subsequently use a lot of water. A lot of them have their own wells and do not use village water.

Mr. Santucci: *Do you have any restrictions on water?*

Mr. Cordy: Not at this time.

Mr. Merkens: *Could I collectively ask all those people who spoke: what were the restrictions imposed during the droughts in the '60's?*

Mr. Harding: Restrictions were exactly the same as those imposed in New York City.

Mrs. Baker: Mr. Chairman, may I remind everyone present that within the city of New York there are expensive residential areas with beautiful homes such as Riverdale. These users are not metered and I would imagine would use large amounts of water.

Mr. Santucci: *That raises another issue. Since New York City doesn't have meters, doesn't that*

benefit you on this per capita limitation?

Mr. Harding: In determining the per capita limitation the city takes a reading from their master meters sending water into the city and divides that amount of water by the population. Without the metering the New York City user will then waste water. This in turn means that the per capita consumption in New York would be higher and that should benefit the users in the outside counties.

If you have individual meters on all your services as they do in Westchester County, you probably don't use as much water and therefore the per capita allowance would be lower, and indirectly further restrict usage. However, I don't think that 100% metering in New York City would give the great reduction in water consumption that most people assume, because after all, New York City is a city of apartment houses and office buildings and most tenants don't care what the landlord pays for water.

Mr. Schickler: I think if you will follow that concept, what you are saying is let us encourage waste so that we can get more water up here.

Mr. Santucci: *Is there a benefit if you encourage waste?*

Mr. Schickler: Yes, that is the point, but I don't think we should be attacking it from that point of view. We should redistribute more efficiently what we have for everybody on a fair and equitable basis.

Mr. Biros: I was the one who mentioned this unmetered business but I think it it being misunderstood. We should meter both the main lines bringing water into a community as well as services in the community. Otherwise, we are not sure of either the amount of water used or internal system problems. The master meters may or may not be accurate. In our community the differences between our master meters and our service meters is 15%. In other words, we have an unaccounted for water loss of 15%. On the other hand, New York City, which is many, many times our size, claims that their unaccounted for water is only 1%, which is just ridiculous. As a case in point, the Croton Aqueduct system is metered by a float gauge on the conduit which has not been calibrated since 1942, some 29 years. It is well known that all meters tend to under register.

Mr. Bell: *Could you tell me a little more about how New York City's estimation figures are arrived at? How do they do that?*

Mr. Biros: They use a figure from the regional plan association. Usually this figure increases each month until we have a census and then it is reduced back to the census figure and automatically start increasing again based on the erroneous assumption that population within the City of New York is always rising.

Mr. Bell: *Is this method specified by legislation?*

Mr. Biros: No sir, this is done by the interpretation of the New York City people.

Mr. Bell: *What is the average per capita running per month in New York City?*

Mr. Biros: I think about 178 gallons per capita.

Mr. Bell: *You mentioned three things: the need for more water, the need for fair allocation of the existing supply, and the third thing you talked about was a regional organization or a state authority. Are you thinking in terms of the entire state of New York?*

Mr. Biros: You probably have to think of the entire state since we will have to go upstate somewhere in the Adirondacks to provide additional water. The region is practically all within the state so we should keep it all within the state and develop a state operation and have a central state agency to allocate and develop water resources on a need basis.

Mr. Bell: *In talking about the General Motors plant in North Tarrytown, as I understand it there is a 5,000 man workforce, 64% of which comes from New York City. Are you telling me that you get no consideration of this in the per capita aid limitation?*

Mr. Biros: We get nothing. The only thing that is considered is the 9,000 people that we have as residents, as a matter of fact according to the latest census we are down to 8,300.

Chairman Conway: *Is it true that you get no credit for institutional populations, for the people that are patients, etc?*

Mr. Biros: We get nothing for patients. The city attitude is that we can estimate and you cannot. We cannot use transient populations no matter what.

Chairman Conway: *Have you gone to court?*

Mr. Biros: We have just finished a court session in connection with taking additional waters from the Catskill Aqueduct. We had an order written in November 1968 and three years later we still do not have approval on that connection. Refusal is based on per capita aid limitation.

Mr. Bell: *As I understand it you are billed at the rate of $70-80 per million gallons of water if your consumption is within the per capita rate limitation. If it is in excess of this per capita limitation, then you are billed at the $700 rate. Consequently, you do use in excess of the per capita limitation?*

Mr. Biros: Yes, we do use excess over the limitation. We have to. We must serve hospitals, schools, and industries.

Mr. Bell: *This is like the Grasslands situation and they bill you at the high rate.*

Mr. Biros: They bill us at the $700 per million gallons for all that they say is in excess of the per capita limitation. They do the computation.

Mr. Gioffre: *What is your suggestion as to what we ought to do in the future? Do you have any ideas?*

Mr. Biros: The first thing to do is to develop an additional source of supply. My suggestion is to follow the comprehensive recommendations and go to the Adirondacks and build an impoundment probably at Hinckley.

Mr. Thomas J. McInerney: *Is New York City using the present New York State law in defense of their action? Does the state law allow them to do this?*

Mr. Biros: State legislation would probably be required to correct this since their basic authority derives from the city administrative code.

Mr. Present: *You say you are billed at $700 per million gallons. You didn't mention as to what happened after the billing.*

Mr. Biros: You don't pay. This has been going on since 1959. In 1959 the excess charge was $200 per million gallons instead of $700 so we paid it under protest. The rate was then jumped to $500 which we refused to pay and then they jumped it up to $700.

Mr. Present: *How much do you owe now?*

Mr. Biros: I don't remember but we pay $70 and they settle for $70 but every once in a while they state that our delinquent accounts are accumulating interest.

Mr. Gioffre: *Are you in litigation now?*

Mr. Biros: No, the only litigation we had was in relation to the Catskill connection which we need very badly. They said we could not because we were using in excess of the per capita allowance. Then we went to court. We lost the first round but on appeal the majority of judges ruled that they must give us a second connection by November of 1968 but they have not done so.

Mr. Gioffre: *Has the city threatened to sue you for the difference in the $70 and the $700?*

Mr. Biros: They keep sending bills, but we don't pay them.

Mrs. Baker: *Since the Rupert Company had to give up their plans for their lack of water, where is this going to leave Grasslands?*

Mr. Natt: This is not for me to say.

Mrs. Baker: *Are you able in Westchester County to go ahead knowing that there may not be adequate water?*

Mr. Natt: We are able to go ahead with it, but someone higher up in Westchester County got to decide just how far the Grasslands plans can proceed before the water supply question is settled. That is not for me to decide.

Mr. Russell: No action has been started on the hospital. I think we are still trying to negotiate with the city of New York but we haven't gotten anywhere. Eventually we will have to go to court and find out what we can do.

Chairman Conway: Certainly Grasslands is one of the many examples that highlights the charge to this Commission to reexamine the whole allocation system, and to make recommendations or changes to make it more workable and fair.

> **Mr. Santucci:** *On that Rupert Brewery thing why couldn't you just go ahead and use the water as you do now?*

Mr. Biros: The Rupert Brewery was a situation where a corporation found themselves in the middle of this conflict and apparently said why should we waste time over this? The legislature did provide as a special case that the commissioner must issue this permit. The commissioner refused. He said it wasn't consitutional.

> **Mr. Paul W. Merkens:** *What was the charge for excess water usage when Rupert left the state?*

Mr. Biros: It was $200 per million gallons and this was the figure used in the special legislation.

> **Mr. Santucci:** *The question that comes to my mind is this: assuming there is something inequitable about the per capita limitation and the surcharges for the use of water in the excess of per capita allotment, if this procedure was changed in such a way as to permit greater consumption in Westchester County and consequently in other municipalities or government agencies along the line, how could this affect or impair the New York City supply?*

Chairman Conway: I think it all boils down to the issue of total supply for the region. I think that is why New York City is concerned over consumption and charges the high retail figures because they have a great concern of the adequacy of the present supplies as everybody in this room does.

> **Mr. Santucci:** *Then this isn't a total arbitrary thing with New York City. In other words, it is intended to protect the system and the supply from being used up before it reaches the City of New York?*

Mr. Bell: In Ulster County we have the water crossroads of the world because the Delaware and Catskill Aqueducts intersect with a total capacity of 1500 MGD. We can't lay a finger on a saucerful of that water. If we are going to have any balanced development of the Hudson River and development is going to proceed, we have to do this on the basis of an organized plan and authority development. In the past years when we have tried to work out a cooperative venture with the City of New York we have met

with a stone wall. There are other factors concerning environmental development, such as recreation which we could go into but the overall tendency seems to be that they will not cooperate with this. We have to have an increased supply and this is going to be difficult but is important. We must also have equitable distribution for all the people in southeastern New York without one party having unilateral control over such a valuable resource as water.

> **Mr. Santucci:** *It seems to me that the priority would be in the area of increasing sources of supply because you can't really allocate under present sources with limited resources.*

Mr. Bell: You can get all the water you want. If you don't change the distribution scheme you don't solve anything.

Mr. Russell: I don't believe that Westchester County is asking for anymore per capita then is being used in New York City. We do say that we want to be treated as a county and not as separate municipal subdivisions. If we could draw enough water per capita for the residents of Westchester County we would have no problem.

> **Mr. Santucci:** *The problem is then that if Putnam and Dutchess and the other counties want to do the same thing, we probably won't have an adequate supply for anybody?*

Mr. Russell: I am not so sure we would but I don't know what the situation is now.

> **Mr. Santucci:** *If you extend your needs to all the municipalities, I am sure we would be in much worse straits than we are now?*

Mr. Russell: If Mid-Manhattan could only draw the same amount of water as residential areas in Brooklyn, it couldn't exist. The only reason they can exist is that the per capita basis treats the city of New York as a single entity.

> **Mr. Santucci:** *Would you then be in favor of Putnam, Dutchess, and Ulster Counties doing the same thing?*

Mr. Russell: Yes, it is the only fair way to do things.

> **Mr. Santucci:** *Would you still have an adequate supply if everyone did this? I don't think that you can do it on a piecemeal basis. You can't just think of Westchester. We must think of the entire region.*

Mr. Harding: Two things have to be done: (1) we don't have an adequate supply now and it must be increased; and (2) we must take care of this per capita situation. If you took care of the per capita limitation without increasing the supply, it would be of limited value since you may not have the water. You are right when you say that to ease the per capita restrictions without increasing the water, the situation for New York City would probably worsen.

Mr. Forster: I want to congratulate Commissioner Harding on the Hinckley reservoir situation for showing us that there is more than one way to skin a skunk. The gentleman from North Tarrytown talked about the 3% constitutional allowance for reservoir acreage as applying to only 10% of the land areas in Adirondack Park. I gave those figures to Arthur Crocker and I got them from Perry Duryea when he was Conservation Commissioner in the State of New York. Apparently the state holdings in the Adirondack are mainly in the high peak sections and the amount of valley land suitable for impoundments is quite small. Duryea told me that the amount of the valley land in the north country did not exceed 10% of the land holdings in the state. I just wanted to make that point clear.

Mr. Schickler: I attended the AWWA convention in Denver and one paper presented was very interesting. It was prepared by professors from John Hopkins and George Washington Universities. They made a study of water usage and the general conclusion was that urban areas are subsidizing suburban areas as far as water use is concerned. After a study of water use they came to the conclusion that the summer use in the urban areas created all sorts of system problems. They attempted to bring this into line by introducing sliding scale rates in Washington, D.C. This provided for increased rates during summer peak demands. Apparently it substantially reduced water demand for lawn sprinkling. It is a system operation concept based on water conservation rather than the utility concept of increased uses to provide revenue. I will obtain copies and distribute them to all of you (copy available).

ADJOURNMENT

Mr. Conway expressed his thanks to the Westchester County people for their interest and participation. He also advised everyone of the field visits planned for the afternoon to Kensico and Croton Dam. The meeting was adjourned at 12:15.

APPENDIX A

ATTENDANCE

SOUTHEAST WATER SUPPLY COMMISSION

Commissioners

E. Virgil Conway, *Chairman*
H. Clark Bell, *Vice Chairman*
Herman Forster
Anthony B. Gioffre
James C. Harding
Thomas J. McInerney
Gerald R. O'Brien, Jr.
Jess J. Present
John J. Santucci
William J. Schickler

Staff

Robert D. Hennigan, *Executive Director*
Richard F. Estes, Jr., *Director, Management Studies & Analysis*
Paul W. Merkens, *Director, Engineering Studies & Analysis*
David A. Duffy, *Administrative Assistant*
Harold Breon, *Water Resources Engineer*
Irene Baker, *Public Relations*
Nelda M. Martin, *Secretary*

WESTCHESTER COUNTY

County

Peter Q. Eschweiler, *Commissioner of Planning, Westchester County*
William G. Borghard, *P.E., Deputy Commissioner, Department of Public Works, Westchester County*
Jermiah R. Dineen, *Associate Engineer, Department of Public Works, Westchester County*
Calvin E. Weber, *Director, Division of Environmental Health Services, Department of Health, Westchester County*

Eugene E. Russell, *Senior Assistant County Attorney, Westchester County*
Thomas C. Hatfield, *Senior Engineering Technician, Department of Public Works, Westchester County*
George H. Straub, *P.E., Manager, Westchester Joint Water Works*

City and Village

Robert D'Angelo, *Deputy Commissioner, Department of Public Works, Village of Greenburgh*
F. Victor Cordy, *Assistant Manager, Village of Scarsdale*
John Biros, *Water Superintendent, Village of Tarrytown*
James A. Neary, *Water Superintendent, City of Yonkers*
Louis Russo, *Superintendent D.P.W., Town of Greenburgh*

Private Corporations

Cyril B. Myers, *President, New Rochelle Water Company*
John G. Hock, *P.E., Division Engineer, New Rochelle Water Company*
John A. Rich, *General Manager, Port Chester Water Works, Inc.*

New York City

Samuel Gofseyeff, *Engineer-in-Charge, Needs and Resources, New York City Board of Water Supply*

Other

Michael C. Pankowitz, *Assistant Utilities Engineer, New York State Public Service Commission*
Albert G. Natoli, *Junior Engineer, New York State Public Service Commission*
George J. Natt, *P.E., Retired, formerly Director of Water Agency, Westchester County*

APPENDIX B

SOUTHEAST WATER SUPPLY COMMISSION

WESTCHESTER COUNTY MEETING

9:30 I. **OPENING STATEMENTS**

(a) *E. Virgil Conway, Chairman, Temporary State Commission*

(b) *Edwin G. Michaelian, County Executive Westchester County*

(c) *Robert D. Hennigan, P.E., Executive Director, Temporary State Commission*

9:45 II. **COUNTY PLANNING ACTIVITIES**

Speaker: Peter Eschweiler, Commissioner, Westchester County Department of Planning

10:15 III. **BREAK**

10:30 IV. **COUNTY WATER SUPPLY SITUATION**

Speaker: William G. Borghard, P.E., Deputy Commissioner Westchester County Department of Public Works

11:00 V. **WATER SUPPLY PROBLEMS OF WESTCHESTER COUNTY'S MUNICIPALITIES**

General statement by James C. Harding, special Consultant, former Commissioner, Westchester County Department of Public Works

(a) The City of Yonkers
James Neary, Water Works Superintendent

(b) The Village of Scarsdale
Victor Cordy, Assistant Village Manager

(c) The Village of North Tarrytown
John Biros, Superintendent of Public Works

(d) The City of Peekskill
Earl Potts, Director of Public Works

(e) The Westchester Joint Water Works
George Straub, Manager

Summary by James C. Harding

12:00 **VI. QUESTION AND ANSWER PERIOD**

Statements by other members of the Westchester Water Works Conference

12:30 **VII. LUNCHEON**

1:30 to 4:00 **VIII. VISIT TO WATER FACILITIES**

(a) Kensico Dam and Chlorination facilities

(b) Croton Dam

APPENDIX C

FIGURES

Figure 1 . . . . . .General County Outline
Figure 2 . . . . . Municipalities
Figure 3 . . . . . Drainage Basins in County
Figure 4 . . . . . Total Consumption
Figure 5 . . . . . Projected drafts from regional sources
Figure 6 . . . . . Major Private Water Companies
Figure 7 . . . . . Other Private Water Companies
Figure 8 . . . . . .Public Water Supply Systems & Source
Figure 9 . . . . . County Water Districts
Figure 10 . . . . . Proposed Northern Westchester Projects

WESTCHESTER COUNTY NEW YORK

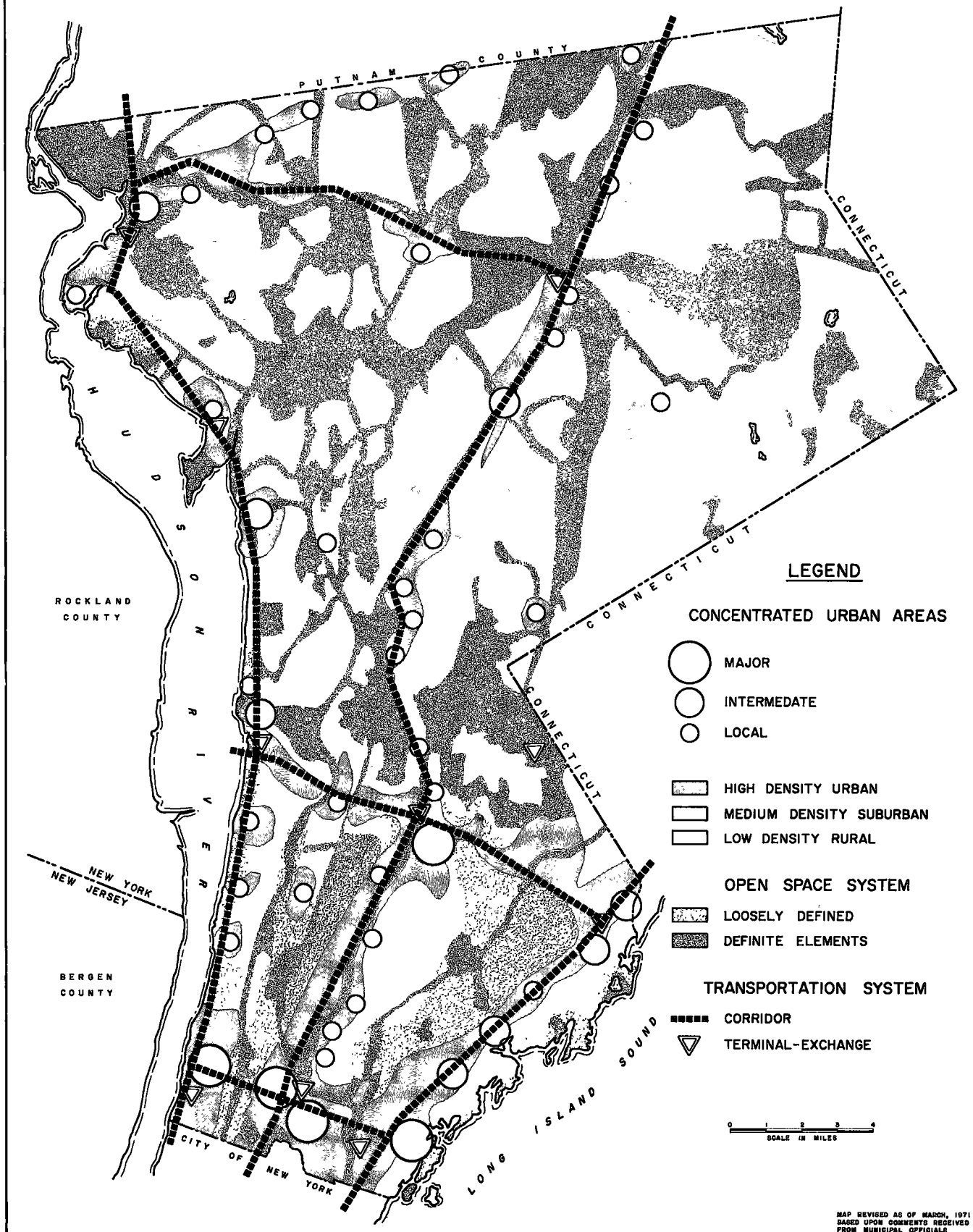


FIGURE 1

PRELIMINARY URBAN FORM CONCEPTS

WESTCHESTER COUNTY

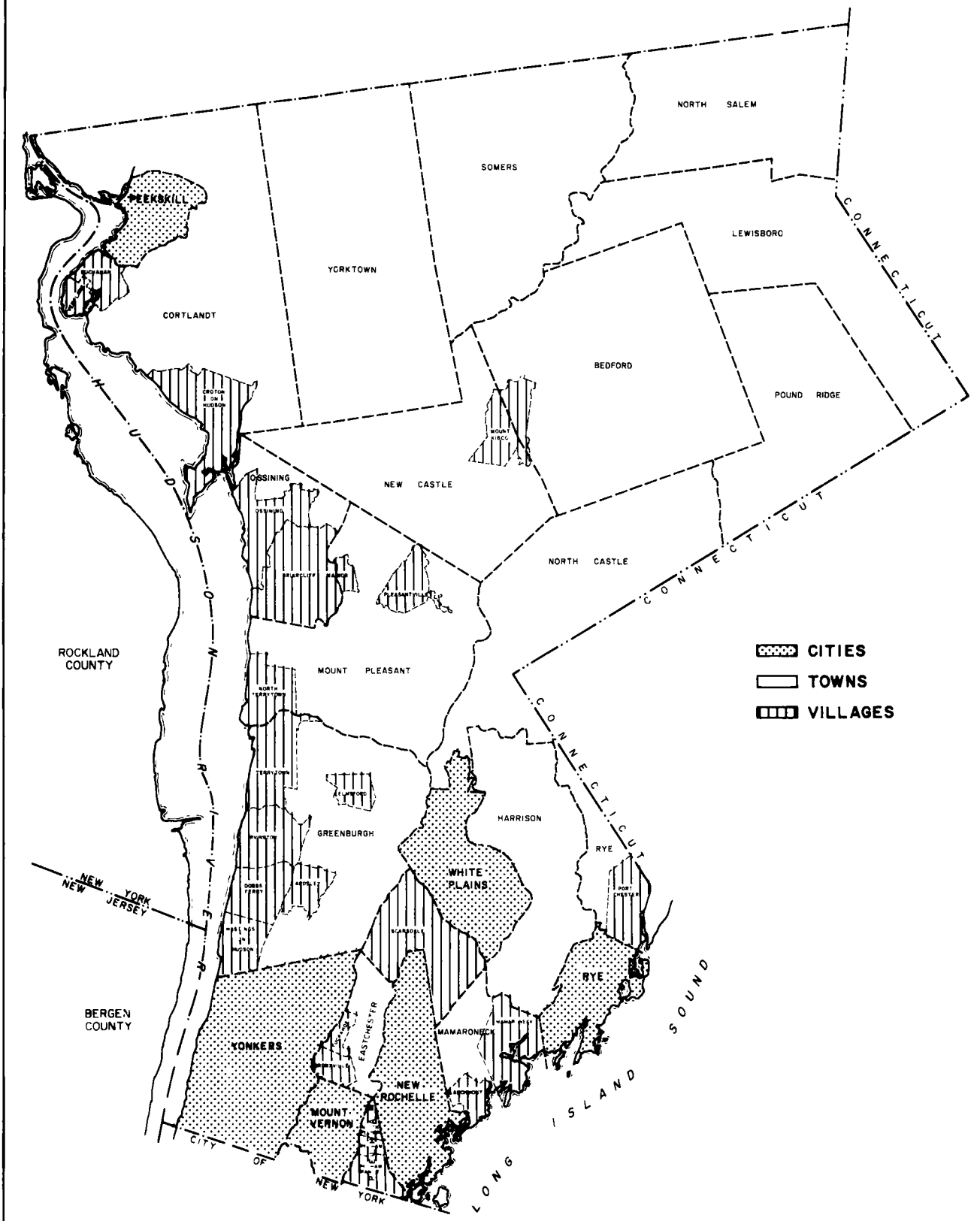
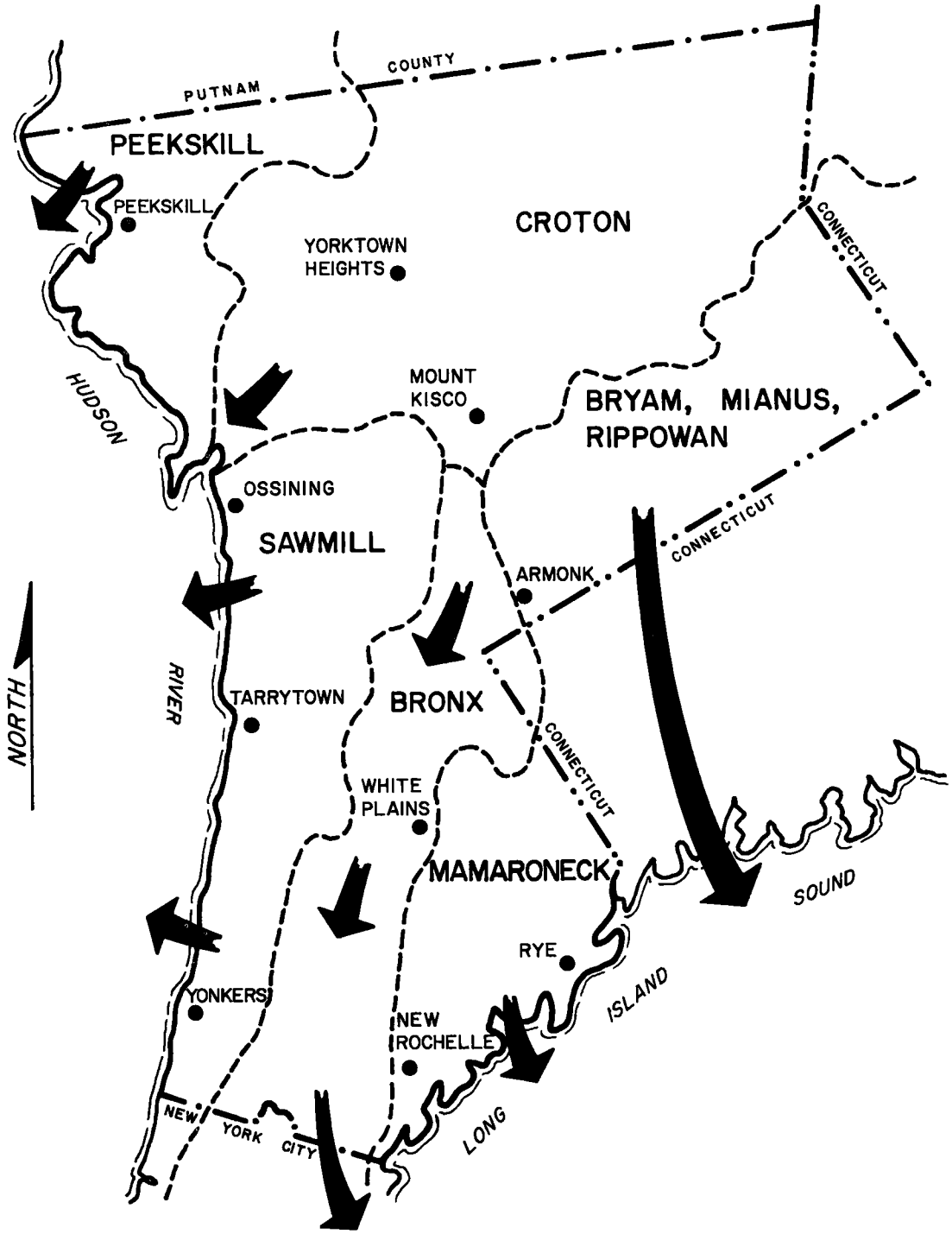


FIGURE 2

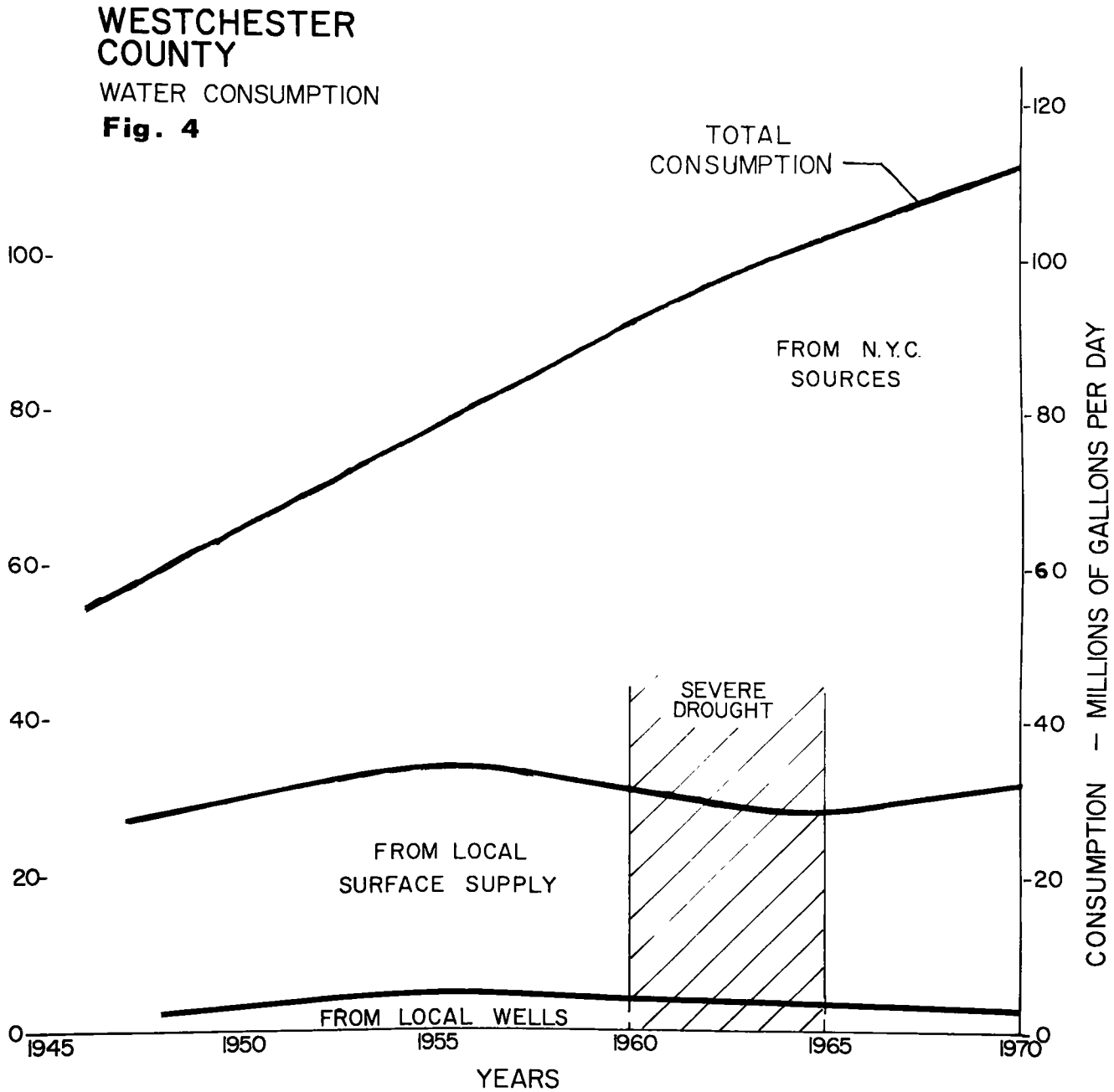
MUNICIPALITIES



MAJOR DRAINAGE SYSTEMS

WESTCHESTER COUNTY

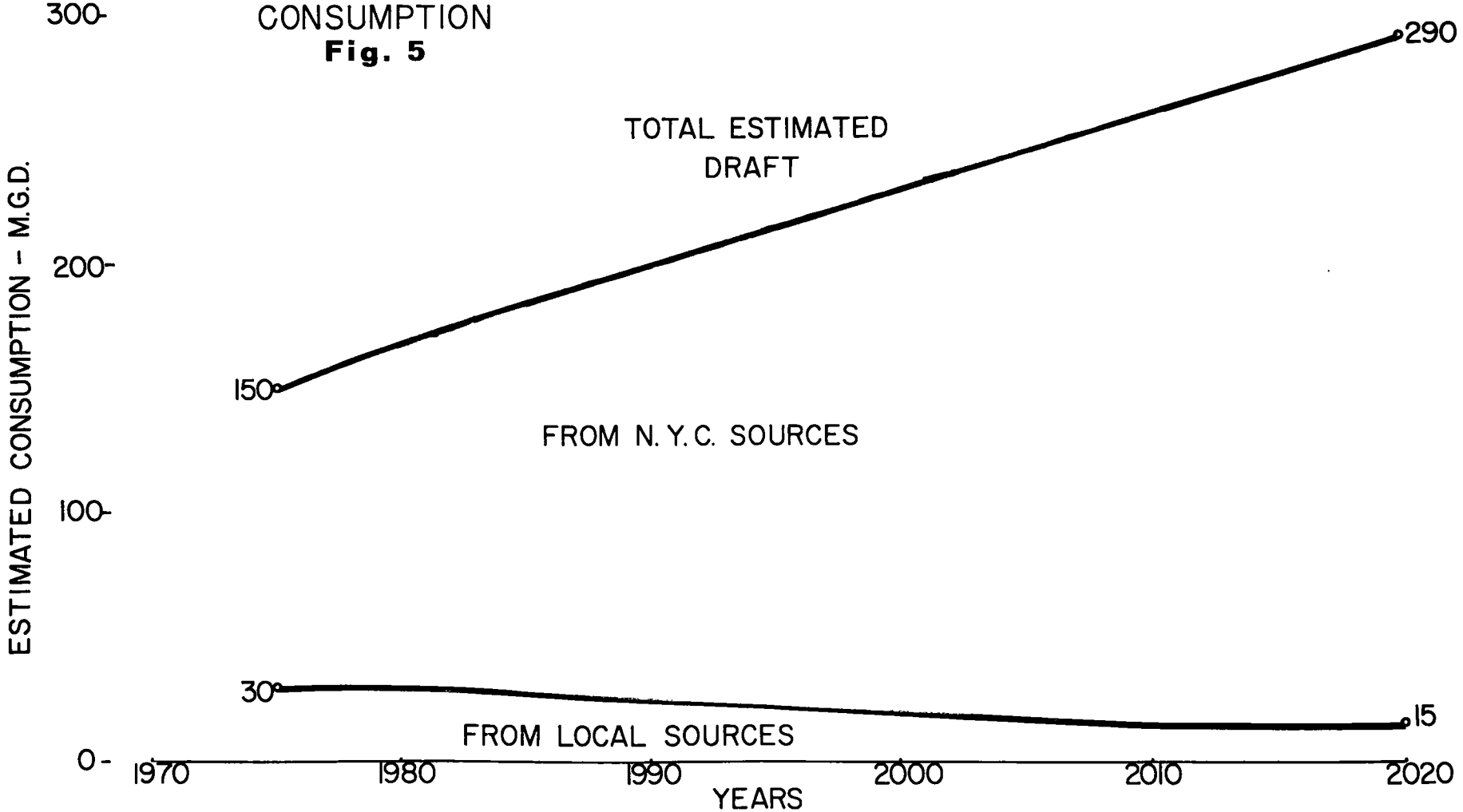
FIGURE 3


WESTCHESTER COUNTY
WATER CONSUMPTION
Fig. 4
TOTAL CONSUMPTION
FROM N.Y.C. SOURCES
SEVERE DROUGHT
FROM LOCAL SURFACE SUPPLY
FROM LOCAL WELLS
0
20
40
60
80
100
120
1945
1950
1955
1960
1965
1970
YEARS
CONSUMPTION — MILLIONS OF GALLONS PER DAY

WESTCHESTER COUNTY

ESTIMATED WATER CONSUMPTION

Fig. 5



WESTCHESTER COUNTY

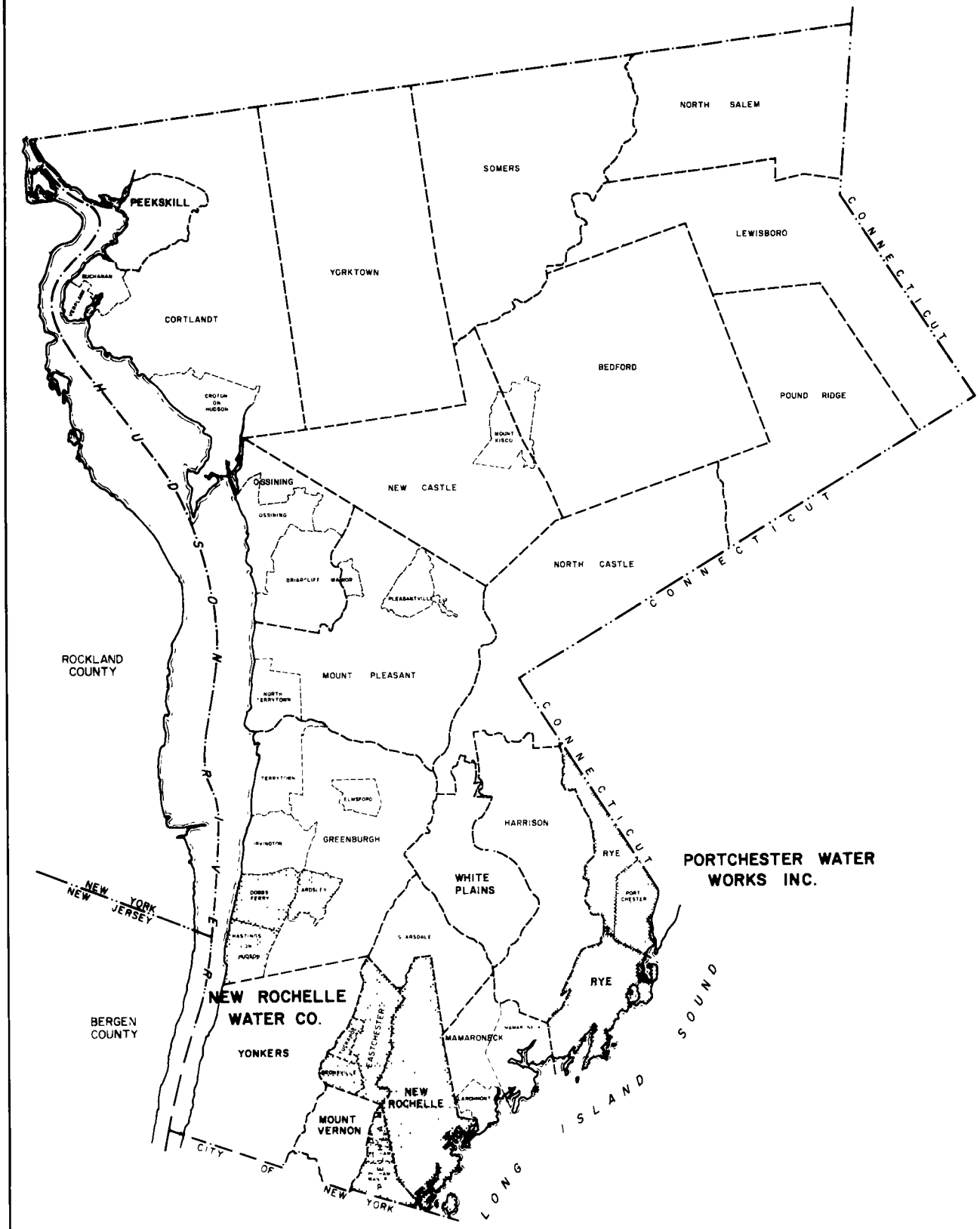


FIGURE 6

MAJOR PRIVATE WATER COMPANIES

WESTCHESTER COUNTY

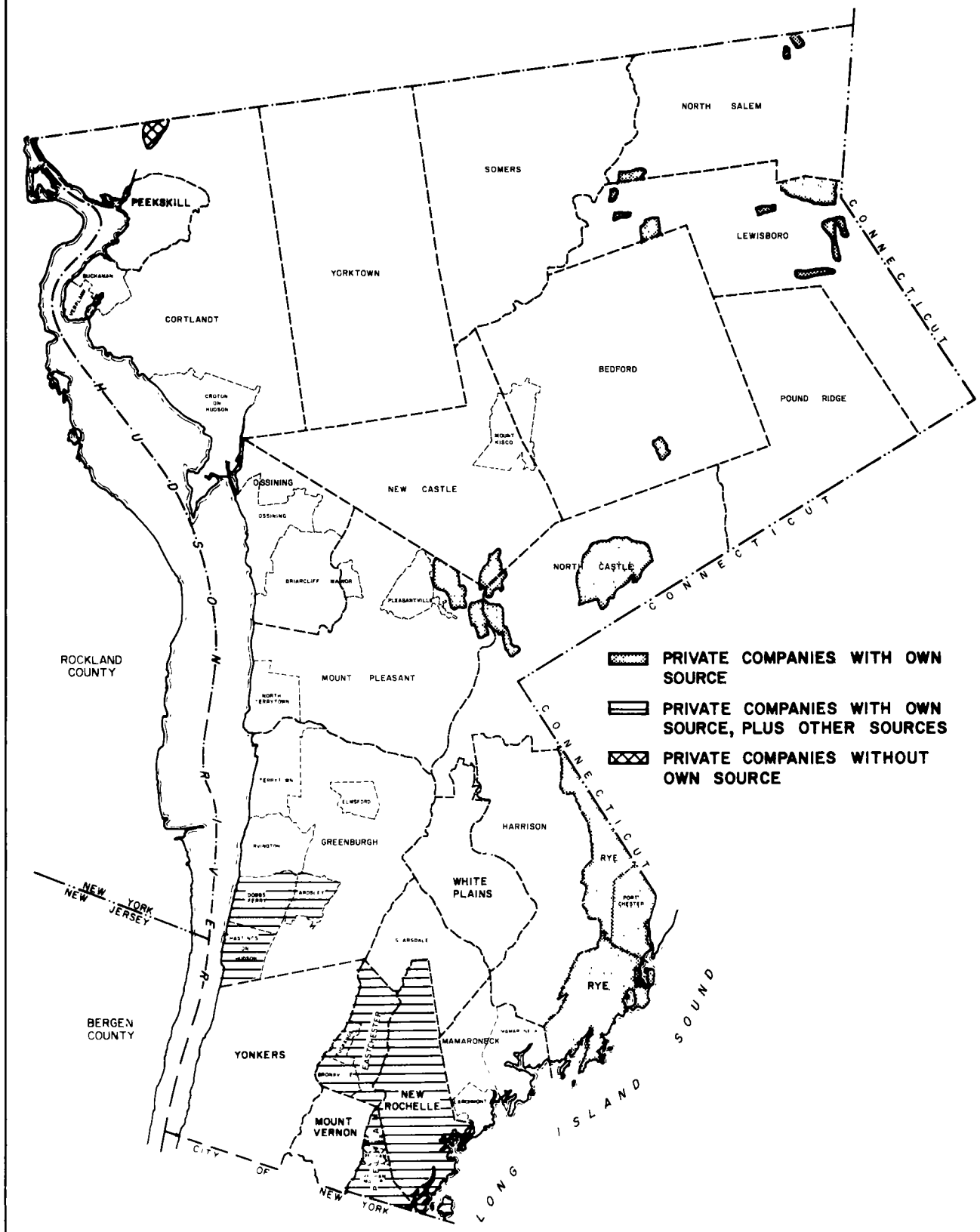


FIGURE 7

PRIVATE WATER COMPANIES

WESTCHESTER COUNTY

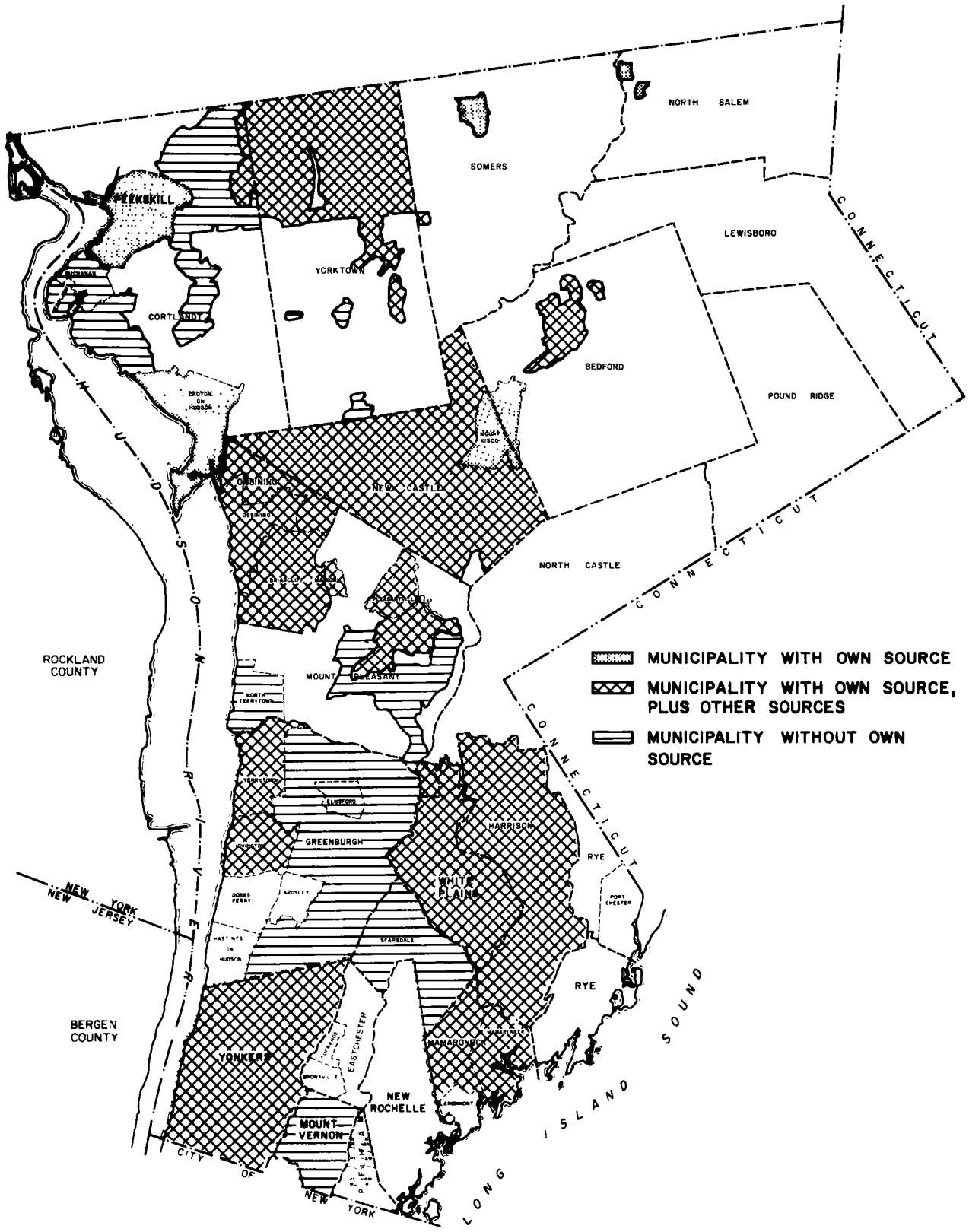


FIGURE 8

MUNICIPAL WATER SYSTEMS

WESTCHESTER COUNTY

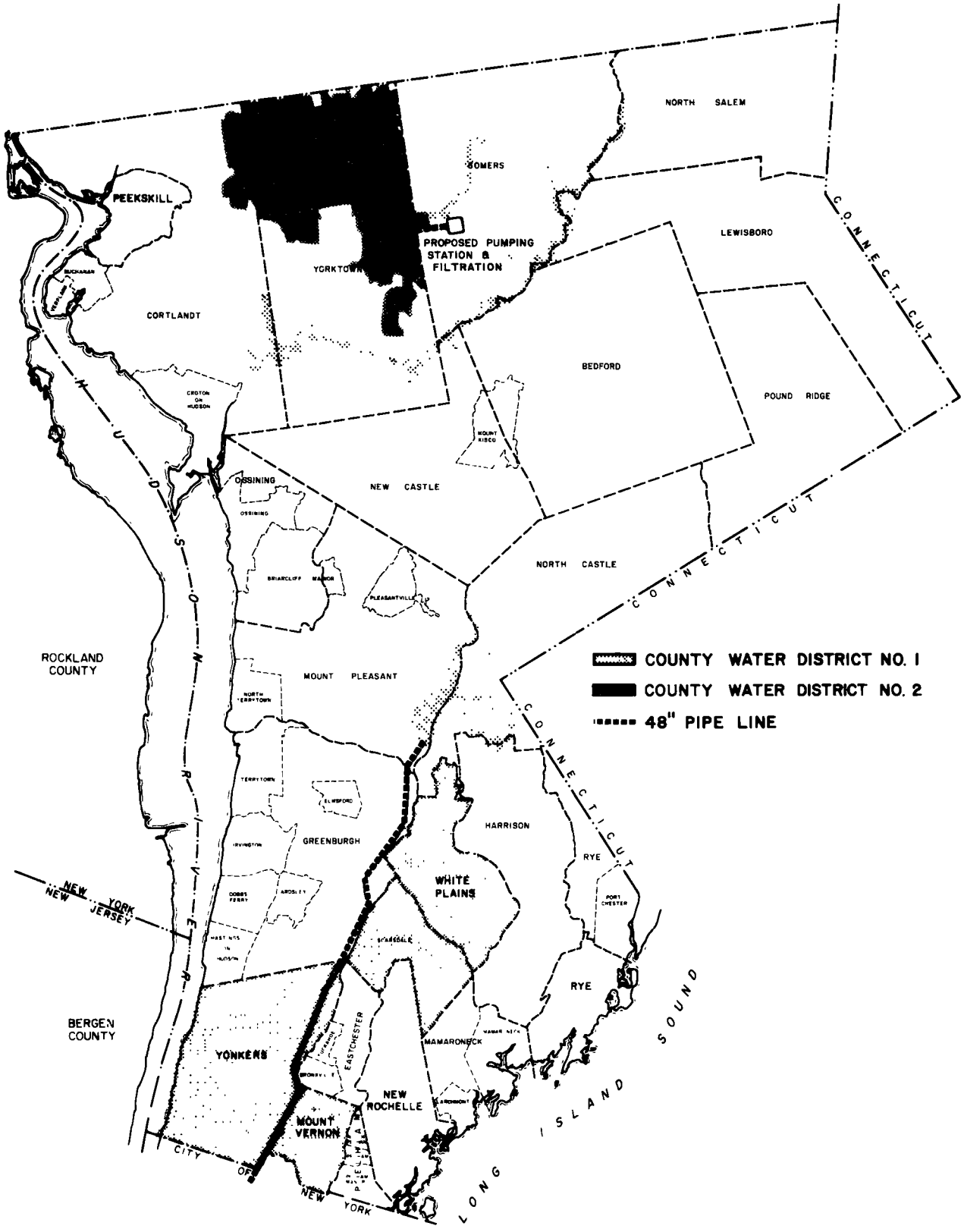


FIGURE 9

COUNTY WATER DISTRICTS

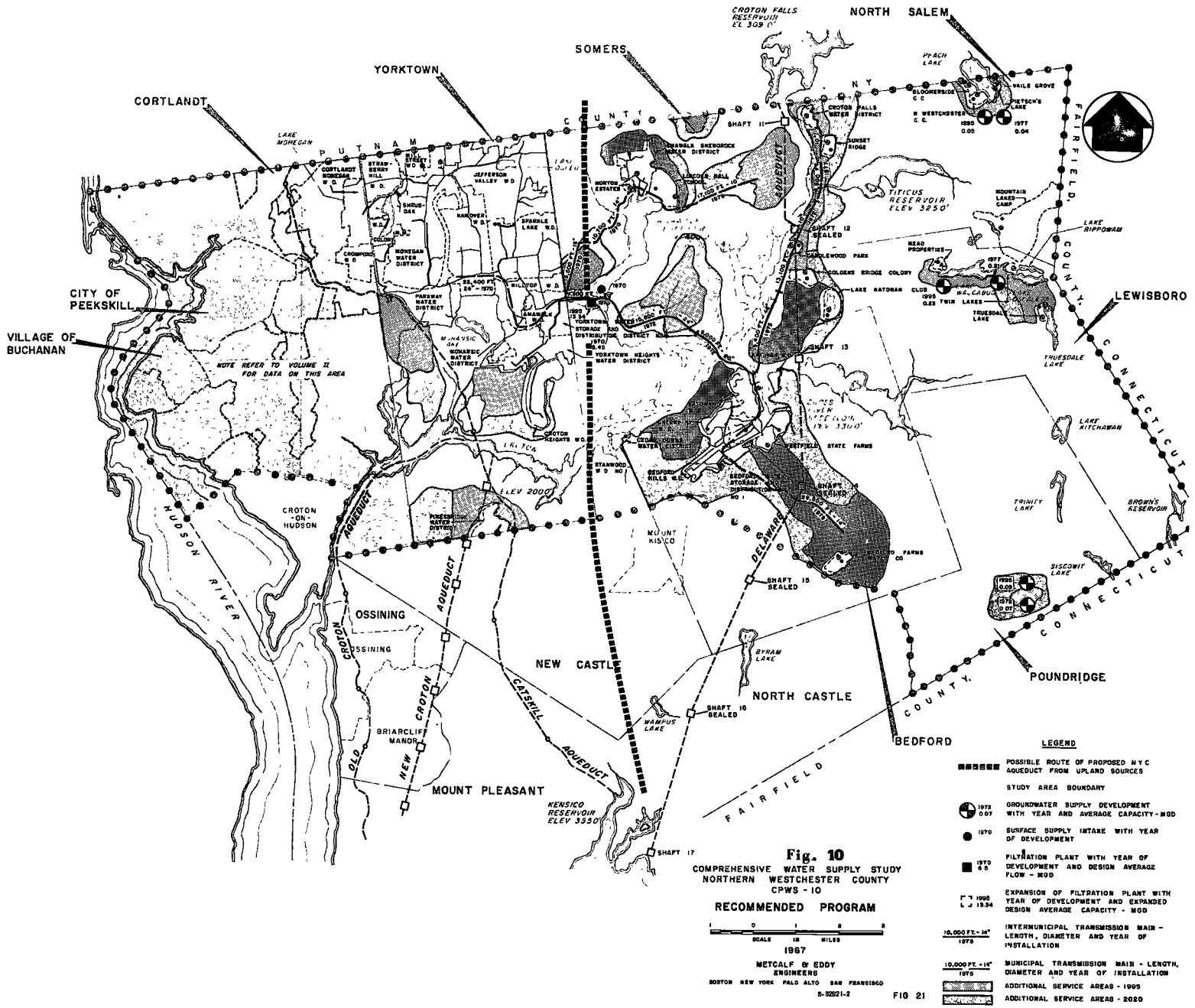


Fig. 10
COMPREHENSIVE WATER SUPPLY STUDY
NORTHERN WESTCHESTER COUNTY
CPWS - 10
RECOMMENDED PROGRAM

APPENDIX D

PRESENTATION OF JOHN A. BIROS AT A MEETING CONDUCTED BY TEMPORARY STATE COMMISSION ON THE FUTURE OF THE ADIRONDACKS AT NEW YORK CITY ON JANUARY 22, 1970

My name is John A. Biros and I am the Water Superintendent of the Village of North Tarrytown and have been since 1953. I am also past chairman and past director of the Westchester Water Works Conference.

I believe that the Village of North Tarrytown is typical of the membership represented by the Westchester Water Works Conference. Small, plagued by water supply problems, yet too small to be able to help itself. Our problems in the field of water supply must be solved on a regional basis.

The need for additional water supply for New York State is well documented in the comprehensive Report CPWS-27 dated August 1967 for the New York State Health Department and presented to you gentlemen of this commission at both the hearings at Old Forge and at Lake George. This study has been made by three engineering firms, giants in the field of water supply. To my knowledge their findings as to need have not been disputed. Their recommendation of additional water from the Adirondacks is the subject of the present hearings.

The oft quoted Article XIV of the state constitution– "the forever wild" concept receives much publicity, yet this same constitution provides in a not so publicized manner that not more than 3% of the Adirondack preserve be used for water supply purposes. An admirable thought by the framers of the constitution who recognized the need for all to share in our natural resources. It is a well known truism that state owned resources belong to all the people of the state and must be used to the benefit of the greatest number.

With the existing water supply reservoirs in the preserve (which enhance rather than detract from the character of the countryside) and the full implementation of the aforementioned comprehensive study the total amount of land utilized for water supply purposes would not closely approximate the statutory limit of 3%.

Does this then seem an exciting possibility to be able to provide the essential services to the majority of our New York State population and yet at the same time provide the aesthetic and forever wild concept in one of our most populous states of our union? Too long the conservationists (and I do not use this term in a derogatory sense) and our practical engineers have been "squared off" one against the other. Our subject matter today appears to me to be the ideal situation wherein the traditional opposing factions co-exist and even though we might be strange bed-fellows, I believe the experience will be stimulating and demonstrate that we are in fact attempting to attain the same goal – "the common good."

Does it not seem incongruous that we stress how important it is to maintain acres and acres of land for our progeny, yet we forget the family who cannot afford lengthy sojourns into the preserve to enjoy the beauty but must stay in close proximity to its work. They scrimp and save to buy a 50x100 plot, spend many dollars for grass and shrubs to emulate the preserve in his own backyard.

A drought occurs. The municipality or water district imposes water sprinkling restrictions (grass and the aesthetic values must now become subserviant to the necessities of life) and now the average taxpayer must lose his investment, not only in dollars but in aesthetics because of the lack of water which only a few short months ago was inundating upstate areas in its rush to get to the sea with resultant benefits to no one and harm of a different nature to many.

Just one more thought I would like to leave. It has been said "there must be another way", and I do agree, but our best technology with grants from State and Federal agencies have not yet produced this breakthrough – but our *need* is now.

Therefore, I would ask your commission to look favorably upon the balance of usage in the Adirondack preserve provided for in the constitution and accept the recommendation of the comprehensive report that the only feasible and economical solution to the water supply needs of the majority of the people of the State of New York is the further development of the water resources in the Adirondack preserve.

STATE OF NEW YORK

Print 1771 Intro. 1722

IN SENATE

February 2, 1966

Introduced by Mr. GORDON–read twice and ordered printed, and when printed to be committee to the Committee on City of New York

AN ACT

To amend the administrative code of the city of New York, in relation to the quantity of water permitted to be taken from the water supply of said city by municipalities located in the county of Westchester.

The people of the State of New York, represented in Senate and Assembly, do enact as follows:

1 Section 1. Section K51-42.0 of the administrative code of the city of New York is hereby amended
2 by adding thereto a new subdivision, to be subdivision (g), to read as follows:

3 *(g) Notwithstanding the provisions of subdivision (e) of this section K51-42.0, the total annual*
4 *quantity of water which may be taken and received by the county of Westchester and all of the munic-*
5 *ipalities located therein under the provisions of this section shall not exceed the annual quantity calcu-*
6 *lated by multiplying the number of inhabitants of the county of Westchester as determined and shown*
7 *by the last preceding census of the United States or the last state or official municipal census by the*
8 *annual per capita consumption in the city of New York. The annual per capita consumption of the*
9 *city of New York shall be determined by the number shown by the last preceding census of the United*
10 *States or the last state or official municipal census of the city of New York. In making calculations*
11 *under this subdivision (g), the same census standard shall be applied to the county of Westchester and*
12 *the city of New York.*

13 § 2. This act shall take effect immediately.

THE ASSOCIATION
FOR THE
PROTECTION OF THE ADIRONDACKS

March 5, 1970

Mr. John A. Biros, Water Superintendent
Village of North Tarrytown
City Hall
North Tarrytown, New York

Dear Mr. Biros:

I heard your testimony at the hearing before the Temporary Study Commission on the Future of the Adirondacks and am enclosing herewith a copy of our last Annual Report which deals with the proposal for a Gooley Dam on the Upper Hudson to provide lowflow augmentation so that the city can take water from the river at Hyde Park. It is my strong conviction that CPWS-27 does not deal sufficiently with all the possible alternatives to massive low-flow augmentation. My views were shared by most of the persons testifying at the Legislative Hearing on Dams in New York State on February 5, last.

In particular, I would like to point out that the New York State Constitution which provides that 3% of the Forest Preserve can be taken for dams for public water supply and the canals of the state is not as bland as it seems. Only about 10% of the Forest Preserve lands are what might be called "bottom lands," so 3% of 10% is a substantial amount of the type of land which is scarce as far as state lands are concerned. This is information which you may not have known and while it has not been specifically verified by the Conservation Department it is the best estimate that I have and we have been using the figures for some years without challenge.

Sincerely yours,

Arthur M. Crocker
President
The Association for the Protection
of the Adirondacks

Arthur M. Crocker
ahg
Enclosure