STATE OF NEW JERSEY

ANNUAL REPORT

OF

INTERSTATE SANITATION COMMISSION

FOR THE YEAR 1937

TO THE LEGISLATURE

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Interstate Sanitation Commission

COMMISSIONERS

NEW JERSEY	NEW YORK
WILLIAM C. COPE	JOSEPH P. DAY, *Chairman*
J. LESTER EISNER	EDWARD S. GODFREY JR.
JOSEPH N. FOWLER	WILLIAM F. HOFMANN
J. SPENCER SMITH	J. NOEL MACY
GEORGE C. WARREN, JR.	JEREMIAH D. MAGUIRE
J. RAYMOND TIFFANY, *General Counsel*	THOMAS K. SMITH, *Associate Counsel*
SETH G. HESS, *Chief Eng.—Exec. Secy.*	SANFORD E. STANTON, *Asst. Secy.*

Letter of Transmittal

January 5th, 1938

TO THE GOVERNORS AND LEGISLATURES OF THE
STATES OF NEW JERSEY AND NEW YORK.

Gentlemen:

The Interstate Sanitation Commission has the honor to submit herewith, the annual report of its activities and accomplishments during the year 1937.

This report sets forth not only the accomplishments and progress made during the past year, but also a statement of the existing conditions of pollution in the district that will furnish a base from which to measure the progress of abatement of pollution in the years to follow.

The Commissioners desire to express their appreciation of the very deep interest in the Commission's work evidenced by the cooperation of many persons and agencies. It would not be feasible to list each of those who have so generously and industriously cooperated with the work of the Commission, but we have endeavored to enumerate some of the individuals and agencies who have rendered assistance to the work of the Commission, not for thanks, but rather for the purpose of indicating the breadth of interests that have joined with the Commission in its endeavors to abate pollution.

We desire to express our thanks and appreciation to all of those who have assisted in this work, whether or not they are mentioned herein.

The work of the Commission has covered such a broad field that in order to fully convey its activities to the Governors, Legislatures and the people of the two states it becomes necessary to go into these subjects somewhat in detail, as will appear by the annexed report.

Respectfully submitted,

JOSEPH P. DAY,
Chairman

J. LESTER EISNER,
Vice Chairman

JEREMIAH D. MAGUIRE,
Acting Chairman

Summary

Within the past year the Commission has established permanent offices to provide adequate and satisfactory working space for administrative engineering and laboratory personnel.

The nucleus of a technical staff has been engaged.

The Commissioners personally made detailed inspections of the more grossly polluted areas of the District.

Hearings required under the provisions of the Compact have been held throughout the entire District.

Classification has been designated for the entire water area of the District except the Central Metropolitan Section.

The first steps have been taken to require the abatement of pollution by certain municipalities now violating the Compact.

Public Opinion favorable to the objectives of the Commission is being rapidly formed.

Technical data has been accumulated.

Plans for financing abatement of pollution have been studied with bonding authorities.

There will be found within the body of this report a statement which attempts to visualize the magnitude of the pollution in the Interstate Sanitation District and the vast program that must be accomplished before pollution is abated. The report indicates that the amount of pollution entering the District is so great that if it had to be pumped, it would require 1,100 fire engines operating continuously twenty-four hours a day. Spaced at 50 foot intervals, they would occupy the Hudson River shore of Manhattan Island from the Battery to Grant's Tomb. Preliminary investigation discloses that 86% of the municipalities within the District are violating the Compact requirements.

The magnitude of the pollution and the number of municipalities violating the Compact make it obvious that the problem of abatement will require time, energy and money. The expenditures will be justified by the results.

A Partial List of Cooperating Individuals and Agencies

The Engineering Advisory Committee:

J. L. Barron
M. D. Bidwell
Louis P. Booz
Rodney E. Cook
William R. Copeland
Harry P. Croft
Earle Devendorf
Richard H. Gould
Charles A. Holmquist
Harold M. Lewis
Arthur P. Miller
Sol Pincus
Edward S. Rankin
Warren J. Scott
Frederick C. Sutro
Sanford H. Wadhams
William A. Welch

Borough Engineers

Borough Presidents

Bureau of Marine Fisheries, N. Y. State Conservation Dept.

Engineers of Board of Estimate and Apportionment, New York City.

Joint Meeting of Union and Essex Counties.

Mayor's Committee on City Planning.

National Resources Committee.

New Jersey State Board of Commerce and Navigation.

New York City Board of Water Supply.

New York City Departments of Health, Parks and Sanitation.

Officers and Engineers of Municipalities in the Interstate Sanitation District.

Palisades Interstate Park Commission.

Passaic Valley Sewerage Commission.

Rahway Valley Joint Meeting.

Regional Plan Association.

State Departments of Health.

Station W. B. B. C., Brooklyn, N. Y.

Supervisor of New York Harbor.

The Port of New York Authority.

Twenty-seventh Division, Aviation, New York National Guard.

U. S. Bureau of Fisheries.

U. S. Engineer's Office.

U. S. Public Health Service.

Westchester, Nassau and Suffolk County Sanitary Engineers.

Works Progress Administrator and Staff.

Section I—Summary of Activities

Early in 1937, the Commission considered the first step required under the Compact, looking toward the abatement of pollution within the Interstate Sanitation District. Each phase in connection with the holding of Public Hearings as required by the Compact was carefully studied, procedure established, locations selected for the various Hearings and the area to be considered at each Hearing was fixed. The Public Hearings by this Commission, together with a brief statement of the area considered at each Hearing, follows:

PUBLIC HEARINGS

Date	*Place*	*Area*
March 30th	Bayonne, N. J.	Kill van Kull from Bergen Point Light to a line between Can Buoy No. 3 off Constable Point and Can Buoy No. 1 off New Brighton, Staten Island.
March 31st	West New Brighton, S. I.	Same as Hearing on March 30th.
April 21st	Elizabeth, N. J.	Southern portion of Newark Bay beginning at Bergen Point Light and of Arthur Kill to Outerbridge Crossing.
April 28th	Perth Amboy, N. J.	Arthur Kill, south of Outerbridge Crossing and Raritan Bay from Arthur Kill to the Middlesex-Monmouth County line west of Keyport New Jersey.
May 19th	New York, N. Y.	Water areas surrounding Borough of Manhattan and those abutting Bronx from Bronx-Westchester County line on Hudson River to Hunts Point.
May 25th	Newark, N. J.	Newark Bay.
June 9th	White Plains, N. Y.	Water areas abutting Westchester County except those abutting City of Yonkers.
June 23rd	Long Island City, N. Y.	Water areas abutting Bronx east of Hunts Point on Long Island Sound and those abutting Queens east of Sanford Point on Long Island Sound.
July 8th	Yonkers, N. Y.	Hudson River abutting Yonkers, N. Y.
July 14th	Mineola, Long Island	Southern shores of Nassau and Suffolk Counties from New York City to Fire Island Inlet.
July 21st	Keansburg, N. J.	Raritan and Sandy Hook Bays from Sandy Hook to Middlesex-Monmouth County line west of Keyport, N. J.
July 28th	Huntington, L. I.	Water areas of Long Island Sound abutting Nassau and Suffolk Counties.
August 10th	Nyack, N. Y.	West shore of Hudson River above the southerly boundary line of Palisades Interstate Park at Fort Lee, N. J.
August 18th	Brooklyn, N. Y.	Lower New York Bay, the Atlantic Ocean and tidal estuaries abutting the Boroughs of Brooklyn and Queens south of the Narrows to Arthur Kill.

Date	*Place*	*Area*
September 8th	Queens, N. Y.	Water area adjacent to the shores of Boroughs of Brooklyn and Queens from Sanford Point in the Borough of Queens to the Narrows.
September 15th	Jersey City, N. J.	Water areas adjacent to the west shore of the Hudson River and Upper New York Bay from the southerly line of Palisades Interstate Park to a line between Can Buoy No. 3 off Constable Point and Can Buoy No. 1 off New Brighton, S. I., thence to the Narrows.

ENGINEERING ADVISORY COMMITTEE

An Engineering Advisory Committee composed of engineers familiar with sanitary conditions in the Interstate Sanitation District rendered to the Commission its opinion of the predominant use of the water areas.

Their opinion was that Class "A" water prevailed except in the central portion of the District, circumscribed by the Narrows; Outerbridge Crossing over Arthur Kill; the southerly end of Palisades Interstate Park on the New Jersey side of the Hudson River and the northerly city-line of Yonkers in New York; a line from Hunt to Sanford Point on the East River at Rikers Island.

NOTICES OF HEARING

Notices of each Hearing were mailed to State, County and Municipal officials, to Chambers of Commerce and other civic organizations and to those interested in the larger shore front properties.

NUMBER OF NOTICES OF HEARINGS MAILED

Place of Hearing	*Date of Hearing*	*Number of Notices Mailed*
Bayonne, N. J.	March 30th	210
West New Brighton, S. I.	March 31st	175
Elizabeth, N. J.	April 21st	100
Perth Amboy, N. J.	April 28th	190
New York, N. Y.	May 19th	110
Newark, N. J.	May 25th	106
White Plains, N. Y.	June 9th	104
Long Island City, N. Y.	June 23rd	115
Yonkers, N. Y.	July 8th	105
Mineola, N. Y.	July 14th	118
Keansburg, N. J.	July 21st	86
Huntington, N. Y.	July 28th	147
Nyack, N. Y.	August 10th	170
Brooklyn, N. Y.	August 18th	150
Queens, N. Y.	September 8th	235
Jersey City, N. J.	September 22nd	400
	Total	2,521

Press releases were sent to approximately forty publishers, referring to the Notice of each Hearing, together with a short item.

The Hearings were well attended and received excellent attention from the press. This phase of public reaction will be discussed in further detail later in the report.

A detailed resume was made of the testimony offered at the Hearings. A transcript of the resume was sent to each Commissioner, to the Counsel, members of the Connecticut Tri-State Treaty Commission and other interested officials.

Each Hearing was conducted by one of the Commissioners, designated by the Acting

Chairman, to preside. Full opportunity was offered to the public to give a frank and full expression of their opinion concerning the expected predominant use of the area under consideration at the Hearing. Whereever possible, the Secretary was called upon to summarize the opinions expressed at the Hearing, and before the closing of the Hearing, a question was put to invite those who disagreed with the summary to make their differences known.

CLASSIFICATION OF AREA

In accord with the provisions of the Compact, the Chief Engineer submitted a report to the Commissioners summarizing his findings of the expected predominant use of the area being considered. These reports also revealed briefly the testimony offered at the Hearings, as well as a summary of the correspondence received pertinent to the classification of the area. These reports made full use of the information obtained from the "Property Use Survey" made by the Works Progress Administration Projects, sponsored by this Commission.

The Chief Engineer's reports were submitted to the Commissioners, prior to the regular meetings of the Commission so that each Commissioner might have an opportunity of studying the report prior to its formal consideration at the Commission meeting. At the Commission meeting, full discussion was invited on each classification of an area. At the present time reports have been submitted covering the entire area of the Interstate Sanitation District, except that surrounding the southern portion of Manhattan, Upper New York Bay, Newark Bay, Arthur Kill and Kill van Kull. Requests have been received from the New Jersey authorities that this Commission withhold its designation of the classification of Newark Bay, pending their study of certain field data, obtained in co-operation with the Commission's staff and the Commission sponsored W. P. A. Project.

The Commission has taken definite steps to designate the classification of Lower New York Bay and the south shore of Long Island, as well as Long Island Sound. Plate No. 8, Chapter VII, page 38, indicates the designation of classification already made by the Commission.

ACTION TAKEN TOWARD ABATEMENT

The degree of pollution within the Interstate Sanitation District and the large number of offenders under the Compact are so well-known as to warrant little discussion of the degree and extent of pollution. The Commission studied carefully methods which it would adopt in taking action toward the abatement of pollution. It was deemed impracticable to attempt to take action against all offenders simultaneously, to that end the Commission has adopted the program of progressive action.

Believing it to be contrary to the intent of the Tri-State Compact to issue preemptory orders the Commission has requested by resolution the cooperation of the respective State Departments of Health in obtaining schedules from municipalities indicating when various specific steps might be expected to be accomplished to ultimately remove the violation of the terms of the Compact.

The schedules fix the time of accomplishment of—

1. The inclusion in the municipal budget of an item to provide for engineering services for the necessary designs, estimates and reports to accomplish the removal of the violation of the Tri-State Compact requirements.
2. The engagement by the municipality of engineering services.
3. Completion of engineering report upon the removal of the violation of the Tri-State Compact.
4. Submission of the necessary plans and specifications by the municipality to the State Department of Health, together with the necessary formal application for approval thereof.
5. Advertisement for bids for the construction of the treatment plant or other necessary works.
6. Letting of construction contracts.
7. Estimated date of completion of construction and removal of violation.

REACTION OF PUBLIC OPINION

The Commission has felt that it can be most successful in attaining the objectives of the Compact, if the public can be fully in-

formed, concerning the need for the abatement of sewage pollution and the benefits that may be derived therefrom.

The Public Hearings furnished an excellent initial contact with the press. As a general rule, they were well covered and fully reported, especially in the local papers.

The attitude of the public attending these Hearings gave full evidence of their interest in the abatement of pollution. We do not have a record of a single case of an expression or indication of antagonism toward the Commission or its purposes. Without exception, we were met with a desire to offer the fullest cooperation. In all, approximately 600 persons attended our Hearings, 175 offered testimony and 80 communications were received in connection with the various Hearings.

WORKS PROGRESS ADMINISTRATION PROJECT

The Commission has sponsored a Works Progress Administration Project for the purpose of undertaking a general physical inspection of the extent, sources and the effects of pollution on the tidal waters by sanitary, industrial and other wastes in and adjacent to the New York Metropolitan area.

The Chief Engineer of the Commission has outlined the work for the project and has given general supervision and advice. The scope of the project was divided into four major sub-divisions:

1. Property Use Survey and Location of Sources of Pollution.
2. Current Studies.
3. Sampling and Analyses.
4. Study of Economic Effects of Pollution.

The purposes and methods of the Property Use and Location of Sources of Pollution Survey has been discussed in connection with the reports on designation of classification of areas.

The Current Surveys are for the purpose of investigating the currents which would carry pollution from one part of the District to another. One comprehensive survey of this nature has already been undertaken in cooperation with the New Jersey State Department of Health to determine the effects of Newark Bay upon the Hackensack River and in particular, upon Overpeck Creek.

Considerable data are available as to the general current trends in New York Harbor. It is not the purpose of this portion of the project to repeat such work as has already been done. There are, however, numerous places where more detailed information is required concerning the effects of current upon pollution and it is our purpose to study these in detail.

Sampling and Analyses cover dissolved oxygen, suspended solids, bacterial count and a study of the character and extent of the sludge blanket on the Harbor bottom. Numerous samples were taken throughout the summer and analyzed for the determination of the percentage of dissolved oxygen in the water throughout the entire Interstate Sanitation District. Approximately 1400 of such analyses were made. These will serve as a criterion upon which to judge the effects of the sewage treatment plants which are being put into operation at the present time and those which may be expected in the future. The *dissolved oxygen* determinations serve as a very satisfactory index of the changes in the degree of pollution in the Harbor. The bacterial count has not yet been undertaken, due primarily to the lack of laboratory facilities. This work, it is hoped, will be undertaken during the coming year and will serve to confirm the work being done by other agencies, as well as to determine the compliance with the provisions of the Tri-State Compact. Determinations of *suspended solids* have been made in some particular instances for the purpose of determining the compliance with the provisions of the Tri-State Compact. This phase of the work is expected to be an active part of our laboratory procedure during the coming year. The determination

of the character and the extent of the sludge blanket on the Harbor bottom is a matter which has been considered for long periods of time, but upon which there has been little satisfactory accomplishment. During the winter months when routine sampling is not of great avail, the laboratory technicians will be employed in studying means of identifying sewage sludge that may be removed from the bottom of the Harbor. Dredging is in almost continuous operation throughout the Harbor and it is expected that little difficulty will be encountered in obtaining samples. Definite determination of whether the samples actually contain sewage sludge will be attempted. Should a satisfactory means of identifying sewage sludge be evolved, we propose to expand the program and attempt to determine the approximate extent of the sludge blanket. Should we be able to accomplish this during the next year, it would serve as a means of determining whether or not the sludge blanket is moving and if so, in what direction.

COOPERATION

Commissioner Day was invited to meet with the New York-New Jersey Coastal Sub-Committee of the National Resources Committee. At his direction, the Chief Engineer attended the Committee meeting, and was also invited to attend the meetings of the Hudson River Basin Sub-Committee. The Commission staff cooperated in the activities of the National Resources Committee by submitting recommendations, briefs, suggestions and attendance at the Sub-Committee Hearings.

The Commission staff made studies of the possibilities of recurrence of marine-borers in this vicinity as a result of abatement of pollution. Evidence was disclosed to indicate that marine-borers may be active even in the most highly polluted waters. It appears that a Committee is being formed to keep informed upon the intrusion of marine-borers in the New York Harbor and it is contemplated that the Commission staff will act in close cooperation with this Committee.

The New Jersey Laundryowners Association conferred with our technical staff on the treatment of laundry wastes.

REPRESENTATIONS

On several occasions the Commission was represented at Congressional hearings in Washington, concerning bills upon the abatement of pollution.

Representatives of the Commission or staff appeared at:

Port Jefferson Public Meeting on use of Harbor
National Resources Basin Committee Meetings, (3)
Long Island Section of New York State Sewage Works Association
New Jersey Sewage Works Association
New Jersey League of Municipalities

POLICY AND PROPOSED PROGRAM

In the Annual Report submitted last year, the Engineering Advisory Committee report submitted by Messrs. C. A. Holmquist and R. H. Gould, outlined four steps, which in their opinion, were required to carry out the purposes of the Compact. They were:

1. Classification of the waters
2. Determination of the Compact violations
3. Preparation of comprehensive plan for pollution abatement
4. Enforcement of provisions of Compact

The past year has seen the first step well under way and brought well-nigh to completion. The classification of the entire area has been designated, except that portion surrounding the lower or southerly part of Manhattan Island, lower New York Bay, Kill von Kull and Newark Bay. This is substantially a single area, which will be considered as a unit.

Following the designation, the Commission has undertaken the determination of Compact violations. This work is now under way and four violators have been reported upon. Work upon this phase of

the program will be continued throughout the coming year.

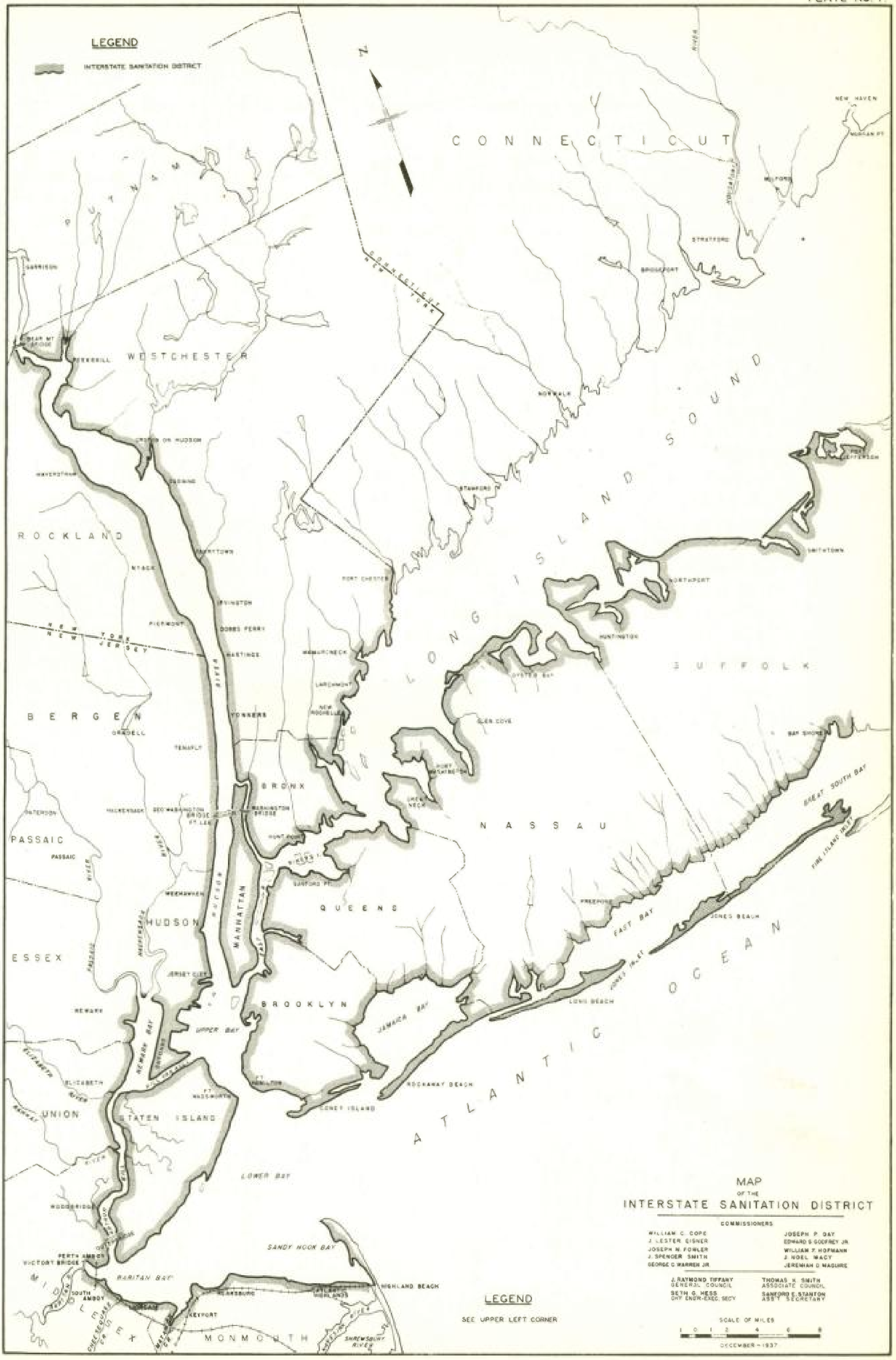
Concerning the preparation of the comprehensive plan for pollution abatement, we find that the greatest, if not the only inhibiting factor, is the means of financing the cost of treatment plants required to abate pollution. If this Commission could successfully offer a comprehensive plan for financing construction of treatment plants and trunk sewers, we are confident that abatement will proceed most rapidly. The cost of constructing the sewage treatment works, together with the necessary intercepting or trunk sewers for the entire Sanitation District has been variously estimated from $300,000,000 to $500,000,000. Many municipalities within the District are entirely unable to finance these improvements. Tentative plans for financing this construction are now being studied. When suitable plans have been evolved, they will be submitted together with recommendations concerning additional legislation, if necessary.

ABATEMENT

It is the purpose of this Commission to act on a progressive plan, rather than to issue orders on a large scale to municipalities and other entities violating the Compact. The wholesale issuance of orders would, it is believed, result in unfavorable public opinion, as well as throwing loads which they are not at present designed to carry upon existing agencies, health departments, finance and construction organizations. By progressive action, it is hoped that the amount of construction on sanitation projects may be carried on from year to year in increasing quantities, but in such a manner as would permit the construction, financing and state agencies to meet the requirements.

PROGRAM FOR NEXT YEAR

It is proposed to conclude the designation of classification in the early part of the year and to continue work on sampling and analyses for the purpose of measuring the degree of pollution within the Harbor to carry on a year by year comparison. During the coming year, we propose to examine a far greater number of sources of pollution and to prepare the necessary ground work upon which the Commission may take the necessary action toward spurring the municipality or other entity to abate the pollution.


LEGEND
INTERSTATE SANITATION DISTRICT
N
CONNECTICUT
NEW HAVEN
MILFORD
STRATFORD
BRIDGEPORT
NORWALK
STAMFORD
CONNECTICUT
NEW YORK
PUTNAM
GARRISON
BEAR MT BRIDGE
PEEKSKILL
WESTCHESTER
CROTON ON HUDSON
HAVERSTRAW
OSSINING
ROCKLAND
TARRYTOWN
NYACK
IRVINGTON
PIERMONT
DOBBS FERRY
HASTINGS
PORT CHESTER
MAMARONECK
LARCHMONT
NEW ROCHELLE
NEW YORK
NEW JERSEY
YONKERS
BERGEN
ORADELL
TENAFLY
BRONX
PATERSON
PASSAIC
HACKENSACK
GEO. WASHINGTON BRIDGE
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HUNTS POINT
SANFORD PT.
WEEHAWKEN
HUDSON
HUDSON RIVER
MANHATTAN
EAST RIVER
QUEENS
ESSEX
JERSEY CITY
NEWARK
NEWARK BAY
UPPER BAY
BROOKLYN
JAMAICA BAY
ELIZABETH
UNION
STATEN ISLAND
FT. WADSWORTH
FT. HAMILTON
CONEY ISLAND
ROCKAWAY BEACH
LOWER BAY
WOODBRIDGE
PERTH AMBOY
VICTORY BRIDGE
SOUTH AMBOY
RARITAN BAY
SANDY HOOK BAY
KEYPORT
KEANSBURG
HIGHLAND BEACH
MIDDLESEX
MONMOUTH
SHREWSBURY RIVER
LONG ISLAND SOUND
PORT JEFFERSON
SMITHTOWN
NORTHPORT
HUNTINGTON
OYSTER BAY
GLEN COVE
PORT WASHINGTON
GREAT NECK
SUFFOLK
NASSAU
BAY SHORE
GREAT SOUTH BAY
FIRE ISLAND INLET
FREEPORT
EAST BAY
JONES BEACH
JONES INLET
LONG BEACH
ATLANTIC OCEAN
MAP
OF THE
INTERSTATE SANITATION DISTRICT
COMMISSIONERS
WILLIAM C. COPE
J. LESTER EISNER
JOSEPH N. FOWLER
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J. RAYMOND TIFFANY
GENERAL COUNCIL
SETH G. HESS
CHF ENGR-EXEC. SECY
THOMAS H. SMITH
ASSOCIATE COUNCIL
SANFORD E. STANTON
ASS'T SECRETARY
SCALE OF MILES
1 0 1 2 4 6 8
DECEMBER - 1937
LEGEND
SEE UPPER LEFT CORNER

Section II—History

The history of pollution of the New York Harbor, of course, extends back to the time when Manhattan was first settled, the first recorded sewer having been built in 1696. It has been but natural to continue to empty sewers into the Harbor since in the last century the waters surrounding New York City appeared to be amply able to assimilate all of the sewage which was carried to them. The load of pollution which these waters had to carry was increased slowly and the detrimental effects were insidious in their growth. There was a sudden realization of the extent to which this shameful situation had been carried and public opinion was finally focused upon it due probably to the plans to discharge the effluent from the Passaic Valley Trunk Sewer into New York Bay. If the Passaic outfall caused public awakening to a situation already serious, we of today owe its sponsors a debt of gratitude. In 1903, the New York State Legislature appointed the "New York Bay Pollution Commission" and in 1906, this Commission submitted a report on the Passaic Valley Outfall and also a careful sanitary survey of the Harbor waters. It showed conclusively the immediate need of sewage treatment; however, that Commission presented no specific plan for abatement. In 1906, the New York State Legislature appointed the Metropolitan Sewerage Commission for the purpose of continuing the investigation of the previous Commission, with instructions to prepare a plan to improve the condition. This Commission made a most exhaustive investigation and its reports cover three large volumes, the last of which was submitted in 1914. The reports contained studies and plans which have formed a basis of nearly all of the subsequent work. The City of New York has adopted much of the Metropolitan Sewerage Commission's recommendations in its present comprehensive plans.

Just prior to the completion of the report of the Metropolitan Sewerage Commission, New York City established the "Sewer Plan Commission" created in 1913 to cooperate with the Metropolitan Sewerage Commission. The Sewer Plan Commission of the City, however, presented an alternative plan. There then followed the first official tentative plan for a comprehensive treatment of New York City sewage which was made by Kenneth Allen, Sanitary Engineer for the Board of Estimate and Apportionment and presented in 1920. In the meantime, however, the State of New Jersey had gone forward with the construction of the Passaic Valley Trunk Sewer which provided for one of the first major sewage treatment plants in the area.

In 1924, a Joint Legislative Committee was formed for the purpose of devising ways and means to be undertaken jointly by the States of New York and New Jersey and Connecticut, whereby pollution may be minimized and whereby such States may jointly urge the Federal Government to take such measures, within its jurisdiction, as shall be proper to remedy conditions in New York Harbor and the adjacent coastal waters. This Committee made a study of the existing sewer systems and methods of sewage disposal. The Committee made numerous personal inspections of conditions of pollution, held hearings and examined many persons, as well as having conferences with the Governors and other officials of the Federal Government in the three States involved. After exhaustive study, the Committee submitted a report in February 1927, which contained among others, the following recommendations:

> Immediate official adoption of the proposed comprehensive plan of sewage disposal in greater New York and a prompt start on such plan.

The release to the City of such portions of Ward's and Welfare Islands as may be necessary for the installation of sewage disposal plants as planned by the City of New York.

That steps be taken to force the City of New York to erect sufficient garbage disposal plants in a manner to scientifically dispose of garbage and refuse and to eliminate dumping at sea.

Thomas K. Smith, Associate Counsel to this Commission, was Counsel to the Joint Legislative Committee.

The United States Engineers offices made a report on the waters of this District, including the Hudson River as far as Poughkeepsie, which was submitted in 1925. And the Governor's Special Long Island Sanitary Commission submitted a report in May, 1931. A report was submitted in December, 1935, by the Nassau County Sanitation Commission which confined itself to the problem of sanitation in Nassau County.

The Tri--State Treaty Commission was created under the provisions of Chapter 671 of the laws of New York of 1931, Joint Resolution No. 8 of the Senate and General Assembly of the State of New Jersey adopted April 21st, 1931, and Chapter 142, Section 423-a of the laws of the State of Connecticut, 1931. That Commission held its first meeting on June 3rd, 1931, at which the Honorable Joseph P. Day was elected Chairman. It submitted its report on February 10th, 1932, which contained three appendices, Appendix A, a recommended form of the Tri-State Compact, Appendix B, recommended forms of legislation, Appendix C, report of the Research and Engineering Committee.

As a direct result of the recommendations of the Tri-State Treaty Commission, the Tri-State Compact establishing the Interstate Sanitation District and the Interstate Sanitation Commission was made effective by the enactment of Chapters 3 and 4 of the laws of New York, 1936, and Chapters 321 and 322 of the laws of New Jersey, 1935. At the present writing, the State of Connecticut has not adopted the Tri-State Compact, however, it has continued its Treaty Commission. The designated members have attended meetings of the Interstate Sanitation Commission and have remained in close contact with the work of this Commission.

BIBLIOGRAPHY

The progress of matters in connection with the abatement of pollution can best be followed by a review of articles on the subject. To record this information in accessible form, there is appended a bibliography of articles concerning sewage disposal and pollution in the Interstate Sanitation District from 1892 to 1937.

THE COMMISSION

The first meeting of the Interstate Sanitation Commission was held on February 17, 1936, at which Joseph P. Day was elected Chairman; Colonel J. Lester Eisner, Vice Chairman; J. Spencer Smith, Treasurer. Jeremiah D. Maguire has been designated Acting Chairman.

Regular meetings of the Commission during 1937 were held on: January 6th, February 3rd, March 3rd, April 7th, May 5th, June 16th, July 17th, August 4th, September 14th, October 6th, November 3rd, December 8th. A special meeting was held on April 20th.

PERSONNEL

The staff of the Commission was reappointed to continue in their respective offices and positions. The position of Secretary to the Chairman was, however, discontinued.

Seth G. Hess was engaged to serve the Commission as its Chief Engineer, effective February 1st. Edith Garthwaite Knight was engaged as Typist-Telephone Operator, effective February 1st; Frank G. Manning was engaged as Assistant Engineer, effective June 1st.

On April 10th, Gerald W. Knight, Executive Secretary, passed away.

At the special meeting of April 20th, the following resolution was passed by the Commission and ordered spread upon the minutes:

RESOLUTION
of
Respect and Sympathy Adopted by the
INTERSTATE SANITATION COMMISSION
60 Hudson Street, New York City

WHEREAS, *Gerald W. Knight,* our beloved friend and Associate, whose untiring efforts in behalf of this Commission and of the general public welfare, has departed this life, terminating a career of immeasurable service and countless blessings to many; and

WHEREAS, he served as a Commissioner and as the first Executive Secretary of this Commission; and

WHEREAS, by his loyalty, character and friendliness he endeared himself to his associates; and

WHEREAS, he gave of himself to the fullest extent in the interests of this Commission and its predecessor, the Tri-State Treaty Commission; now, therefore,

Be it Resolved, that there be spread upon the minutes of this meeting, an expression of the sorrow which his associates feel in the loss of one for whom they had the highest regard.

Be it Further Resolved, that a copy of this Resolution be forwarded to his family, as an inadequate though most sincere tribute to a Man—a Friend.

Unanimously passed and spread upon the minutes of this meeting, this 20th day of April, 1937.

(Signed) JOSEPH P. DAY, *Chairman,*
Interstate Sanitation Commission

At a special meeting of April 20th, Seth G. Hess, Chief Engineer, was authorized to act as Executive Secretary, in addition to his duties as Chief Engineer.

An Assistant Engineer, draftsman and two stenographers were engaged for temporary work during the month of December. At the conclusion of the year, the staff consisted of a General Counsel, Associate Counsel, Assistant Secretary and six members of the operating staff, and in addition four temporary employees.

On February first, the Commission established its office at 60 Hudson Street, occupying 1200 square feet on the fourth floor.

The meetings of the Commission are regularly held at the Commission's office, 60 Hudson Street, New York City.

In addition to the regular meetings, the Commissioners made personal inspection trips of the more grossly polluted areas of the District. Through the courtesy of the Supervisor of the Harbor, Captain T. H. Taylor, boats were made available to the Commissioners. On each trip, small boats were used and detailed inspections were made into the various canals, creeks and estuaries where the worst pollution existed.

Section III—Status of Pollution

AREA

The Interstate Sanitation District includes within its boundaries in New York State—Westchester County, the easterly part of Rockland County, New York City; Bronx, Manhattan, Queens, Brooklyn and Richmond; Nassau County and the westerly half of Suffolk County; in New Jersey, the District comprises the easterly part of Bergen County along the Hudson River, the eastern and southern parts of Hudson County, Essex County along Newark Bay, Union County along Arthur Kill, Middlesex County along Arthur Kill and Raritan Bay and Monmouth County along Raritan Bay and Sandy Hook Bay.

POLLUTION

Pollution in the tidal waters receiving sewage may be physical, chemical or bacterial in character, or all of these. Physical pollution is caused by suspended matter creating conditions offensive to the senses. Chemical pollution is caused by organic matter and depletes the dissolved oxygen content of the water. Bacterial pollution is caused by disease-producing bacteria.

Physical pollution in New York Harbor consists of putrefying deposits of sewage solids on the bottom and shores of the bay and of floating matters of sewage origin. Discharges of oil, refuse and other wastes from industrial plants and harbor craft augment the effect of pollution from sewage. Black and unsightly water out of which odorous gases are bubbling is further evidence of sewage pollution. It is most marked in tidal estuaries, such as Newtown Creek and Gowanus Canal and Wallabout Basin which serve as open sewers to carry pollution to the bay. It is also very noticeable in slips and similar stagnant areas near sewer outlets.

Our point of vantage is often unsatisfactory to distinguish this condition and fortunately so. Driving along the shore affords only an oblique view, so that the edge of the sewage field merges with the water. Observe, however, how clearly the sewage field is distinguishable in the accompanying aerial photographs.

Organic matter in sewage has a part in both physical and chemical pollution in the harbor. It is offensive in character and action. Composed of unstable complex chemical substances that are excellent food for bacteria, it is readily broken down by biological action into simpler compounds. In the process of decomposition, the bacteria draw upon the dissolved oxygen in the water to meet the needs of their metabolism, thereby continuously reducing the quantity of dissolved oxygen (chemical pollution). As the oxygen in the waters of the harbor is reduced below 70% of the natural quantity, fish life is first threatened and then disappears altogether. So long as some dissolved oxygen is present, the decomposition proceeds without the formation of offensive gases. Eventually, however, when the dissolved oxygen is all gone, putrefaction takes place and produces the nauseous odors that are an accompaniment of the physical pollution in the harbor caused by sewage.

Bacteria in sewage number literally millions even in a thimble full. Most of them are harmless to man and are useful agents in reducing organic substances to a stable, or non-putrescible, condition. Some are pathogerms capable of causing typhoid, dysentery and other gastro-intestinal diseases in man. Their presence in waters of the harbor makes it unsafe for shellfish culture or for bathing.

Sewage has been defined by the American Public Health Association as "a combination of

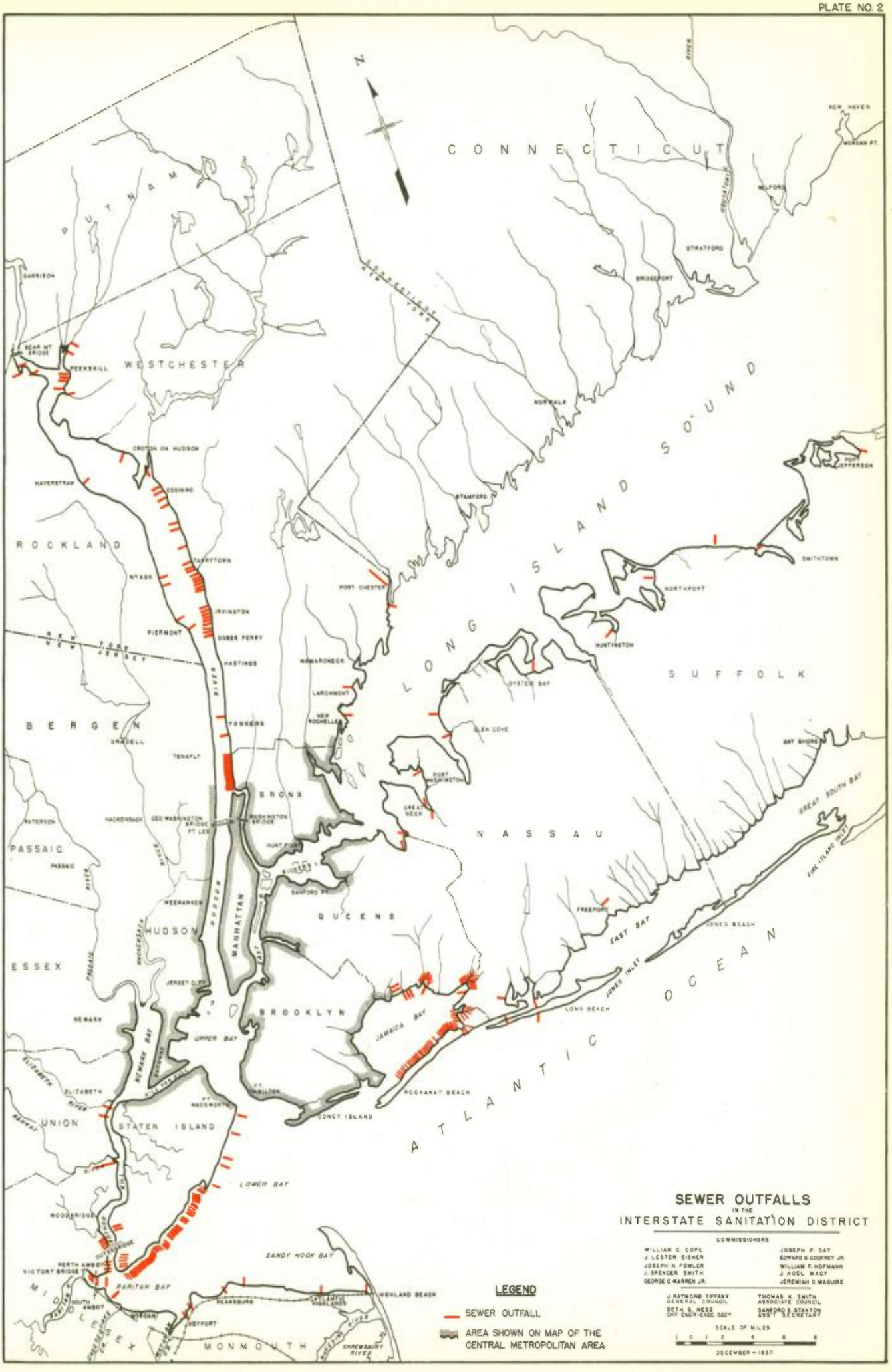
Photographs by Courtesy of New York City Department of Parks

The new Henry Hudson Drive along the Hudson River, New York City, looking north from 72nd St. The discolored water areas show sewage flowing from the 72nd St., 80th St. and 91st St. sewers.

The new East River Drive approach to Triborough Bridge looking north from 90th St. The tide has been running north and just changed to bring fresh water in from Long Island Sound through Hell Gate between Wards and Welfare Islands—at the right edge of picture. The contrast between the grossly polluted water and the inflow from the Sound may be seen.

Photograph by Courtesy 27th Division Aviation, N.Y.N.G.

The discolored area around the end of the pier is sewage from the four-foot sewer at West 46th Street, Manhattan.



SEWER OUTFALLS
IN THE
INTERSTATE SANITATION DISTRICT

COMMISSIONERS

WILLIAM C. COPE	JOSEPH P. DAY
J. LESTER EISNER	EDWARD S. GODFREY JR.
JOSEPH N. FOWLER	WILLIAM F. HOFMANN
J. SPENCER SMITH	J. NOEL MACY
GEORGE C. WARREN JR.	JEREMIAH O. MAGUIRE

J. RAYMOND TIFFANY GENERAL COUNCIL	THOMAS K. SMITH ASSOCIATE COUNCIL
SETH B. HESS CHF ENGR-EXEC SECY	SANFORD E. STANTON ASST SECRETARY

LEGEND

- SEWER OUTFALL
- AREA SHOWN ON MAP OF THE CENTRAL METROPOLITAN AREA

SCALE OF MILES

1 0 1 2 4 6 8

DECEMBER - 1937

(a) the liquid wastes conducted away from residences, business buildings and institutions and
(b) from industrial establishments, with
(c) such ground water, surface and storm water as may be admitted or finds its way into the sewers."

Domestic sewage is a combination of elements (a) and (c). Industrial wastes are composed of elements (b) and (c). In appearance, sewage is gray, like dirty, soapy dishwater, with small pieces of floating or settling matter such as fecal solids, paper, rags, matches, grease, vegetable debris, fruit skins, seeds, etc.

Sewage is nearly all (99.9%) water, but the other substances present usually are offensive æsthetically or dangerous to health, or both. The objectionable elements in sewage may be classed as suspended matter (organic and inorganic), organic substances (in suspension and solution) and living organisms, mainly bacteria.

The most offensive constituents of sewage from a sanitary viewpoint are the waste products of the human body. It is this portion of the sewage that contains bacteria of various diseases. Untreated sewage discharged into waterways is a sinister means of transmitting diseases by polluting water supplies, the water at bathing beaches, or by infecting shellfish.

RIVERS ENTERING THE DISTRICT

The waters of the District are greatly influenced by the discharge of rivers into the District waterways. These rivers are listed below:

	Length in Miles	*Drainage Area in Square Miles*
Bronx River	30	60
Hudson River	300	13,500
Hackensack River	34	202
Passaic River	61	949
Elizabeth River	9	19
Rahway River	17	84
Raritan River	67	1,105
Total of Drainage Area		15,919

In addition to these, there are many small tidal creeks and upland streams, some of which are very badly polluted at the present time, which discharge into the various waters of the District.

POLLUTION ENTERING DISTRICT

Although New York City discharges more sewage into the waterways within the Interstate Sanitation District than all other places combined, nevertheless, a substantial portion of the pollution in these waters originates in other New York State and New Jersey municipalities.

In addition to sewage from New York City, the Hudson River receives sewage along its east shore from Yonkers and other Westchester County municipalities and, along its west shore, from Jersey City, Hoboken, Weehawken and other towns along the New Jersey Palisades and in Rockland County.

Long Island Sound receives sewage mainly from the Westchester municipalities of Pelham, New Rochelle, Mamaroneck and Rye; from Connecticut, the shore municipalities which contribute treated, partially treated and some untreated sewage; and from the Long Island communities of Great Neck, Port Washington, Glen Cove, Oyster Bay and Port Jefferson.

The East River receives sewage from the easterly portion of Manhattan and the Bronx from the northerly part of Queens, and from the northwesterly part of Brooklyn.

In the Upper Bay is the outlet of the Passaic Valley outfall sewer discharging sewage from Newark, Paterson and twenty other municipalities in the Passaic River Valley, N. J. Sewer outlets from lower Manhattan and the western part of Brooklyn also empty into the Upper Bay.

Bayonne, N. J., has sewer outlets into the Upper Bay, Kill van Kull and Newark Bay. The Passaic and Hackensack Rivers empty into Newark Bay, which finds an outlet through Kill van Kull into Upper Bay and

through Arthur Kill into Raritan Bay. Arthur Kill also receives sewage from Staten Island and the discharge of two joint trunk sewers in New Jersey. One of these trunk sewers serves thirteen communities in the Elizabeth River valley and the other serves cities and towns in the Rahway River valley.

The Lower Bay receives New Jersey sewage from New Brunswick, Perth Amboy and other places along the Raritan River and from the coastal communities of Highlands, Keansburg, etc. Sewer outlets along the west shore of Staten Island and the southwest shore of Brooklyn also discharge into the Lower Bay.

The Atlantic Ocean and Jamaica Bay, East Bay and other small bays north of the beaches along the ocean front receive sewage from some of the communities located along the south side of Long Island, including the southern portions of Brooklyn and Queens.

Tides cause tremendously large flows of water into and out of New York Harbor. Unfortunately they do not sweep clean each time. Sewage carried toward the ocean by an ebb tide is partly returned by the succeeding flood tide, tending to diffuse the pollution throughout the harbor. The flow of the Hudson, Passaic and other rivers into the harbor assists in carrying pollution out into the ocean. However, their influence in this respect, as well as in adding to the dilution of the sewage, is relatively small compared with that of the tidal action. Most of the suspended solids in the sewage is deposited on the bottom of the harbor, particularly during periods of slack tides.

SOME SEWAGE TREATMENT REQUIRED AT AN EARLY DATE

The tentative plans of the World's Fair provide for waterway access through a water-gate near the head of Flushing Bay to be made accessible by a suitable channel in the bay. The upper East River has for years been heavily polluted with sewage and Flushing Bay, which drains into it, is contaminated not only by tidal waters from the larger body, but by direct pollution from communities around it. The waters in the bay are now not only dangerous for bathing but offensive to eye and nose.

It is hoped that the East River pollution from those parts of Manhattan and The Bronx adjoining the Harlem River will soon be lessened by the completion of the Ward's Island intercepting sewers. This will not be enough to remedy conditions in Flushing Bay, and it is desirable that additional treatment plants to serve areas affecting the waters of Flushing Bay be in operation before the opening of the Fair.

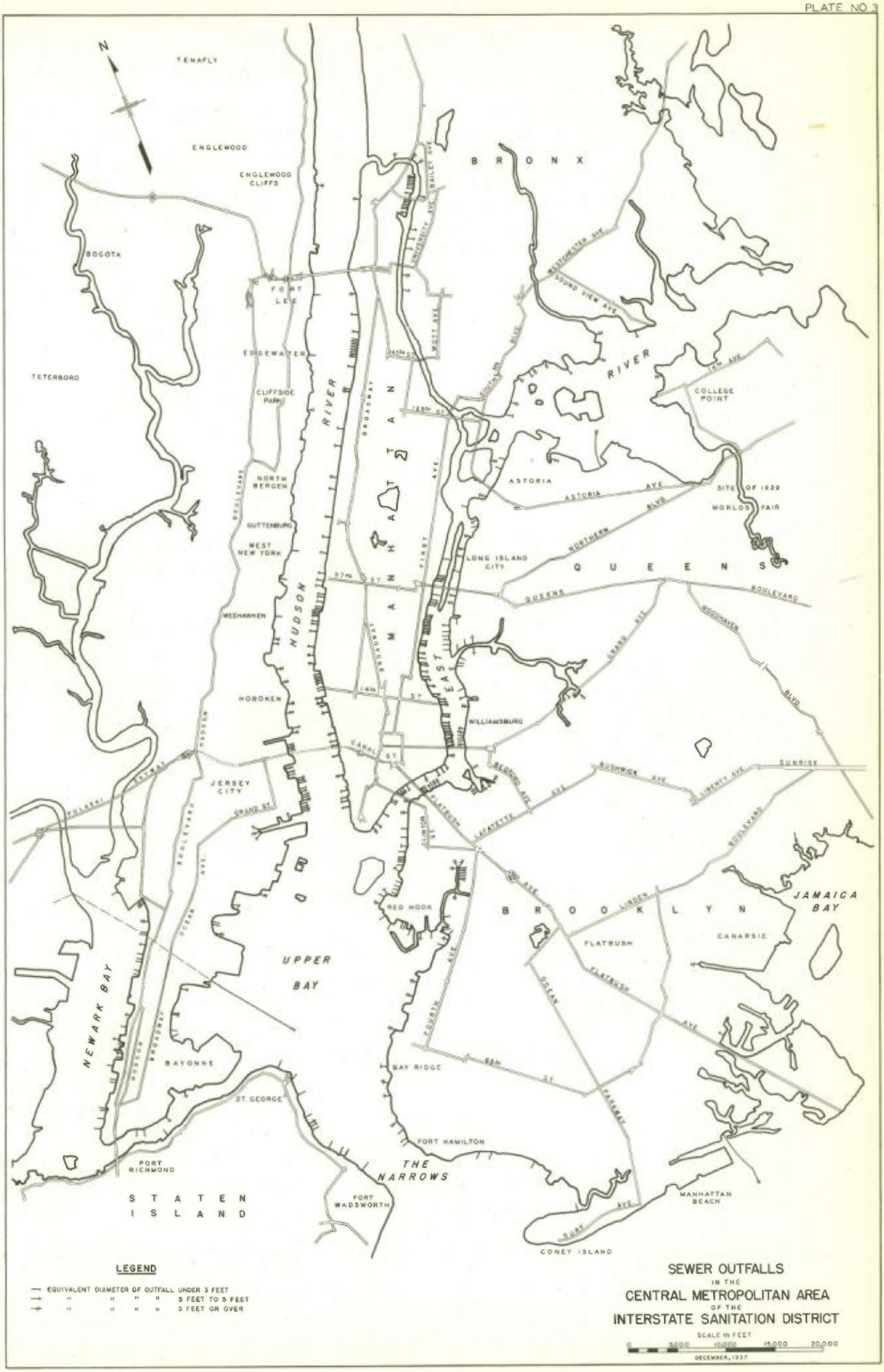
Construction is under way for an activated sludge plant at Tallman's Island which would serve the built-up areas in Flushing, College Point and Whitestone. The initial installation will have a capacity of 40,000,000 gallons daily to serve about 300,000 people.

This project will have the most immediate effect on the conditions in Flushing River and Flushing Bay.

POPULATION

A most satisfactory study of the present and future population of the New York Metropolitan Region as a whole has been made by the Regional Plan Association, Inc. In a recent revision of this entire region for 1940 to be 13,426,000, and that this population will increase to 15,355,000 in 1950 and to 16,379,000 in 1960. In making their estimates, this Commission includes several rural counties which are not within the limits of the Interstate Sanitation District. It is a fact, however, that the drainage from all of the counties included in their estimate and also from other counties of New York State eventually flow into waters which are tributary to the Interstate Sanitation District.

In the following tables, Nos. 1–6, there are given the 1930 populations of the various municipalities in the Sanitation District from which sewage is discharged directly into the various waters in the vicinity of


N
TENAFLY
ENGLEWOOD
ENGLEWOOD CLIFFS
BOGOTA
TETERBORO
FORT LEE
EDGEWATER
CLIFFSIDE PARK
NORTH BERGEN
GUTTENBURG
WEST NEW YORK
WEEHAWKEN
HOBOKEN
JERSEY CITY
HUDSON RIVER
HARLEM RIVER
EAST RIVER
BRONX
COLLEGE POINT
ASTORIA
LONG ISLAND CITY
QUEENS
SITE OF 1939 WORLDS FAIR
WILLIAMSBURG
RED HOOK
BROOKLYN
FLATBUSH
CANARSIE
JAMAICA BAY
UPPER BAY
NEWARK BAY
BAYONNE
ST. GEORGE
PORT RICHMOND
STATEN ISLAND
FORT WADSWORTH
THE NARROWS
FORT HAMILTON
BAY RIDGE
MANHATTAN BEACH
CONEY ISLAND
LEGEND
EQUIVALENT DIAMETER OF OUTFALL UNDER 3 FEET
3 FEET TO 5 FEET
5 FEET OR OVER
SEWER OUTFALLS
IN THE
CENTRAL METROPOLITAN AREA
OF THE
INTERSTATE SANITATION DISTRICT
SCALE IN FEET
0 5000 10000 15000 20000
DECEMBER, 1937

New York City. The tables further indicate whether or not the sewage is subjected to some kind of treatment to make it less objectionable before it is discharged into the waters of the District. These municipalities are all within the Interstate Sanitation District as defined by legislation. They have been grouped in accordance with the parts of the harbor waters into which the raw or treated sewage is discharged. It should be understood that by the word "treated," it is not intended to convey the meaning that the effluent discharged from the sewage treatment works is in compliance with the terms of the legislation establishing the Interstate Sanitation District. In many instances it is known that the treatment of the sewage is inadequate, and plans are being made for improvements and extension of some of the sewage treatment plants.

The population data does not include any municipalities in the State of Connecticut nor in the State of New York above the northern boundary of Westchester County. The population data is taken from the 1930 Federal Census.

The total population now residing in the District is 9,905,175.

TABLE NO. 1

Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into the Hudson River above the George Washington Bridge. Data from 1930 Census.

	Population Contributing Sewage	
	Untreated	*Some Form of Treatment*
New York State—		
Bear Mountain—3 Plants	.....	19,000
Briarcliff Manor	.....	1,794
Buchanan	1,346	.....
Croton-on-Hudson	.....	2,447
Dobbs Ferry	5,741	.....
Hastings	7,097	.....
Haverstraw	5,621	.....
Irvington	3,067	.....
Montrose	*	.....
North Tarrytown	.....	7,417
Nyack	5,392	.....
Ossining	.....	15,241
Peekskill	.....	17,125
Piermont	.....	1,765
South Nyack	2,212	.....
Tarrytown	.....	6,841
Verplank	*	.....
Westchester Trunk Sewers—		
North and South Yonkers Outlets—		
Ardsley	.....	1,135
Bronxville	.....	6,387
East Chester	.....	20,340
Elmsford	.....	2,935
Greenburgh	.....	35,821
Mount Vernon	.....	61,499
North Castle	.....	2,540
North Pelham	.....	4,890
Pelham	.....	2,053
Pelham Manor	.....	4,908
Pleasantville	.....	4,540
Scarsdale	.....	9,690
Tuckahoe	.....	6,138
Valhalla (Est.)	.....	1,600
White Plains	.....	35,830
Yonkers	.....	134,646
West Haverstraw	2,034	800
New York City—		
Bronx	25,000	.....
Manhattan (Dyckman St.)	.....	36,000
New Jersey State—		
Englewood Cliffs	.....	809
	57,510	444,191
SUMMARY:		
Population from which sewage is discharged into the Hudson River from North boundary of Westchester County to the George Washington Bridge—		
Untreated		57,510
After some form of Treatment		444,191
		501,701

*Data incomplete, under investigation.

TABLE NO. 2

Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into Long Island Sound and the East River, North of Riker's Island. (Municipalities in Connecticut State omitted from Table.) Data from 1930 Census.

	Population Contributing Sewage	
	Untreated	*Some Form of Treatment*
New York State—		
Glen Cove	.....	11,430
Great Neck	.....	5,824

Huntington	.....	6,500
Kings Park State Hospital	.....	6,200
Larchmont	.....	5,282
Mineola	.....	8,155
New Rochelle	.....	54,000
North Hempstead	.....	4,000
North Port	.....	2,528
Oyster Bay	.....	5,500
Port Chester	.....	22,662
Port Jefferson	.....	1,300
Port Washington	.....	6,000
Sunken Meadows State Park	.....	7,500
Westchester Trunk Sewers—		
Harrison Town	.....	7,000
Mamaroneck	.....	11,766
Rye	.....	8,712
New York City—		
Bronx*	350,000	.....
Queens	440,000	40,000
	790,000	214,359

SUMMARY:

Population from which sewage is discharged into Long Island Sound and the East River from Port Jefferson to Riker's Island—	
Untreated	790,000
After some form of Treatment	214,359
	1,004,359

*With the completion of trunk sewer construction the sewage will be treated at the recently completed Ward's Island Sewage Treatment Plant.

TABLE NO. 3

Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into the Hudson River south of the George Washington Bridge, the East River south of Riker's Island and the Upper Bay. Data from 1930 Census.

	Population Contributing Sewage	
	Untreated	*Some Form of Treatment*
New York State—		
New York City (Est)—		
Bronx	355,000	535,000
Queens	259,000	.....
Manhattan	1,166,000	665,000
Brooklyn	1,970,000	.....
Richmond	25,000	.....
New Jersey State—		
Bayonne	58,979	.....
Cliffside Park	.....	15,267
Edgewater	4,089	.....
Fort Lee	8,759	.....
Guttenberg	6,535	.....
Hoboken	59,261	.....
Jersey City	236,715	.....
Union City	58,659	.....
Weehawken	14,807	.....
West New York	37,107	.....
Passaic Valley Trunk Sewer (1,024,954)		
Belleville	.....	26,974
Bloomfield	.....	38,077
Clifton	.....	46,875
East Newark	.....	2,686
East Orange	.....	68,020
East Rutherford	.....	7,080
Garfield	.....	29,739
Glen Ridge	.....	7,365
Haledon	.....	4,812
Harrison	.....	15,601
Kearney	.....	40,716
Lyndhurst	.....	17,362
Montclair	.....	42,017
Newark	.....	382,037
North Arlington	.....	8,263
Nutley	.....	20,572
Orange	.....	35,399
Passaic	.....	62,959
Paterson	.....	138,513
Prospect Park	.....	5,909
Rutherford	.....	14,915
Wallington	.....	9,063
	4,259,911	2,240,221

SUMMARY:

Population from which sewage is discharged into the Hudson River south of the George Washington Bridge, the East River south of Riker's Island and Upper New York Bay—	
Untreated	4,259,911
After some form of Treatment	2,240,221
	6,500,132

TABLE NO. 4

Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into Newark Bay, Kill van Kull and Arthur Kill. Data from 1930 Census.

	Population Contributing Sewage	
	Untreated	*Some Form of Treatment*
New York State—		
Richmond (Staten Island)	55,000	.....
New Jersey State—		
Bayonne	30,000	.....
Jersey City	80,000	.....

Elizabeth	50,000	.....
Joint Outlet Sewer (370,780)		
East Orange	.....	13,600
Hillside	.....	17,600
Irvington	.....	56,730
Maplewood	.....	21,320
Millburn	.....	8,600
Newark	.....	60,300
Roselle Park	.....	8,070
South Orange	.....	13,600
Summit	.....	15,570
Union	.....	16,470
West Orange	.....	24,330
Elizabeth	.....	64,590
Rahway Valley Trunk Sewer (59,670)		
Cranford	.....	11,126
Garwood	.....	3,344
Rahway	.....	16,011
Springfield	.....	3,725
Kenilworth	.....	2,243
Roselle Park	.....	896
Westfield	.....	15,801
Clark Twp.	.....	1,474
Woodbridge	.....	5,050
Carteret	13,339	.....
Linden	21,206	.....
Woodbridge	10,216	10,000
	259,761	390,450

SUMMARY:

Population from which sewage is discharged into Newark Bay, Kill van Kull and Arthur Kill—	
Untreated	259,761
After some form of Treatment	390,450
	650,211

TABLE NO. 5

Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into Raritan Bay, Lower New York Bay and Sandy Hook Bay. Data from 1930 Census.

	Population Contributing Sewage	
	Untreated	*Some Form of Treatment*
New York State—		
Mount Loretto Home	.....	*
New York City, Boro of Richmond	20,000	24,000
Richmond Hospital	.....	*
S. S. White Laboratories	.....	*
New Jersey State—		
Atlantic Highlands	.....	2,000
Highlands	.....	1,877
Keansburg	.....	2,190
Keyport	.....	4,940
Perth Amboy	.....	43,516
South Amboy	8,476	.....
	28,476	78,523

SUMMARY:

Population from which sewage is discharged into Raritan Bay, Lower New York Bay and Sandy Hook Bay—	
Untreated	28,476
After some form of Treatment	78,523
	106,999

*Data incomplete, under investigation.

TABLE NO. 6

Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into the Waterways along the South Shore of Long Island, West of Fire Island Inlet. Data from 1930 Census.

	Population Contributing Sewage	
	Untreated	*Some Form of Treatment*
New York State—		
Beth Page State Park	.....	2,300
Cedarhurst	.....	5,000
Central Islip Hospital	.....	8,100
Freeport	.....	15,467
Garden City	.....	7,180
Hempstead	.....	12,650
Hempstead Lake	.....	9,500
Jones Beach	.....	100,000
Lawrence	.....	3,041
Long Beach	.....	5,817
New York City—		
Brooklyn	125,000	465,000
Queens	.....	340,000
Pilgrim State Hospital	.....	9,500
Rockville Center	.....	13,718
Valley Stream State Park	.....	17,500
West Long Beach	.....	2,000
	125,000	1,016,773

SUMMARY:

Population from which sewage is discharged into Waters on the south shore of Long Island, west of Fire Island Inlet—	
Untreated	125,000
After some form of Treatment	1,016,773
	1,141,773

TABLE NO. 7

Summary of Population of Municipalities in the Interstate Sanitation District Discharging Raw or Treated Sewage Directly into the Waterways of the District. Data from 1930 Census.

Section No.	District	Population Contributing Sewage: Untreated	Population Contributing Sewage: Some Form of Treatment
1.	Hudson River above Washington Bridge.	57,510	444,191
2.	East River and Long Island Sound North of Riker's Island...	790,000	214,359
3.	Hudson River below Washington Bridge, East River South of Riker's Island and Upper New York Bay	4,259,911	2,240,221
4.	Kill van Kull, Newark Bay and Arthur Kill	259,761	390,450
5.	Lower New York Bay Sandy Hook Bay and Raritan Bay...	28,476	78,523
6.	South Shore of Long Island, West of Fire Island Inlet	125,000	1,016,773
		5,520,658	4,384,517

SUMMARY:

Population from which sewage is discharged directly into the waters of the Interstate Sanitation District—	
Untreated	5,520,658
After some form of Treatment.	4,384,517
	9,905,175

Practically all of this population is of an urban character. There are six municipalities in the area, the populations of which are over 100,000. These are as follows:

New York City	6,930,446
Newark	442,337
Jersey City	316,715
Paterson	138,513
Yonkers	134,646
Elizabeth	114,589

Twenty-five of the municipalities have populations of over 25,000. Within the district there are 68 municipalities having populations between 5,000 and 20,000.

In Table No. 8 that follows, there is given a list of municipalities and their populations, not within the Sanitation District, but from which the sewage, either treated or untreated, is discharged into comparatively short waterways which are tributary to the district as defined by law. Most of the sewage from the municipalities listed in the table is treated before it is discharged into the rivers or tidal waters.

TABLE NO. 8

Population of Municipalities from which Sewage, either Treated or Untreated, is Discharged into Rivers (Other than the Hudson) which are tributary to the Waters of the Interstate Sanitation District.

Municipality	Population Contributing Sewage: Untreated	Population Contributing Sewage: Some Form of Treatment
New Jersey—		
Bergenfield-Dumont	.....	14,677
Bernardsville	.....	3,336
Bogota	.....	7,341
Boonton, Dover, etc.	.....	16,807
Bound Brook*	7,372	.....
Butler-Bloomingdale	.....	5,935
Caldwell	.....	9,547
Carlstadt	.....	5,425
Chatham-Madison	.....	11,350
East Rutherford	.....	7,080
Englewood	.....	17,805
Essex Fells	.....	1,115
Fairview	.....	9,067
Hackensack	.....	24,568
Hasbrouck Heights	.....	5,658
Highland Park	.....	8,690
Hohokus-Mahwah	.....	3,536
Kearney	.....	40,716
Leonia	.....	5,350
Little Falls	.....	5,161
Little Ferry	.....	4,151
Lodi	.....	1,294
Lyndhurst	.....	17,362
Manville	.....	5,440
Maywood	.....	3,398
Metuchen	.....	5,748
Middlesex Boro	.....	3,504
New Brunswick	.....	34,550
North Arlington	.....	8,263
North Bergen	.....	40,714
North Brunswick	.....	3,622
Oradell	.....	2,360
Palisades Park	.....	7,065
Plainfield, North Plainfield, Dunellen	.....	51,011

Raritan Twp.*	10,025	.....
Red Bank	.....	11,622
Ridgefield	.....	4,671
Ridgefield Park	.....	10,764
Riverside (Bergen Co.)	.....	2,210
Rumson	.....	2,073
Rutherford	.....	14,915
Sayreville*	8,660	.....
Secaucus	.....	8,950
Somerville*	8,255	.....
South Bound Brook	.....	1,763
South River*	10,759	.....
Teaneck Twp.	.....	16,513
Totowa	.....	4,600
Verona	.....	7,161
	45,071	476,888

SUMMARY:

Treatment plant under construction	45,071
Some form of Sewage Treatment	466,888
	511,959

*Plant under construction.

It can be readily understood that the discharge of sewage from a population as large as that indicated in the above tables must have an injurious effect upon part or all of the waters into which the sewage is discharged unless it is first subjected to proper purification treatment.

Practically all of the New York Metropolitan District is an industrial and commercial development which has grown very rapidly in the past. There is no reason to doubt that this growth will continue, although recent estimates indicate that it will be at a somewhat slower rate. The metropolitan district has well developed transportation facilities which are constantly being expanded. It is needless to point out that this is necessary since New York City and vicinity has developed the greatest amount of ocean commerce on the eastern seaboard. Even as the transportation facilities must be developed, the sanitation of the metropolitan district must be maintained at a high standard for the satisfactory continuation of the growth and the development of the territory.

NEW SOURCES OF WATER SUPPLIES

From a sanitary standpoint, the population studies are significant as they are a measure of the rate at which water used for domestic and manufacturing purposes is converted into sewage. As a further indication of the increased amount of sewage which will be produced in the District in the future, it is of interest to note that the City of New York is now engaged in the construction of the first parts of a water supply system from which 440,000,000 gallons of water per day will be obtained from tributaries of the Delaware River and 100,000,000 gallons daily from Rondout. In New Jersey plans have been made and the necessity fully recognized, for the early construction of a water supply that will be capable of delivering 100,000,000 gallons of additional water daily to the North Jersey metropolitan area. It is probable that this source of supply will be taken from the upper branches of the Raritan River.

The five boroughs of the City of New York in the year 1936 used an average of 972,000,000 gallons of water daily of which 913,000,000 gallons were derived from city water supplies and 59,000,000 gallons were taken from private companies. The maximum water consumption of New York City during the summer months (July 10th) was 1,240,300,000 gallons per day.

It can be seen from the above that the total amount of the new water supplies which are projected for the New Jersey Metropolitan District and for New York City amount to 540,000,000 gallons per day. This is sufficient water to supply approximately 4,500,000 people. If this number of inhabitants is added to the 9,905,000, as listed by the 1930 census figures above, it will be seen that the total population will be about 14,405,000. This figure is somewhat below the population as given by the Regional Plan Association, Inc., for the year 1950 estimate for the entire metropolitan district.

QUANTITY OF SEWAGE

The total quantity of sewage which is produced daily in the Interstate Sanitation District reaches almost inconceivable figures. It is difficult to realize that any body of water could receive 1,608,870,000 gallons of sewage a day without producing a general nuisance. That this was not the case can be attributed to the fact that the large waterways which compose New York Harbor bring each day a very large amount of oxygen into it. This oxygen is used for the oxidization of the sewage organic matter and is nature's means of again purifying the water and converting the putrescible organic matter into an inert stable material. As long as there is a sufficient surplus of oxygen in the waterway, offensive conditions of a general character will not be produced. However, due to the fact that most sewers discharge their contents at or near the shore line, the sewage is not intimately mixed with the fresh sea and upland river water which contains the oxygen required for stabilization.

And as most of the solid materials contained in raw sewage are deposited along the shore by settling out of the mixture of sewage and water and accumulate there, it often happens that, although there is sufficient oxygen present in the whole body of water, local offensive conditions exist along the shore and small estuaries.

In the following table Number 9 is given the quantity of sewage originating in each municipality in the Sanitation District. The table further shows, whether or not the sewage has received some form of treatment before being discharged into the natural waterways and also briefly indicates the kind of sewage treatment provided. For the purpose of facilitating the use of the data in administrative work the table has been arranged in several sections which relate to particular sections of the harbor waters.

Briefly summarized the quantity of untreated sewage which is discharged into the Sanitation District waterways without treatment is 1,066,454,000 gallons daily. An additional quantity of effluents from sewage treatment plants amounts to 542,416,000 gallons per day. This makes a total quantity of 1,608,870,000 gallons of sewage and sewage effluents which are discharged in the District waters. This amount will be increased from year to year from increasing population and also from the extension and construction of sewer systems in areas in which they do not exist at present.

One billion, six hundred million gallons of sewage each day is an immense quantity. If Central Park were flat and surrounded by a wall, this flow of sewage for one day would fill it to a depth of six feet and the sewage flow for a week would fill it to a depth of forty-two feet. This will give some idea as to the quantity of sewage originating in the Sanitation District each day.

That the discharge of such a very large quantity of untreated sewage has not caused a terrible offensive condition in the past is due to the great natural waterways that comprise the Hudson River and New York Harbor. Nevertheless, it is true that in some of the more restricted areas, such as the Passaic River, the Harlem River and several small inlets and bays, there have been very offensive conditions in the past. Remedial measures, either by changing the location of the sewer outlet or by treating the sewage in some manner, have temporarily abated the offensive conditions or changed their location to less populous districts. It is obvious that with a continual growth in population, there will be a necessary increase in the quantity of sewage originating in the District. Therefore, if present conditions are to be maintained or improved, it is necessary that plans now be made for the construction of additional sewage treatment plants to reduce to a considerable extent the ever increasing burden placed upon the harbor waters. Otherwise the extent of the offensive waterways will be considerably extended. As we find at the end of the year 1937 that 1,066,454,000 gallons of untreated sewage are daily being discharged into a waterway, it is apparent that there is much work to be done both in designing and constructing main sewers and sewage treatment plants.

TABLE NO. 9

Quantity of Sewage, Untreated or Treated in Some Form, which is Discharged into Various Sections of the Waterways included in the Interstate Sanitation District.

Section No.	Municipality	Quantity of Sewage (Gallons Daily) Untreated	Treated	Treatment	Effluent Discharges Into
1	HUDSON RIVER SECTION				
	Bear Mountain	.....	206,000	Sedimentation, Chlorine	Hudson River
	Briarcliff Manor	.....	108,000	Sedimentation, Sand filters	Pocantico River
				Chlorine (4 months)	Hudson River
	Buchanan	*	.....		
	Croton-on-Hudson	.....	300,000	Chlorine	Hudson River
	Dobbs Ferry	574,000	.....	None	Hudson River
	Hastings	700,000	.....	None (Part through North Yonkers)	Hudson River
	Haverstraw	560,000	.....	None	Hudson River
	Irvington	300,000	.....	None	Hudson River
	Montrose	*	.....		
	North Tarrytown	.....	1,000,000	Chlorine	Hudson River
		.....	30,000	Sedimentation	Hudson River
	Nyack	540,000	.....	None	Hudson River
	Ossining	.....	1,525,000	Chlorine (4 Months)	Hudson River
	Peekskill	.....	1,750,000	Chlorine (4 Months)	Hudson River
	Piermont	.....	176,000	Sedimentation	Hudson River
	South Nyack	250,000	.....	None	Hudson River
	Tarrytown	.....	700,000	Chlorine (4 Months)	Hudson River
	Verplank	*	.....		
	Westchester County—				
	North Yonkers	.....	10,600,000	Fine Screens, Chlorine	Hudson River
	South Yonkers	.....	29,200,000	Fine Screens, Chlorine	Hudson River
	West Haverstraw	200,000	75,000	Sedimentation, Chlorine	Minisceongo Creek
	New York City—				
	Bronx	4,250,000	.....	None	Hudson River
	Manhattan (Dyckman St.)	.....	6,120,000	Fine Screens	Hudson River
	Englewood Cliffs, N. J.	.....	216,000	Sedimentation	Hudson River
	Sub-Total	7,374,000	52,006,000		
2	LONG ISLAND SOUND SECTION				
	Glen Cove	.....	1,600,000	Sedimentation, Chlorine	Long Island Sound
	Great Neck (2 Plants)	.....	1,320,000	Sedimentation, Chlorine	Manhasset Bay
	Huntington	.....	600,000	Sedimentation, Chlorine	Huntington Harbor
	King's Park	.....	800,000	Activated Sludge, Chlorine	Long Island Sound
	Larchmont	.....	1,000,000	Sedimentation, Chlorine	Larchmont Harbor
	Mamaroneck	.....	300,000	Sedimentation, Chlorine	Larchmont Harbor
	Mineola	.....	640,000	Activated Sludge, Sand Filters	Ground Water
	New Rochelle	.....	5,400,000	Fine Screens, Chlorine	Long Island Sound
	North Hempsted	.....	300,000	Sedimentation, Chlorine	Little Neck Bay
	Northport	.....	250,000	Sedimentation, Chlorine	Northport Harbor
	Oyster Bay	.....	1,000,000	Sedimentation, Chlorine	Oyster Bay
	Port Chester	.....	2,150,000	Sedimentation, Chlorine	Port Chester Harbor

TABLE NO. 9—Continued

Quantity of Sewage, Untreated or Treated in Some Form, which is Discharged into Various Sections of the Waterways included in the Interstate Sanitation District.

Section No.	Municipality	Quantity of Sewage (Gallons Daily) Untreated	Treated	Treatment	Effluent Discharges Into
	Port Jefferson	.....	120,000	Sedimentation, Chlorine	Port Jefferson Harbor
	Port Washington	.....	800,000	Sedimentation, Chlorine	Manhasset Bay
	Sunken Meadows	.....	75,000	Sedimentation, sub-surface irrigation	Ground Water
	Westchester County Sewers—				
	Mamaroneck	.....	9,670,000	Fine Screens, Chlorine	Long Island Sound
	Blind Brook	.....	1,050,000	Fine Screens, Chlorine	Long Island Sound
	New York City—				
	Bronx	59,500,000	.....	None	East River and Long Island Sound
	Queens	81,600,000	.....	None	East River and Long Island Sound
	North Beach	.....	5,000,000	Fine Screens	Flushing Bay
	Sub-Total	141,100,000	32,075,000		
3	CENTRAL METROPOLITAN SECTION				
	New York City—				
	Bronx	60,350,000	.....	None	East and Harlem Rivers
	Ward's Island	.....	90,950,000	Activated Sludge	East River
	Manhattan	198,220,000	.....	None	Hudson, East Rivers, Upper Bay
	Ward's Island	.....	104,550,000	Activated Sludge	East River
	Canal Street	.....	8,500,000	Fine Screens	Hudson River
	Brooklyn	334,900,000	.....	None	East River and Upper Bay
	Queens	34,030,000	.....	None	East River
	Richmond	4,250,000	.....	None	Upper New York Bay
	Bayonne	7,500,000	.....	None	Upper New York Bay
	Cliffside Park	.....	1,500,000	Sedimentation	Hudson River
	Edwegater	500,000	.....	None	Hudson River
	Fort Lee	1,000,000	.....	None	Hudson River
	Guttenberg	800,000	.....	None	Hudson River
	Hoboken	7,500,000	.....	None	Hudson River
	Jersey City	25,000,000	.....	None	Hudson River
	Union City	7,500,000	.....	None	Hudson River
	Weehawken	1,800,000	.....	None	Hudson River
	West New York	4,600,000	.....	None	Hudson River
	Passaic Valley Trunk Sewer	.....	100,000,000	Sedimentation	Upper New York Bay
	Sub-Total	687,950,000	305,500,000		

TABLE NO. 9—Continued

Quantity of Sewage, Untreated or Treated in Some Form, which is Discharged into Various Sections of the Waterways included in the Interstate Sanitation District.

Section No.	Municipality	Quantity of Sewage (Gallons Daily) Untreated	Treated	Treatment	Effluent Discharges Into
4	KILLS AND NEWARK BAY SECTION				
	New York City—				
	Richmond	9,350,000	.....	None	Kill van Kull and Arthur Kill
	Bayonne	3,000,000	.....	None	Kill van Kull and Newark Bay
	Jersey City (80,000)	15,000,000	.....	None	Newark Bay
	Elizabeth	10,000,000	.....	None	Arthur Kill, etc.
	Joint Meeting Sewer	.....	22,000,000	Sedimentation, Chlorine	Arthur Kill
	Rahway Valley Sewer	.....	10,000,000	Sedimentation, Chlorine	Arthur Kill
	Carteret	800,000	.....	None	Arthur Kill
	Linden	2,000,000	.....	None	Creek
	Woodbridge	1,200,000	1,000,000	Sedimentation	Woodbridge Creek, etc.
	Sub-Total	41,350,000	33,000,000		
5	LOWER BAY SECTION				
	New York City	3,400,000	.....	None	Raritan, Lower Bay
	(Richmond Boro)	.....	4,080,000	.....	Lower New York Bay
	Atlantic Highlands	.....	600,000	Sedimentation, Chlorine	Sandy Hook Bay
	Highlands	.....	1,200,000	Sedimentation, Chlorine	Sandy Hook Bay
	Keansburg	.....	2,000,000	Fine Screens, Chlorine	Raritan Bay
	Keyport	.....	500,000	Sedimentation, Hypochlorite	Raritan Bay
	Perth Amboy	.....	10,000,000	Chem. prec., Sedimentation, Chlorine	Raritan River
	South Amboy	750,000	.....	None	Raritan River
	Sub-Total	4,150,000	18,380,000		
6	OCEAN SECTION				
	Beth Page Park	.....	50,000	Sedimentation	Ground Water
	Cedarhurst	.....	350,000	Sedimentation	Jamaica Bay
	Central Islip Hospital	.....	800,000	Sedimentation, Sand Filters	Ground Water
	Freeport	.....	1,500,000	Chemical Precipitation, Chlorine	Cow Creek, East Bay
	Garden City	.....	900,000	Sedimentation, Sand Filters	Ground Water
	Hempstead	.....	1,140,000	Sedimentation, Sand Filters	Ground Water
	Hempstead Lake	.....	285,000	Sedimentation, Sub-Surface Irrigation	Ground Water
	Jones Beach	.....	3,000,000	Sedimentation, Sub-Surface Irrigation	Ground Water
	Lawrence	.....	480,000	Sedimentation, Chlorine	Bannister Creek
	Long Beach	.....	1,500,000	Sedimentation, Chlorine	Atlantic Ocean

TABLE NO. 9—Continued

Quantity of Sewage, Untreated or Treated in Some Form, which is Discharged into Various Sections of the Waterways included in the Interstate Sanitation District.

Section No.	*Municipality*	*Quantity of Sewage Untreated (Gallons Daily)*	*Quantity of Sewage Treated (Gallons Daily)*	*Treatment*	*Effluent Discharges Into*
	New York City—				
	Brooklyn	161,030,000	.....	None	Coastal Waters
	Coney Island	.....	18,000,000	Sedimentation, 8 Months Chemical Precipitation & Chlorine, 4 Months	Rockaway Inlet
	26th Ward	.....	35,000,000	Fine Screens	Jamaica Bay
	Queens	23,500,000	.....	None	Coastal Waters
	Hammels	.....	5,300,000	Fine Screens	Jamaica Bay
	Jamaica	.....	29,000,000	Fine Screens	Jamaica Bay
	Pilgrim State Hospital	.....	1,200,000	Sedimentation, Sand Filters	Ground Water
	Rockville Center	.....	1,650,000	Activated Sludge, Pulp Filters, Chlorine	Parson's Creek
	Valley Stream Park	.....	600,000	Sedimentation, Sub-Surface Irrigation	Ground Water
	West Long Beach	.....	700,000	Sedimentation, Chlorine	East Rockaway Inlet
	Sub-Total	184,530,000	101,455,000		

SUMMARY

1	Hudson River from the Northerly Boundary of Westchester County to George Washington Bridge	7,374,000	52,006,000
2	Long Island Sound and East River North of Riker's Island	141,100,000	32,075,000
3	Lower Hudson, Upper New York Bay and East River South of Riker's Island	687,950,000	305,500,000
4	Kill van Kull, Newark Bay and Arthur Kill	41,350,000	33,000,000
5	Lower New York Bay and Raritan Bay	4,150,000	18,380,000
6	Tide Waters, South Shore of Long Island, West of Fire Island	184,530,000	101,455,000
	Total	1,066,454,000	542,416,000

MANUFACTURING WASTES

Investigations of large groups of urban population have shown that the manufacturing wastes are almost equal to the domestic wastes. No reliable data is available at this time which shows the amount of industrial wastes in the District which is not included in the above table. It seems from certain indications at hand that the total amount of these wastes will be large. As many trade wastes contain more organic material than domestic sewage and, gallon for gallon, use more oxygen from the diluting waters, therefore the quantity discharged is of particular importance. In some cases manufacturing waste can not be taken into sewage treatment works and must be separately treated.

SEWAGE TREATMENT PLANTS

Sewage treatment is a broad term used to cover a great variety of structures and apparatus that purify sewage to varying degrees to satisfy the sanitary requirements of the environment. As a minimum method of treatment, sewage is often passed through fine screens which remove only particles over a quarter of an inch in diameter. After maximum treatment, the sewage can be converted into a clear sparkling water practically free from harmful bacteria, such that it would be equal in quality and appearance to most natural brook waters. For large quantities of sewage, the latter type of treatment which usually includes sand filtration would be extremely expensive and is usually resorted to only where streams are small or for the protection of sources of water supply. Many degrees of purification between the above extremes can readily be obtained by providing the proper engineering works.

The design of each sewage treatment plant should be based upon a study of the uses to which the water is put which receives the treated sewage effluent and also the character of the neighborhood in which the plant is to be located.

The law establishing the Interstate Sanitation District provides that the water areas shall be subdivided into two classes—"A" and "B". Before sewage may be discharged into class "A" area, it shall be so treated that all floating solids and at least 60% of the suspended solids shall be removed. Bacteria of the B. Coli group (intestinal bacilli) shall be removed so that the effluent will not contain more than one organism per cubic centimeter in more than 50% of the samples of sewage effluent tested, providing, however, that in the case of discharge of the effluent into waters used primarily for bathing, this bacterial standard need not be required except during the bathing season. Also the sewage shall be so purified that the dissolved oxygen in the tidal waters in the general vicinity of the point of discharge shall not be less than 50% of saturation during any week of the year.

Before being discharged into class "B" areas, sewage shall be so treated as to remove at least 10% of the suspended solids, although a greater removal of the suspended solids may be required in certain localities, and also to effect a reduction in the oxygen demand of the sewage effluent so that the dissolved oxygen in the tidal waters in the general vicinity of the point of discharge shall not be less than 30% saturation during any week of the year. Each sewage treatment plant constructed in the District will, therefore, have to be designed to comply with the above minimum requirements and also meet any requirements of a local character which are necessary to prevent offensive conditions.

Fine screens for sewage treatment usually consist of slotted plates having openings not more than 3/16 of an inch wide through which the sewage flows. These screens are mechanically operated and mechanically cleaned. A plant of this character will remove solids that would float on the surface or which are over 3/16 of an inch in diameter, but does not remove the finer solids that might settle out in a sluggish current and be deposited as sludge banks. The screenings are usually carted away for burial.

Another method of removing solids from sewage is by use of various types of settling

tanks. The effluents from these tanks vary from soapy appearing water to a dark gray liquid depending greatly upon the age of the sewage when it is received at the plant. The effluent contains a large amount of solids both in solution and finely divided solids in suspension which, unless discharged into waterways large enough to oxidize it quickly, may give rise to offensive conditions. Such plants are satisfactory in many cases where the sewage is very largely diluted by river or other waters. Otherwise the effluent is still putrescible.

Where it is necessary to purify sewage to an extent that it will not be putrescible, some kind of oxidation or purifying agencies are required. There are various types of units used for this purpose which are known as sprinkling filters, contact beds, sand filters and the recently developed activated sludge process. The activated sludge process is one in which sewage is treated by blowing small particles of air through it while it is flowing in a large tank and mixing some of the aerated sludge with the incoming sewage to provide the organisms which oxidize the organic matter in the sewage.

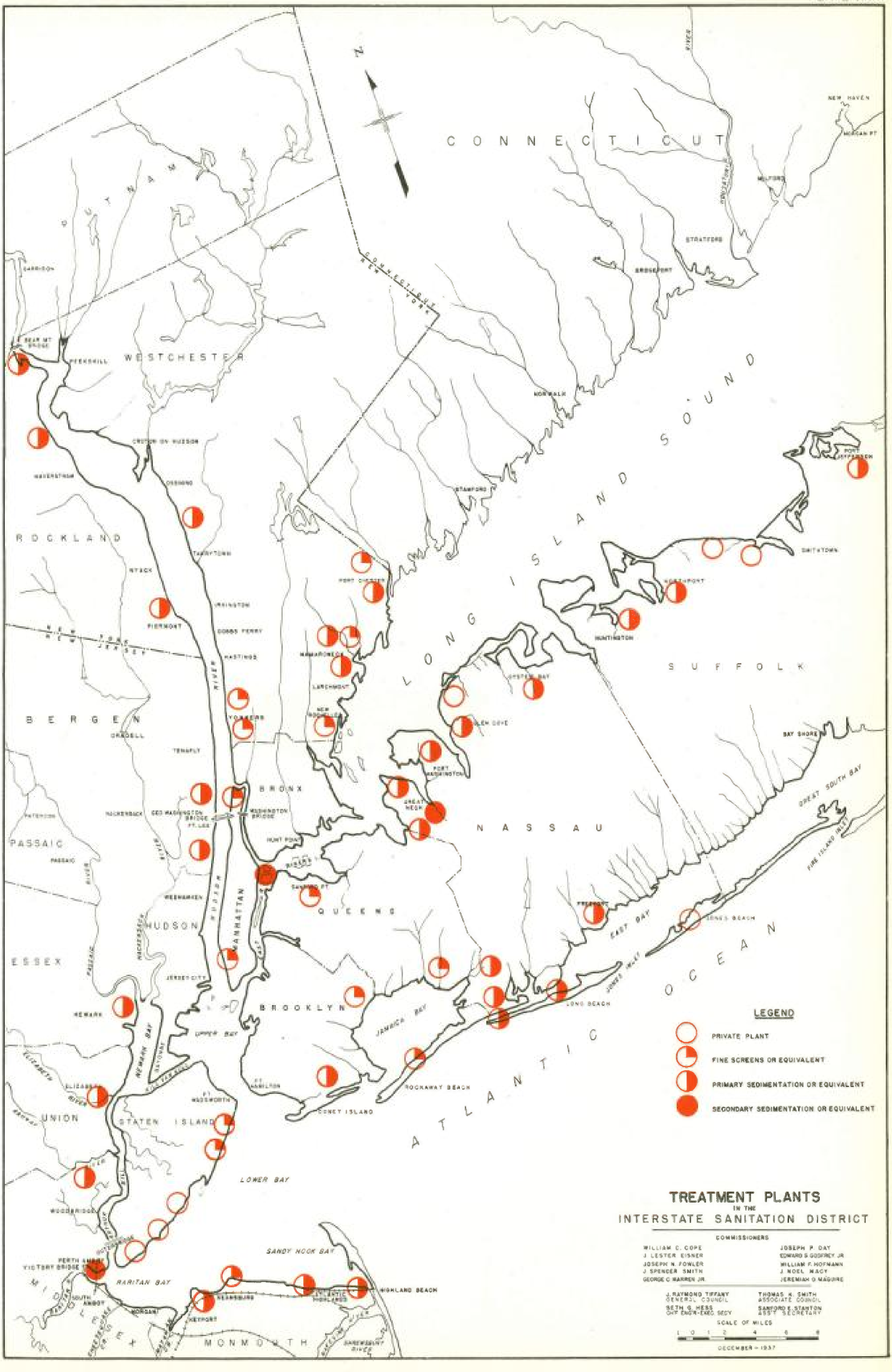
Where it is necessary to protect the health of the adjacent resident population from the bacterial sewage pollution, the effluent from any of the above types of sewage treatment works can be disinfected by the addition of chlorine gas under conditions which permit it to act upon the sewage organisms for a short period of time. By the disinfection of the sewage the bacteria to which the disease producing organisms belong, are destroyed. Wherever sewage treatment plants are constructed, it is of prime importance that their operation be under the supervision of men who will operate the plant conscientiously in order to see that the purification processes are kept working at full efficiency.

DESCRIPTION OF EXISTING SEWAGE TREATMENT PLANTS AND AREA

During recent years the construction of sewage treatment plants in the Sanitation District has been carried forward vigorously. In 1936 sewage treatment plants were put in operation at the City of Perth Amboy, N. J., and by New York City at Coney Island. During the year 1937, the Ward's Island Sewage Treatment Plant was put in service. This plant was designed to eventually treat 180,000,000 gallons of sewage per day. At the present time about 60,000,000 gallons of sewage are being received. With the completion of the trunk sewer system in 1938, the plant will be treating a sewage flow of approximately 130,000,000 gallons per day. Sewage treatment plants were also put in operation for the Joint Meeting serving municipalities in Union and Essex counties at Elizabeth, N. J., and for the several cities and towns in the Rahway Valley operating as the Rahway Valley Joint Meeting. The effluents from these two plants are discharged into Arthur Kill. A sewage treatment plant was constructed at Kings Park, Long Island, and the sewage plant at Freeport was very largely reconstructed for the purpose of providing better treatment. On Staten Island sewage treatment plants were constructed for the Richmond Hospital, Mount Loretto Home and the S. S. White Dental Laboratories. Sewage plants are being constructed at the present time in the Sanitation District at Tallmans Island and Jamaica in the Borough of Queens and by the Department of Parks at Orchard Beach.

Although the Raritan River above Perth Amboy is not in the Sanitation District established by law, its discharge has a large effect upon the waters of Raritan Bay. It is, therefore, of interest to note that several sewage treatment plants have been constructed along that river serving the municipalities of Highland Park, Manville, New Brunswick and Middlesex Borough. At the present time new sewage treatment plants are being constructed at Bound Brook, Raritan, Sayreville, Somerville and South River. It would appear that in the near future there will be no untreated sewage discharged into the Raritan River.

As the Ward's Island Treatment Plant is one of the largest and most up-to-date of this kind in the East, it should prove of


CONNECTICUT
PUTNAM
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
HUDSON
ESSEX
UNION
BRONX
MANHATTAN
QUEENS
BROOKLYN
NASSAU
SUFFOLK
STATEN ISLAND
MONMOUTH
LONG ISLAND SOUND
ATLANTIC OCEAN
NEW YORK
NEW JERSEY
CONNECTICUT
NEW YORK
HUDSON RIVER
UPPER BAY
LOWER BAY
NEWARK BAY
RARITAN BAY
SANDY HOOK BAY
JAMAICA BAY
GREAT SOUTH BAY
EAST BAY
JONES INLET
FIRE ISLAND INLET
NEW HAVEN
MILFORD
STRATFORD
BRIDGEPORT
NORWALK
STAMFORD
PORT JEFFERSON
SMITHTOWN
NORTHPORT
HUNTINGTON
OYSTER BAY
GLEN COVE
PORT WASHINGTON
GREAT NECK
BAY SHORE
FREEPORT
JONES BEACH
LONG BEACH
ROCKAWAY BEACH
CONEY ISLAND
FT. HAMILTON
FT. WADSWORTH
GARRISON
BEAR MT. BRIDGE
PEEKSKILL
CROTON ON HUDSON
HAVERSTRAW
OSSINING
TARRYTOWN
NYACK
PIERMONT
IRVINGTON
DOBBS FERRY
HASTINGS
YONKERS
PORT CHESTER
MAMARONECK
LARCHMONT
NEW ROCHELLE
TENAFLY
CRESKILL
PATERSON
HACKENSACK
GEO. WASHINGTON BRIDGE
FT. LEE
WASHINGTON BRIDGE
HUNT POINT
WEEHAWKEN
JERSEY CITY
NEWARK
ELIZABETH
WOODBRIDGE
PERTH AMBOY
VICTORY BRIDGE
SOUTH AMBOY
MORGAN
KEYPORT
KEANSBURG
ATLANTIC HIGHLANDS
HIGHLAND BEACH
LEGEND
PRIVATE PLANT
FINE SCREENS OR EQUIVALENT
PRIMARY SEDIMENTATION OR EQUIVALENT
SECONDARY SEDIMENTATION OR EQUIVALENT
TREATMENT PLANTS
IN THE
INTERSTATE SANITATION DISTRICT
COMMISSIONERS
WILLIAM C. COPE
J. LESTER EISNER
JOSEPH N. FOWLER
J. SPENCER SMITH
GEORGE C. WARREN JR.
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EDWARD S. GODFREY JR.
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DECEMBER - 1937

interest not only to engineers and sanitarians, but also to the inhabitants of New York and vicinity. For this reason there is given below a brief history and description of the plant. This has been abstracted from the paper entitled the "Ward's Island Sewage Treatment Project" by Walter D. Binger, Deputy Commissioner of Sanitation, and Richard H. Gould, Chief Engineer, Bureau of Sewer Disposal and Intercepting Sewers, of New York City.

As this plant will treat approximately one-fifth of the New York City sewage flow, it should accomplish a great deal in improving the conditions in the Harlem and East Rivers.

"About twenty-three years ago in its final report published in 1914 the Metropolitan Sewerage Commission recommended a sewage treatment plant on Ward's Island to serve an area substantially the same as that now included in the present construction. This recommendation, however, was for a sedimentation plant. It was not until the spring of 1927 that the State Legislature released to the city a site of fifty-two acres on Ward's Island for the construction of a sewage treatment works. The actual detail design of the works was not commenced until late in 1928 when the firm of Fuller & McClintock, Engineers, were employed to design an activated sludge plant on Ward's Island and the Borough Presidents of Manhattan and The Bronx were authorized to start preliminary work on the intercepting sewer system.

"The control of the entire project passed to the newly created Department of Sanitation in December 1929, but although plans for the treatment works were advanced rapidly it was not until June, 1931, that actual construction was started.

"It may well be asked why a project of this type, of such vital importance to the city in bringing about decent and safe conditions along the waterfront, which plays so great a part in preserving property values, can take nearly a quarter of a century to effectuate. The answer probably lies in the lack of realization of the general public of the seriousness of conditions that exist and the reluctance of those heretofore responsible for the expenditure of public funds to provide large sums of money for projects that are non-revenue producing and of which the public have little opportunity to know or even to realize the existence. That this point of view is changing rapidly is evidenced by the developments in the past few years.

"Whereas the Ward's Island project has taken such a long time to realize, since 1934 modern treatment works have been undertaken and completed at Coney Island; another is under construction on Tallman's Island in College Point, Queens; bids have been received on a revision of the treatment works at North Beach, Queens; preliminary authorizations have been made for the construction of large treatment works in Jamaica; another at Hendrix Street, Brooklyn and also for the doubling of the capacity of the Coney Island plant.

"The Ward's Island project receives the sanitary drainage from sections of Manhattan tributary to the East and Harlem Rivers from 72 to 176 Streets. From the Bronx under the present construction it is received from the area tributary to the Harlem River, from St. Ann's Avenue to Jerome Avenue. Authority has been given and funds are available for the extension of this area up to 192 Street, The Bronx.

"In Manhattan, the flow from some fifty-two outlets is collected through regulating gates, and tide gates are provided to prevent river water from flowing back into the intercepting sewers. The discharge through these regulators passes to an intercepting sewer along the water-front 6¾ miles long ranging in size up to 8'-2" x 10'-0" in section and flows to a central location at 110 Street. At this point a grit and screening chamber is provided where the coarser solids are screened out and the heavy grit removed.

"In the Bronx, the present construction up to Jerome Avenue includes 2½ miles of large intercepting sewers ranging up to 10'-6" x 12'-4" in section which receive the flow from eight existing sewers through regulators and with tide gates similar to the Manhattan construction. As in Manhattan, a grit and screening chamber is provided (of similar construction) and from this point the sewage is conducted to Ward's Island through a rock tunnel 10½ feet in finished diameter 150 feet below tidewater.

"The area drained includes 3,253 acres, in Manhattan, with the present population of 615,000 and an area of 4,314 acres in the Bronx with a present population of 553,000. The extension of the Bronx intercepting sewer, which will be built in 1938, will add an additional area of 3,025 acres.

"Eight preliminary settling tanks are provided, each approximately 100 feet square by 15 feet deep, and equipped with revolving mechanisms of the tractor type for sludge removal and for the removal of scum. They provide for a retention period of about one hour at average flow. From the settling tanks the flow is to the aeration tanks. These tanks are subdivided into four batteries, with four tanks in each battery, making a total of sixteen in all. Each tank is 345 feet long and 88 feet wide divided into four passes. The tanks have an effective depth of 15 feet and are of the spiral flow type with curved baffles. With one tank out of service an aerating period of 5¼ hours is provided at an average flow of 180 m.g.d. plus 25 per cent return sludge.

"Each aeration tank serves two final settling tanks. There are thirty-two final settling tanks each with a surface area of approximately 7500 square feet and an effective depth of 12 feet. With two tanks out of service, at the average rate of flow plus 25 per cent return sludge, the tanks have a capacity of

one thousand gallons per square foot per day. Sludge is removed from these tanks by mechanism of the conveyor type. The tanks are rectangular, the flow entering at the center and flowing both ways over four effluent weirs at each end of the tank. Sludge from these tanks is returned to the head of the aeration tanks where it is mixed wtih the incoming settled sewage. The operations are controlled from operating galleries totaling about 1600 ft. in length.

"The sludge from the storage tanks is discharged to sludge vessels and disposed of at sea at the authorized dumping grounds eight miles east southeast of Scotland Lightship, opposite the harbor entrance. The location is determined by the Supervisor of the Harbor, and is the same as used by the State of New Jersey.

"Three twin-screw diesel-propelled, ocean going steel sludge vessels 260 feet long are built for this service. Each has a capacity of 410,000 gallons of sludge and will operate at a speed of about 10 knots.

"The treatment works were rated on a conservative basis by the designers at a capacity of 180 MGD. The intercepting sewer system and tunnels are designed to take the ultimate flow from the tributary areas. The treatment works pass up to twice the dry weather flow through the primary settling tanks and one and a half times the dry weather flow through the aeration tanks and final settling tanks. At times of storm the flow not passing through the aeration tanks will be diverted to the river after receiving treatment by sedimentation. The entire tributary area is sewered on the combined system and during storms flows in excess of twice the dry weather flow will be diverted to the river through present outlets.

"On Saturday, October 16, 1937, the regulators connected to the Bronx trunk sewers were opened and the flow passed through the interceptors and grit chambers and was pumped through the preliminary settling tanks on Ward's Island and thence to the river."

COMPLIANCE WITH THE INTERSTATE COMPACT

Although analyses have not yet been made throughout the District, a reasonable estimate can be made as to whether or not the existing sewage treatment works will meet the Interstate Compact requirements through our knowledge of the degree of purification that can be attained by various types of sewage treatment plants. From a study of available data, it is apparent that only 30% of all the sewage discharged into the District waters is at present treated in any way whatsoever. An inspection of many of these plants and an estimate of the effectiveness of others reveals that at least 72% of the existing plants are either overloaded or inadequate to meet the Compact requirements. Even with the Ward's Island Sewage Treatment Plant in service only about one-third of the sewage originating in the Sanitation District is treated in any way and the majority of the sewage treatment plants at the present time are not discharging an effluent that would meet the standards of the Interstate Compact. Another way of stating this is that 86% of all the municipalities discharging sewage into the District waters are violating the Compact standards for purification.

DISSOLVED OXYGEN IN THE DISTRICT WATERS

All natural surface waters carry a certain amount of oxygen in solution. Under natural conditions, the amount of this oxygen varies mainly with the temperature. When polluting material is discharged into any natural surface water, the oxygen in the water is depleted and used for the purpose of oxidizing the polluting matter to an inert and inoffensive base material. While the polluting material is robbing the waterway of oxygen there are other agencies at work tending to increase the amount of oxygen, such as absorption from the air, wave action, and propeller action of boats or in an upland county, by streams splashing over rocks. In chemical analysis the dissolved oxygen figure is a measure of the ability of the water to assimilate and reduce further organic polluting material to inert matter without inoffensive conditions being incurred. Unfortunately for the requirements of sanitation, the amount of oxygen in the natural waters is greatest during cold weather when the oxidation of organic material proceeds at a slow rate and is much lower at high temperatures during the summer season when the bacterial decomposition of organic matter is much more rapid.

In a natural waterway where there is no population contributing pollution, the minimum percent of saturation of oxygen in the water would vary from 85% to 100% of saturation. This percentage figure gives

the relative amount of oxygen held by the water at the time the sample is taken. If this waterway received polluting material over a period of years in a gradually increasing amount, the amount of dissolved oxygen in the water would be diminished until no oxygen was present at all. Under these conditions the water with the polluting material would become offensive, due to putrefaction of the organic material.

It may be said generally in speaking of large bodies of water that when the oxygen content is reduced to an average figure of 30% of saturation at summer temperatures, there will be considerable danger of there being no residual oxygen in the vicinity of sewage outlets. These are usually along the shore line in the vicinity of dwellings or business places. When such a condition exists the natural waters attempt to correct it by oxidizing the organic material and for this purpose absorbing oxygen from the air. It is one of the main purposes of sewage treatment to so reduce the load of pollution that the condition of balance will be maintained between the oxidizing requirements of the pollution of various kinds and the supply of oxygen in the water. Since 1909, the City of New York has annually collected data during the summer months showing the amount of dissolved oxygen in the main branches of the New York Harbor waters. A summary showing the average percentages of saturation of the water with oxygen in the various parts of the harbor are shown in the following Table No. 10.

TABLE NO. 10

Average Percentage of Saturation of the Main Branches of New York Harbor

June 1st to October 1st

Year	*No. of Samps*	*Hudson River Below Spuyten Duyvil*	*Harlem River*	*Upper East River*	*Lower East River*	*Upper Bay*	*Kill van Kull*	*The Narrows*	*Arthur Kill*	*Jamaica Bay*
1909	404	72	55	86	65	67	79	83	..	..
1911	861	62	42	69	54	72	70	76	..	..
1912	150	58	..	..	49	64	65	71	..	..
1913	880	57	29	..	43	66	65	69	..	..
1914	473	50	30	50	40	71	..	68	..	..
1915	245	43	28	..	33	72	..	78	..	..
1916	176	46	24	..	26	64	..	63	..	..
1917	238	42	22	47	29	50	..	63	..	..
1918	54	54	23	50	21	56	..	61	..	..
1919	320	36	29	30	24	51	35	58	..	..
1920	264	44	23	50	27	43	42	52	..	..
1921	258	30	15	37	16	33	38	35	..	..
1922	280	44	26	51	26	51	51	60	..	..
1923	354	37	27	38	22	47	43	57	..	..
1924	643	44	26	45	26	48	48	73	..	..
1925	662	41	27	50	26	46	47	55	..	..
1926	396	23	14	37	13	26	29	40	26	66
1927	368	35	17	40	21	27	34	48	50	59
1928	433	37	28	41	23	47	41	44	56	69
1929	382	47	30	62	29	45	41	52	85	77
1930	332	37	25	40	20	38	39	51	49	73
1931	532	47	27	50	23	37	42	48	45	70
1932	582	41	20	38	16	43	47	51	71	75
1933	568	44	22	21	20	40	46	51	44	80
1934	751	47	22	39	16	39	50	52	55	69
1935	783	40	20	38	15	39	44	52	58	67

It shows, in all of the branches of the harbor waters, a reduction in a considerable amount from the natural condition. In most cases, there has been from year to year a gradual reduction in the amount of dissolved oxygen present indicating that the sewage entering the harbor waters has reached a point where the available oxygen supply is a continually diminishing quantity, as increasing pollution is discharged. The Hudson River at Spuyten Duyvil shows a drop from 72% in 1909 to 40% in 1935 with a minimum of 30% in 1921. In the Harlem River, which has long been throughout much of its length a public nuisance, the average data shows a drop from 55% saturation in 1909 to 20% in 1935. In the Upper East River, the oxygen supply was diminished from 86% in 1909 to 38% in 1934. In the Lower East River it has diminished from 65% to 15% in the same period.

These average figures do not indicate the worst conditions. In the following Table No. 11, it will be noted that on several occasions the analysis of the Harlem River water shows that there was no oxygen present and that in the Lower East River only 3 to 5 parts of oxygen were at times present. Under such conditions the ebulution of offensive gases is greatly increased during the hottest days of summer. For these reasons it was absolutely essential that the sewage discharged in these waters should receive some treatment as otherwise conditions would become worse and the area involved more extensive. Actually, the amount of oxygen in the New York Harbor waters is dependent upon the amount of oxygen brought in by fresh sea-water and by the oxygen contained in the various streams, such as the Hudson, which flow into the harbor together with the oxygen which is absorbed by the water from the atmosphere. The most important item is the oxygen brought in by the sea-water.

In the appendix will be found an abstract of a report made to the Joint Meeting Committee of Essex and Union Counties in New Jersey relative to the dissolved oxygen in Arthur Kill. The report shows that the oxygen in parts of the Kill was often below 5% during the period of investigation and at times there was no dissolved oxygen present. This more detailed study of a small section of the Harbor waters indicates that in certain localities conditions are very bad.

For comparison data is given in Appendix B relative to the amount of dissolved oxygen in Arthur Kill and Raritan Bay obtained in 1915 by the U. S. Public Health Service. The dissolved oxygen values were very much higher in Arthur Kill in 1915 than is shown by recent data for which see Appendix A.

TABLE NO. 11

Dissolved Oxygen Analyses Selected Stations

June 1st to Oct. 1st 1935

Station	*Number of Samples*	*Minimum and Date of Occurrence*		*Percent Saturation*				
				Top	*Bot.*	*Ebb*	*Flood*	*All Samples*
Hudson River—								
Pier A	26	14	Aug. 21	38	34	39	32	36
42nd Street NR	24	9	Aug. 21	45	26	38	28	36
155th Street NR	27	20	Aug. 15	47	35	48	36	41
Spuyten Duyvil NR	27	15	Aug. 21	58	34	53	43	46
Mt. St. Vincent	21	25	Sept. 13	71	45	60	58	59
Harlem River—								
Spuyten Duyvil	51	1	Aug. 21	44	39	35	44	42
Morris Hts.	49	0	See Note 1	30	27	27	29	28
155th Street	49	0	See Note 2	17	16	9	21	17
Willis Ave.	49	0	See Note 3	5	5	2	6	5
106th Street	49	0	See Note 4	5	6	2	7	6
Lower East River—								
Pier 10	25	4	Aug. 21	18	15	14	19	17
23rd Street	25	3	July 11	12	12	10	15	12
42nd Street	25	5	6/28, 7/11, 8/8	13	13	11	15	13
Hell Gate	23	4	July 12	17	19	14	19	18
Upper East River—								
Baretto Point	23	7	July 18	23	22	26	21	23
Flushing Bay	23	9	Sept. 12	28	28	34	26	28
Whitestone	23	22	July 12	43	44	54	39	44
Throg's Neck	23	39	July 2	55	57	59	54	56
Long Island Sound—								
Stepping Stones	6	62	Sept. 12	88	72	63	86	78

Zero Dissolved Oxygen in Harlem River on Dates as Follows:

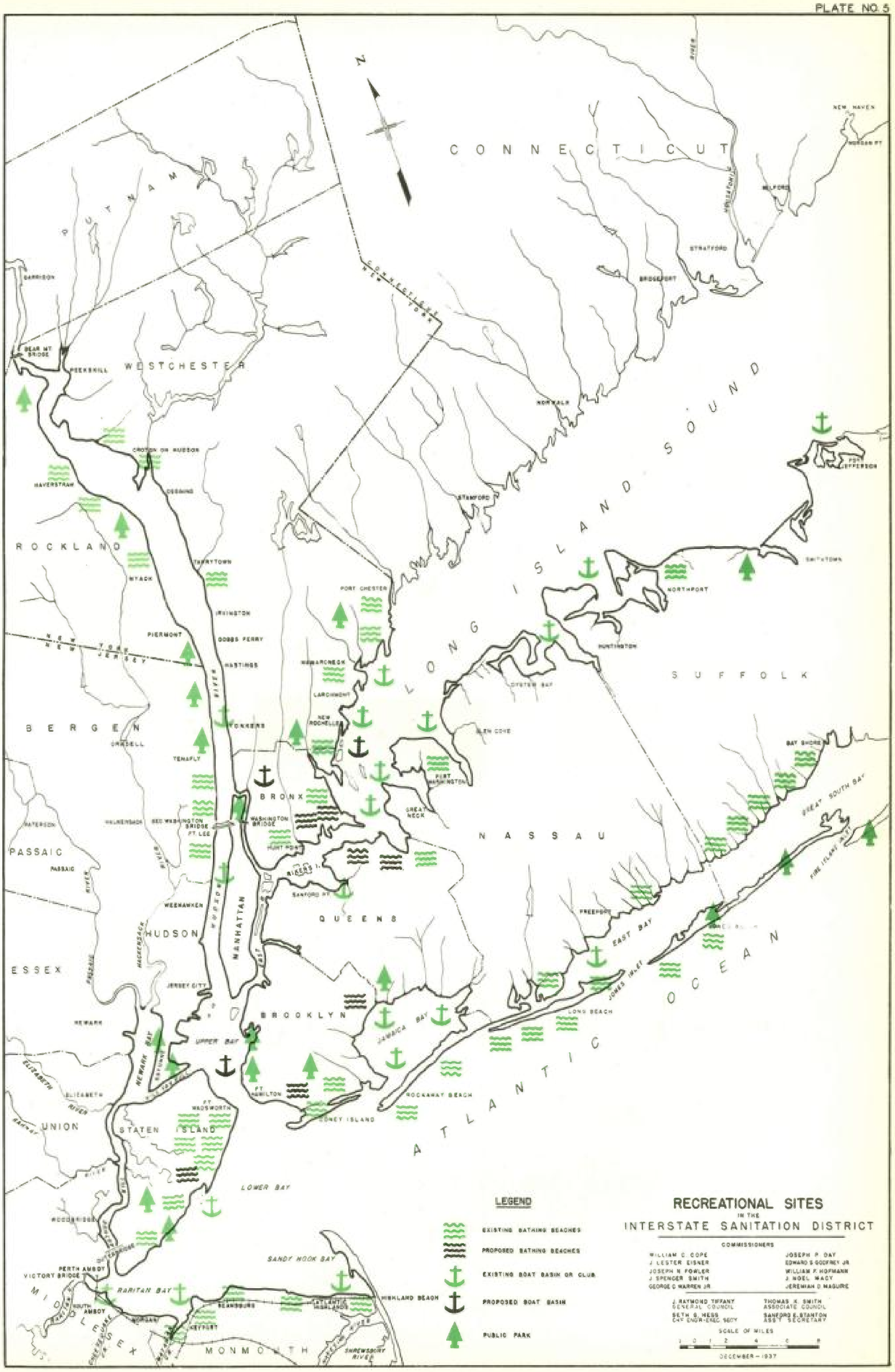
Note 1. July 23, Aug. 7, 8, 21, 23.
2. June 27, 28, July 11, Aug. 7, 8, 21, 23, Sept. 4, 19.
3. June 27, 28, July 2, 5, 11, 12, 18, Aug. 8, 21, 23, 30, Sept. 4, 6, 19.
4. June 27, July 2, 5, 12, 18, Aug. 7, 8, 21, 23, Sept. 4, 6.

Section IV—Use of Area

In the New York metropolitan area the largest concentration of humanity in the world is assembled. The problem of affording recreational facilities in keeping with the needs and demands of the ten millions of people abiding here is a problem no agency concerned with public welfare can overlook. Of all the facilities available to the people of this area the one affording the most in the way of recreational value is the bathing beach.

While it has been disclosed that we have here in the Interstate Sanitation District some 300 beaches, pools, lakes, and streams where bathing can be indulged in, there is a crying need for more of the best type and a most urgent need for protecting suitable waters from such pollution as had already led much of the shore front of the central area to be condemned as unfit for bathing. This spider of pollution is continually extending its web further towards the periphery of our area with a resulting economic loss that is almost incalculable. Naturally there exists an accompanying inconvenience that is continually affecting the people of this area. In this report is included a spot map which shows the locations of some of the existing recreational facilities in the region. We would call attention briefly to the rapid growth in the popularity of swimming and the water clarification problem it presents. This demand for swimming places has been partly met by both public and private agencies. The activities of public agencies is one indication of the marked change that has taken place in the conception of public recreation in the past decade. Emphasis is now being placed on the active or athletic interpretation instead of the passive or contemplative type. A recognition of this change can be seen in the development of the park systems of the country. Stadiums, athletic fields, swimming pools, beaches and boating facilities have been installed to an unusual degree in the public parks. Such a trend is welcome in that more people are afforded enjoyment of the parks. The community is now getting a larger return on its investment in the park system. Marginal parks have boomed in popular favor. The clamor has been for parks that unfurl shimmering ribbons of lakes and rivers at their feet. The provision of parks on a national, state and local scale has been generally accepted as a public obligation. The provision of swimming facilities within these parks follows as a corollary. In fact, a public park system must today be regarded as inadequate and incomplete if bathing facilities are not provided in reasonable relation to population density, transportation facilities and the geography of the community. In the District area, the development of beach facilities is one of the outstanding achievements in providing for active recreation. The supply of public facilities of this kind has lagged so far behind the need that commercial enterprise has found it profitable to go into the business on an extensive scale.

Although no corresponding detail survey was made of swimming facilities at an earlier date, it is known that many of the present facilities are of recent development. Nor is the increasing demand peculiar to our District area alone; beach and lake facilities have sprung up all over the country. In connection with planning for the future, the question at once arises as to whether the popularity of swimming and bathing will further increase. There may be some elements of a fad in the movement such as the fashionableness of a sun tan, but the movement is largely motivated by permanent values and permanent appeals. Oppressive temperatures are always making a dip in the water a pleasure. Swimming as a sport will always have its appeal. Sports and


LEGEND
EXISTING BATHING BEACHES
PROPOSED BATHING BEACHES
EXISTING BOAT BASIN OR CLUB
PROPOSED BOAT BASIN
PUBLIC PARK
RECREATIONAL SITES
IN THE
INTERSTATE SANITATION DISTRICT
COMMISSIONERS
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ASS'T SECRETARY
SCALE OF MILES
DECEMBER – 1937
CONNECTICUT
PUTNAM
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
HUDSON
ESSEX
UNION
MIDDLESEX
MONMOUTH
BRONX
MANHATTAN
QUEENS
BROOKLYN
STATEN ISLAND
NASSAU
SUFFOLK
LONG ISLAND SOUND
ATLANTIC OCEAN
UPPER BAY
LOWER BAY
SANDY HOOK BAY
RARITAN BAY
JAMAICA BAY
EAST BAY
GREAT SOUTH BAY
HUDSON RIVER
NEW HAVEN
BRIDGEPORT
STRATFORD
NORWALK
STAMFORD
PORT CHESTER
MAMARONECK
LARCHMONT
NEW ROCHELLE
YONKERS
TARRYTOWN
IRVINGTON
DOBBS FERRY
HASTINGS
PIERMONT
NYACK
HAVERSTRAW
OSSINING
CROTON ON HUDSON
PEEKSKILL
BEAR MT. BRIDGE
GARRISON
TENAFLY
WASHINGTON BRIDGE
HUNT POINT
RIKERS I.
WEEHAWKEN
JERSEY CITY
NEWARK
ELIZABETH
PERTH AMBOY
VICTORY BRIDGE
SOUTH AMBOY
KEYPORT
KEANSBURG
ATLANTIC HIGHLANDS
HIGHLAND BEACH
SHREWSBURY RIVER
FT. WADSWORTH
FT. HAMILTON
CONEY ISLAND
ROCKAWAY BEACH
LONG BEACH
JONES INLET
FREEPORT
BAY SHORE
FIRE ISLAND INLET
GREAT NECK
PORT WASHINGTON
GLEN COVE
OYSTER BAY
HUNTINGTON
NORTHPORT
SMITHTOWN
PORT JEFFERSON

games requiring physical exertion will continue to offer more pleasure in combination with swimming facilities, and the health value of sunshine and out-of-doors will be even more appreciated by the people in the future. Like golf, which was one a rich man's game, swimming needed only the facilities at reasonable prices to make it popular with the masses.

Places where the general public may swim are located approximately on the map (Plate No. 5). Beaches which extended in some cases for several miles along the shore are shown by single symbols where they are under single operation. There are open to the public either in public parks or under operation by private agencies ten beaches on the New Jersey shore of the Interstate Sanitation District, eighteen in New York City and forty-one in the remaining New York section of the District, bringing the total to sixty-nine beaches now operating in this area.

Some mention has been made of marginal parks. As these are the parks more directly affected by the District waters we shall confine our remarks herein to a brief mention of some of the more important marginal park developments abutting the Interstate Sanitation District.

Most of the frontage on the Atlantic Ocean in Brooklyn and Queens is already developed for parks and public beaches. Of a total of approximately 17 miles, more than 15 miles is in City or Federal ownership. Coney Island and Rockaway beaches account for 13 miles and are fully developed with a boardwalk along the landward margin. Bath houses, athletic and amusement features are supplied commercially back of the boardwalks. Jacob Riis Park with a shore front of about a mile in length, is now being further developed by the Park Department with bath houses and supplementary service, and recreational features on the order of those at Jones Beach. Attention might also be called to the availability of Fort Tilden west of Jacob Riis Park with its mile or more sea frontage which can eventually be developed for public use. From the Fort to the point of the Rockaway Peninsula is another mile and a half of beach front which can also be developed. Staten Island has a frontage on the lower bay some thirteen miles in length. Two parks and a public beach are now being developed along this front. Wolf's Pond Park is already open to the public. It has a frontage on the bay about one half mile. Great Kills Park, practically in the center of the island frontage, requires more development before its two miles of bay shore can be used. It is in the process of being developed. Between Fort Wadsworth and Miller Field a distance of two and one half miles the City is establishing a public beach and park.

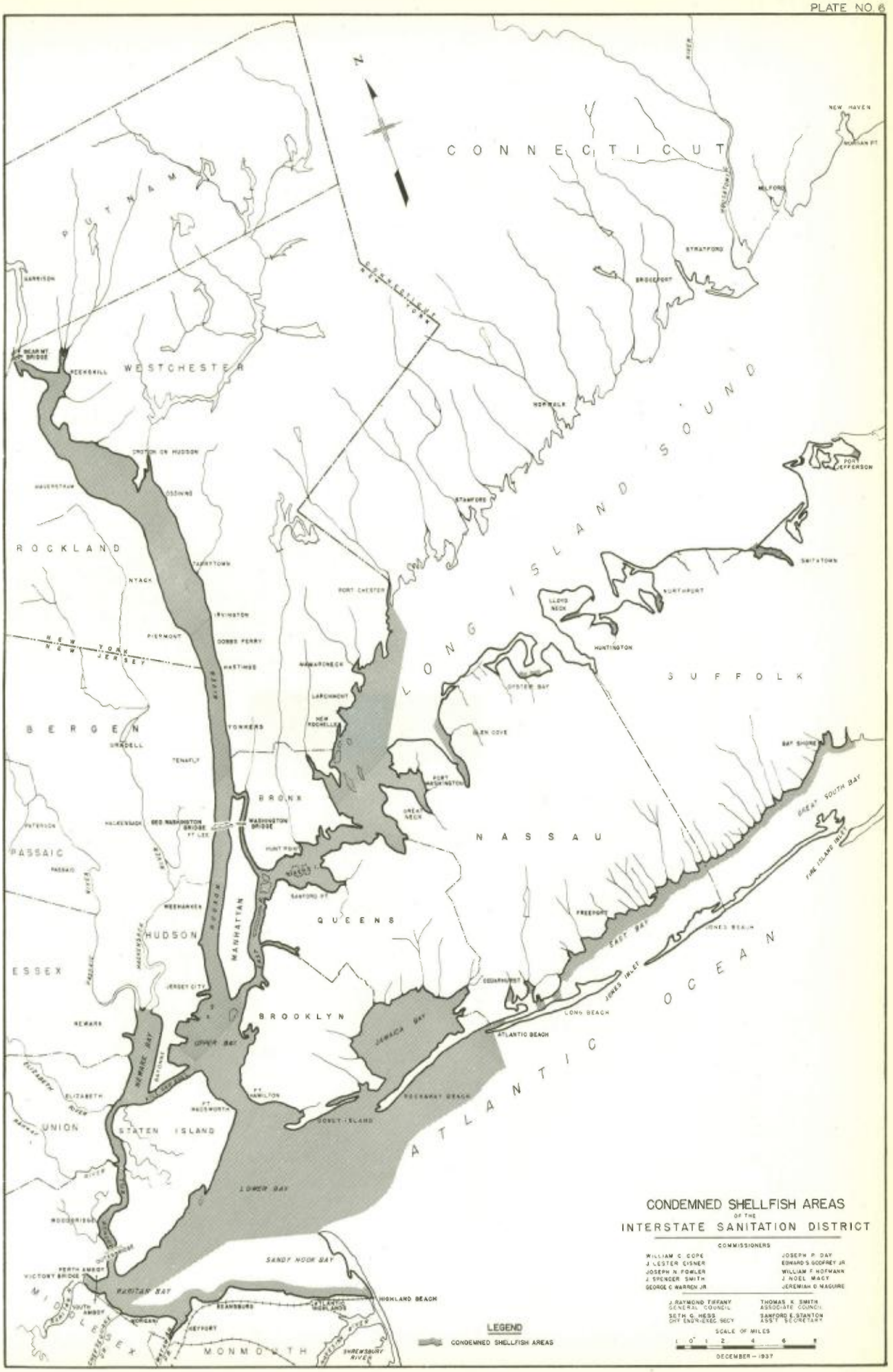
In October, 1935, arrangements were completed by which the ungranted lands under water along their front were turned over to the City by the State. While transportation to the shore is not yet sufficient to make these areas effective in serving the central part of the City, they have been wisely acquired in advance. About half the Bronx frontage on the Long Island Sound is included in Pelham Bay and Fort Schuyler Parks. The shore between these two parks, a length of about three miles, is proposed to be acquired for public use. Bathing facilities are being developed in the existing parks and a new beach and bath house in Orchard Beach and Pelham Bay Park was opened in July, 1936. On the Sound the proximity of shore frontage throughout its length, the absence of lakes and large streams, together with the fact that population is located for the most part near the shores results in bathing facilities limited almost entirely to the north and south shores. In that part of the district west of the Hudson River the Palisades Interstate Park Commission has made great strides towards providing adequate bathing facilities. The Palisades Interstate Park has a total of 42,319 acres of shore front properties abutting the Hudson River. As for South Jersey, a legislative commission was created in 1933 and is actively engaged in promoting the development of a state park at Sandy Hook. At our Keansburg hearing the State Park Advisor, representing the

New Jersey State Department of Conservation and Development, made known the fact that an appropriation had been made in the winter of 1936 for the development of a recreational park on Cheesequake Creek and Raritan Bay. It was made known that the intention is to develop the lakes and lagoons and clear the bay front for extensive recreational facilities in this area. Although there is no State Park Department in New Jersey the State Planning Board and the State Department of Conservation and Development have been actively engaged in extending the park system throughout the state.

Another very important item in the manner of the use to which the District waters are put, is that of pleasure craft. Just as the Bays of New York, Raritan and Newark, with their interlinking rivers and tidal estuaries collectively constitute the area of largest concentration of water commerce in the world, so also might the remainder of the District undisputedly claim top rank as the anchorage for yacht clubs and boat basins. In the Jersey section of the District are located approximately ten yacht clubs extending from Englewood Basin south to Sandy Hook. In the waters of New York City are located fifty-eight yacht clubs. A score of public boat basins are also under construction in this area. In the remainder of the District there are registered some fifty-four additional clubs.

The glory that was New York harbor's in the past decades has of recent years receded to the outlying districts which now give anchorage to most of the larger yacht clubs. Although approximately 50% of the largest yacht clubs in the Interstate Sanitation District are still located in the waters of New York City, the migration is nevertheless definitely outward. There are numerous instances of boat companies having moved to avoid ruining the finishes on their boats before sales could be effected. On the whole, pollution has resulted in a wholesale inconvenience to the members of the various clubs formerly located in the Hudson, East and Harlem Rivers.

For over a century the shell fish industry in the harbor of New York has been one of the largest in the world. Within the past two decades health authorities have continually condemned additional portions of the area so that at the present time less than 30% of the waters of the Interstate Sanitation District are now open as shell fish marketing sources. For many years the greater portion of the area has been a prolific producer of both hard and soft clams. Whether this variety of shell fish was harvested from this area years ago to the detriment of public health, is not known, but without present knowledge concerning the relationship between contaminated shellfish and the incidence of certain diseases, it behooves present day public health agencies to consider more carefully the source of market shell fish. We now find that the State Health Agencies have condemned as sources of market shell fish, the entire Hudson River from its southern extremity to a point well beyond the northerly limits of the District, the Upper and Lower Bays, the Newark Bay, the greater portion of Raritan and Sandy Hook Bays, and their interconnecting rivers, as well as the East and Harlem Rivers. Pollution has made it necessary to close the Atlantic Ocean front as far east as Rockaway Inlet, as well as the mouths of the streams and rivers entering into the bays on the southerly shore of Long Island. Certain harbors on the northerly shore of Long Island are also closed as market sources for shell fish. The exact limits of these areas may be noted on a special map we have prepared for this purpose entitled "Condemned Shellfish Areas in the Interstate Sanitation District" (Plate No. 6). The tremendous economic loss incurred by the necessary closing of formerly famous shell fish grounds will be discussed in Section V, "Effect of Pollution".



CONDEMNED SHELLFISH AREAS
OF THE
INTERSTATE SANITATION DISTRICT

COMMISSIONERS

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J. RAYMOND TIFFANY GENERAL COUNCIL	THOMAS K. SMITH ASSOCIATE COUNCIL
SETH G. HESS CHIEF ENGINEER& SECY	SANFORD E. STANTON ASST. SECRETARY

SCALE OF MILES

1 0 1 2 4 6 8

DECEMBER – 1937

Section V—Effect of Pollution

The effect of pollution is most generally considered from three angles, namely, esthetic, health and economic.

Although the esthetic effect of pollution has its reaction in reducing property value along the shore line, it is not always possible to evaluate. One cannot adequately describe the unsavory conditions that exist in many places within the Interstate Sanitation District. Certain areas have degenerated from fine residential districts into unwholesome rat infested water-fronts. One must inspect the affected areas in a small boat to adequately appreciate these conditions. We have within our District many places which are truly navigable sewers. There are other places within the District which may not have reached the degree of pollution to make them continuously revolting, however, on summer days or early evenings, the odors are most unpleasant. It is reasonable to assume, however, that when the pollution of the entire District has been treated to meet the standards of the Compact, that even within the Class "B" areas, one will not be offended by unpleasant odors or sights.

The health menace of pollution is also a most difficult matter to evaluate and as a matter of fact, difficult to prove. One will be faced continually with the query of how the youngsters who live and swim in the most highly polluted areas of the District appear to be healthy and find no immediate unfavorable reaction. This may be explained by the fact that continual swimming in polluted waters develops an immunity to disease, much in the same way that immunity is developed to typhoid fever by inoculation. There are, however, many secondary indications of the health menace of pollution, notwithstanding the fact that the water is not used for drinking purposes. The large increase in eye, ear and nose infections during the bathing season, particularly in those areas where the water is polluted, although not proof, is at least an indication of the effects of pollution.

The economic phase of pollution is likewise difficult to evaluate. It has been felt, however, that in specific cases it will be possible to obtain some rather definite facts on this score and during the past year some definite and valuable information has been accumulated. Our Works Progress Administration Project has made a study of the economic effects upon a bathing beach which was closed due to pollution. This area was most active as a recreational center up until 1913 when the Department of Health declared the waters unfit for bathing and as the result of which the beach and the recreational area immediately adjacent to it were closed down. A photograph on a post card taken during the height of the popularity of the beach shows a condition very similar to that which now exists on Coney Island, namely, crowded to a point which might be stated as "standing room only." A photograph taken during the past summer on a hot August day is a shocking comparison. This year's photograph taken in almost the identical spot as the 1910 photograph, discloses a totally abandoned beach with not a soul in sight and the abandoned equipment rotting away. It has been reported that during the height of popularity of this beach, the total income to the bathers and concessionaires approximated $1,000,000 per year. The annual taxes from this enterprise alone would go far to pay the interest and amortization of an investment for the abatement of pollution.

Probably one of the greatest losses incurred from sewage discharged untreated in the District waterways is the loss of the recreational use for bathing, boating, fishing and summer resorts. The actual pecuni-

ary loss is not easily arrived at, but it is in a way indicated by the greater expense to which people are put in order to travel to areas that may be enjoyed. With proper treatment of the sewage, the cost of which is not prohibitive, the banks of waterways which are not used for commercial purposes should be one of the most salubrious and pleasant portions of any community both for dwelling purposes as well as recreational. In this connection, it is of interest to point out that some thirty-five or forty years ago there were several large floating bath houses situated in various places of New York Harbor waters which in summer were well patronized. There were also numerous bathing beaches in the outlying sections at many of which a fee was charged from which some people derived a livelihood. This has all been changed by a continual discharge of an increasing quantity of sewage into the harbor waters.

As it became apparent through the increased knowledge of the transmission of diseases that sickness of various kinds were continually associated with bathing in polluted water, it was necessary for the health departments to take action on the matter. In September, 1926, the New York City Department of Health prohibited by ordinance any one from bathing in badly polluted sections of the New York Harbor waters. This action was taken only after considerable debate upon the subject, but that the action was justified was, we believe, clearly shown by the decrease in the number of cases and deaths from typhoid, paratyphoid and dysentery in the summer months of succeeding years.

The shellfish industry, likewise shows a tremendous economic loss resulting from pollution. During the time the waters of the harbor were satisfactory for the development of shellfish, Newark Bay produced as many as 50,000 bushels of seed oysters and the waters in and adjacent to Prince's Bay produced marketable oysters to the extent of about 500,000 bushels. Jamaica Bay and the lower areas of Great South Bay are reported to have produced about 700,000 bushels of marketable oysters annually, while the lower section of Long Island Sound and the upper areas of the East River, 300,000 bushels. The annual production of marketable oysters within the area described alone aggregated approximately one and one-half million bushels, and in addition to this, seed oysters were taken in vast quantities and transplanted to other waters. Without regard to the value of seed oysters and based on a value of 65c per bushel for marketable oysters, the loss solely in this area would be approximately $1,000,000 every year.

The United States Bureau of Fisheries' records indicate a decrease in the catch in some of the areas within the Interstate Sanitation District. Those of which we have a record follow:

	1930 *lbs.*	*1935* *lbs.*	*1930* *Value*	*1935* *Value*
Jamaica Bay	29,385 lbs.	3,000 lbs.	$ 3,113	$ 187
Long Island Sound	2,181,025 lbs.	1,660,400 lbs.	362,456	235,233
Manhasset Bay	57,764 lbs.	16,900 lbs.	15,974	3,509

Although there is no direct evidence that this reduction in income results from an increase in pollution, we believe this to be a reasonable conclusion, in view of the fact that in the same period the catch in Great South Bay, the greater part of which is in the easterly end of the Bay and is relatively free from pollution, the number of pounds in 1930 was 2,020,897, while in 1935, the reported catch was 2,001,400 pounds. The report for the entire area of New York State covered by the Bureau shows in 1930, 14,045,507 pounds against 13,505,000 pounds in 1935, substantially no change. With reasonable restrictions and proper care the fishing industry stands as one of the permanent and most constant of resources of this country. This appears to be brought

Photographed on a hot, clea

From an illustrated card—about 1910—taken at the sa

Photograph by Courtesy 27th Division Aviation, N.Y.N.G.

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the same place

Sewage from East 86th St. and East 89th St., Manhattan, that no longer pollutes the East River. Since the photograph below was taken the sewage has been intercepted and carried to Wards Island for treatment.

Photograph by Courtesy of New York City Department of Parks

Industrial wastes pouring into Newark Bay.

out most forcefully when considering the depletion of the resources of Alaska. There in the last forty years, there has been mined in Alaska $450,000,000 worth of gold. In the same period of time, the canneries of Alaska have taken $500,000,000 worth of salmon from the Alaska waters. The natural resources of Alaska have been depleted to the extent of $450,000,000 worth of gold, but the salmon return year after year and this tremendous business can continue indefinitely without planting, fertilizing, or other works of man save to avoid the abuses of civilization.

Peconic Bay and the Great South Bay in Suffolk County are two of the greatest sources of oysters and shellfish and the prevention of pollution of these areas is one of the chief problems of sanitation in this territory.

The Great South Bay area, with its largely built up portion of Suffolk County adjacent to it, is still without adequate sewerage facilities. This problem is not yet solved but it is not unsolvable and with the advantage of increasing personnel and a convenient laboratory that the State Conservation Department has now started, a careful check-up on areas of possible contamination in that Bay can be maintained.

One of the greatest injuries resulting from the discharge of sewage into tidal waters has been the total destruction of the shellfish industry in that section. The prohibition of the taking of shellfish from natural waterways because of pollution not only destroys the livelihood of many people, but destroys as well a source of food supply of much more value in dollars than is supposed by most people. In such cases it requires careful study to determine whether or not the sewage should be treated to such an extent as to permit the taking of shellfish or whether it is cheaper to partially treat the sewage and abandon the shellfish industry in the neighborhood. An illustrative example of what may be done in certain cases is a study of the Raritan Bay shellfish industry. Due to cases of typhoid fever which years ago were traced to the eating of shellfish from this area, the taking of any shellfish therefrom was strictly prohibited and for many years the Bay was useless for shellfish propagation. Persons who were engaged in gathering and selling shellfish from this area claimed that the annual gross income from the business before this action was taken had been between $300,000 and $500,000 per year. These earnings varied with what the owners designated as "good" or "bad" years. These resulted from various conditions of run off and climate. Due to local agitation, sewage treatment plants were constructed at various municipalities both on the river and along the bay. The result of this was that recent studies under the direction of the United States Public Health Service have shown that certain portions of the bay may now be safely used for the taking of shellfish. Losses due to polluting of waters are also incurred where shellfish areas have been condemned by the cost of patroling or policing them in order to be sure that so-called "Bootleg" shellfish are not taken and sold to the public.

The damage resulting from the depreciation of property values both unimproved and improved along the banks of badly polluted waterways is often very large. The depreciation of property in this manner may be observed at several places where the waterways are badly polluted.

The discharge of raw sewage and the consequent stranding of food particles on the shore line of a waterway contributes largely to the development of a large number of rats which are continually causing an economic loss due to damaged property and food supplies. As a rat is believed to be the carrier of diseases such as the Bubonic plague, which fortunately is not epidemic in the United States generally, although it has been found in some of the southern ports, it is possible that in the future the discharge of untreated sewage may be a contributory factor in the loss of life caused by the spreading of this disease.

Practically all of these losses are of a kind that are recurring annually and could the sum total of these losses be obtained they

should be viewed as the amount of money that could be used for interest and a sinking fund to pay for the construction of adequate sewage treatment plants. The problem of sewage treatment is one of balancing economies in which the benefits to be obtained are capitalized and balanced against the cost of improvement. Not all of this can be summed up in dollars and cents as there are many psychological factors involved which are of importance, but which can not readily be evaluated. As an example it may be found good economics at the present time to save the shellfish industry of Great South Bay and at the same time it may be good economics to abandon the shellfish industry in Jamaica. These matters can only be determined after a careful study and balance of the benefits that may be obtained against the cost of adequate sewage treatment works.

The destruction of fish life in the waterways is sometimes of great economic importance. In the past the Hudson River was a great center of the shad fishing industry which at the present time has been practically abandoned. The conservation of game life where possible is among the minor items that should be considered in determining the character of the sewage treatment work. It has, however, more particular relation to the discharge of oil wastes than of sewage.

ECONOMIC EFFECTS

As far back as 1902, the United States Geological Survey in its "Water Supply and Irrigation Paper, No. 72," evaluated the loss due to pollution on the Passaic River and the summary stated, "We have seen that the natural resources of Passaic System are very extensive, embracing water power, water supply, ice fields, fisheries, transportation and natural scenic advantages, but that all but one of these have been so damaged by pollution as to produce the following results:

1. Abandonment of three water supply intakes and the establishment of three others at a total expense of not less than $20,000,000.
2. Extensive decline of power values because of inadaptability of water for use in boilers and in manufacturing processes.
3. Loss of annual harvests of ice weighing ten thousand tons.
4. Absolute destruction of fisheries in the lower valley.
5. Impairment of realty value, the extent of which can not be too highly estimated, in view of the fact that similar properties in unpolluted localities have been made of immense value."

Under the heading of Realty Values, the paper states that only a few years prior to this writing the value of land for farming purposes was from $500 to $800 per acre, and building space was held at a much higher value. Today, however, the paper states, "This plot cannot be sold at any price nor is there any market for the property along the entire shore."

Conditions in the Passaic Valley have, of course, been greatly improved by the construction of the Passaic Valley Trunk Sewer Treatment Plant; however, the above is merely an indication of the effects of pollution.

Section VI—Abatement

It now appears probable that at an early date adequate treatment of the sewage coming from New York City will be provided, if design and treatment plant construction that is now being vigorously advanced by the present city officials is continued. The city officials should be complimented for their foresight and courage in undertaking the work which is of very large proportions. The plans for providing adequate sewage treatment plants is based upon the investigations of various commissions and city departments which have been studying the New York Harbor waters at various times during a period of thirty years. These investigations showed conclusively that, in addition to local nuisances which were occurring in some of the constricted waterways, that most of the New York Harbor waters were being depleted of oxygen at a very rapid rate and further indicated that there is an upper limit to the capacity of these waters to receive sewage and that this upper limit has been practically reached.

It was therefore obvious that remedial measures must be undertaken by constructing adequate sewage treatment works in order to prevent the extension of the offensive condition of the waterways about the city.

It is to be hoped that other cities in the Interstate Sanitation District which are now discharging sewage into the various waterways will at an early date undertake the engineering studies which will be necessary for the purpose of constructing trunk sewers and sewage treatment works.

The abatement of the pollution of New York Harbor waters is a Herculean task in which the efforts of many official groups will be required before the conditions of the Harbor waters can be made satisfactory Under the chapter entitled "Sewage Treatment Plants" is given a brief description of the newly constructed Ward's Island plant which will treat the sewage from a large part of the Northern half of Manhattan borough and from the Southern and central portions of the borough of the Bronx. The construction of this plant is a great step forward as it will treat a large amount of sewage daily which originates in densely populated areas, and will remove the sewage from the portions of the Harlem and East Rivers where they have been most offensive and where the oxygen supply has been very low during recent years. This plant at the present time receives only about 40% of the sewage which in the future will flow to it for treatment and purification before being discharged into the East River. This is due to the fact that the construction of trunk and main collecting sewers is a slow and expensive job. Under the schedule of construction arranged by the Department of Sanitation, some of these trunk sewers will not be completed until near the end of 1938.

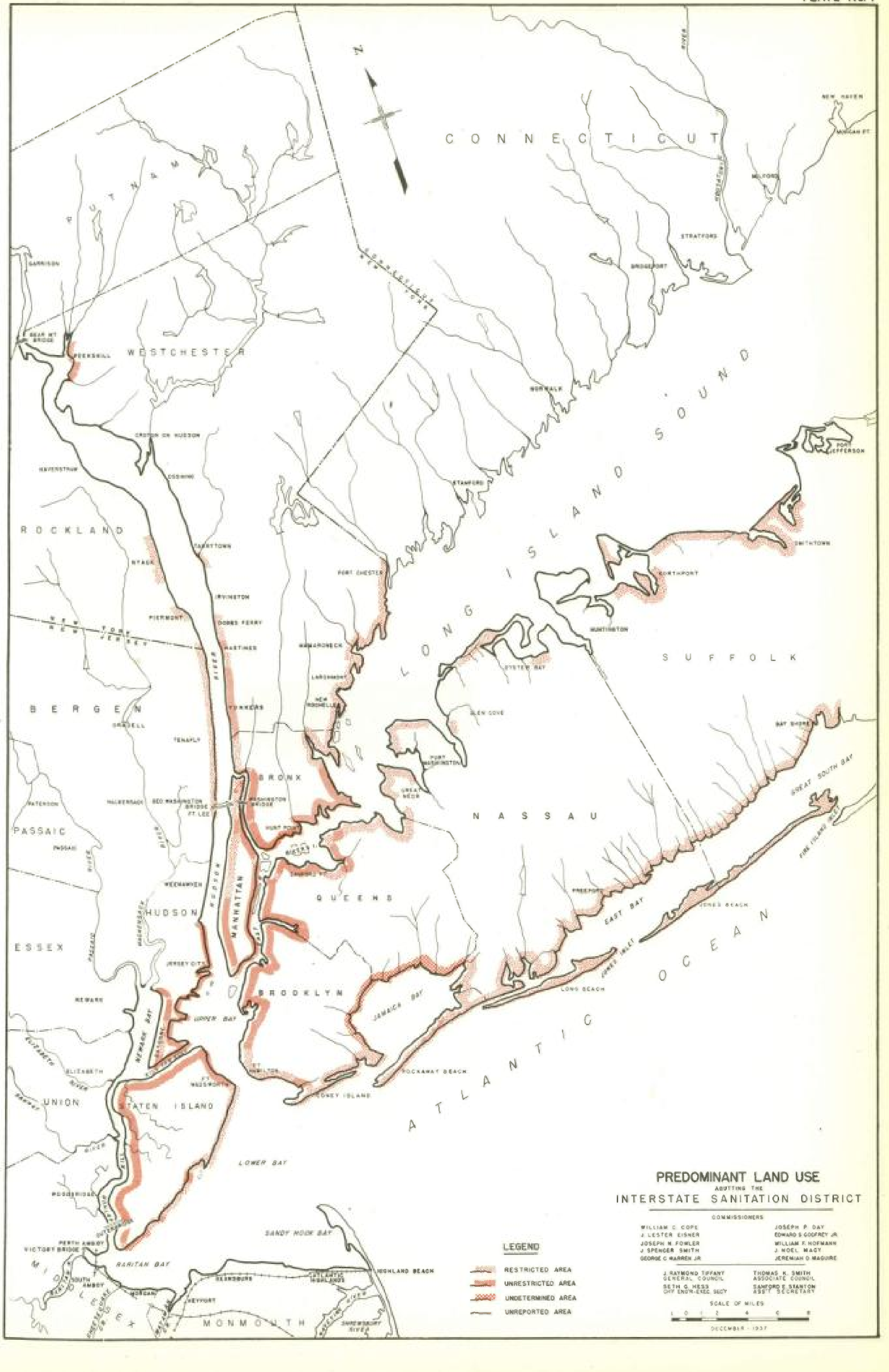
Among the plants which have been put in operation in the past two years is the Coney Island plant, to which a large amount of the sewage originating in the beach areas along the Atlantic Ocean is treated before being discharged into Rockaway Inlet.

On Staten Island several small sewage treatment plants have been constructed to improve conditions on the local beaches. These plants receive the sewage from the Mount Loretto Home, the S. S. White Dental Laboratories and the Richmond Hospital. On Long Island a new sewage treatment plant has been constructed to serve the Kings Park State Hospital from which the effluent will flow into Long Island Sound. The sewage treatament plant at Freeport has been very largely reconstructed in order to improve the quality of effluent

discharged from it. In New Jersey, sewage treatment plants have been put in operation by the Joint Meeting which takes sewage from various municipalities in Essex and Union Counties, and also for the Rahway Valley Joint Meeting serving municipalities in Union County. The effluent from these plants will be discharged into Arthur Kill, which in the past has been in a very badly polluted condition. Putting these plants in operation should do much to improve the quality of the waters flowing in Arthur Kill. About a year ago, a sewage treatment plant was put in service at Perth Amboy, N. J., treating approximately ten million gallons of sewage which had been formerly discharged into the headwaters of Raritan Bay.

At the present time several plants in the New York City area are under construction. The largest of these will eventually treat about 130,000,000 gallons of sewage from Jamaica and vicinity which is now discharged into Jamaica Bay. Another important plant under construction is at Tallmans Island which will treat the sewage from the northern portion of the borough of Queens. Also in the northern portion of Queens is the North Beach sewage treatment plant which is now being considered. On the other side of the East River a sewage treatment plant will be constructed at Orchard Beach in the early part of next year.

While construction proceeds at some of the sewage treatment plants, designs for other sewage treatment projects are being completed. Among these may be mentioned the 26th Ward sewage treatment plant, the City Island sewage treatment works, and the Port Richmond sewage treatment plant.


PREDOMINANT LAND USE
ABUTTING THE
INTERSTATE SANITATION DISTRICT
COMMISSIONERS
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CH'F ENG'R-EXEC. SEC'Y
SANFORD E. STANTON
ASS'T SECRETARY
SCALE OF MILES
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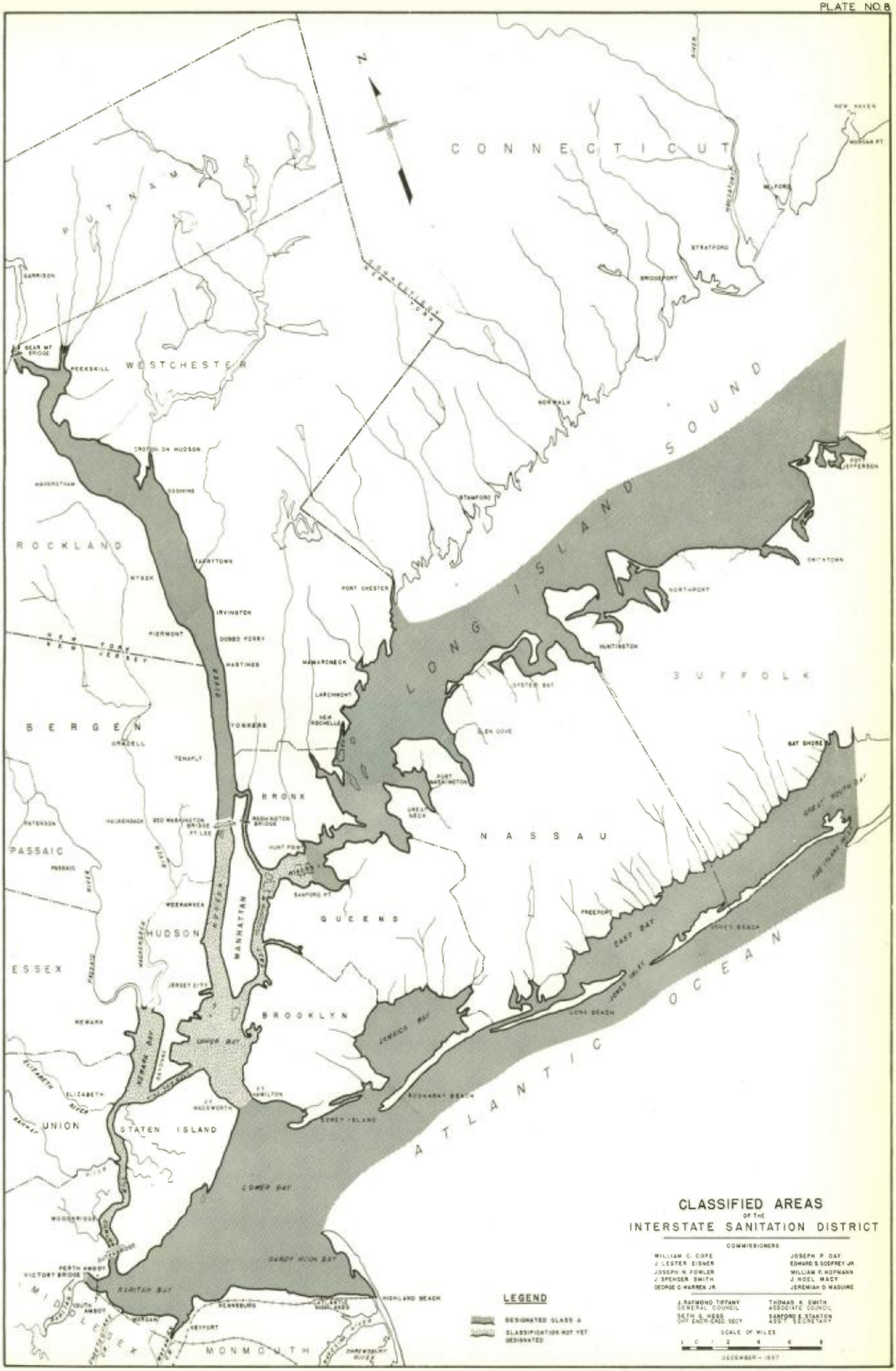
UNION
MIDDLESEX
MONMOUTH
BRONX
MANHATTAN
QUEENS
BROOKLYN
STATEN ISLAND
NASSAU
SUFFOLK
LONG ISLAND SOUND
ATLANTIC OCEAN
UPPER BAY
LOWER BAY
SANDY HOOK BAY
RARITAN BAY
NEWARK BAY
JAMAICA BAY
EAST BAY
GREAT SOUTH BAY
HUDSON RIVER
NEW YORK
NEW JERSEY
GARRISON
BEAR MT. BRIDGE
PEEKSKILL
CROTON ON HUDSON
HAVERSTRAW
OSSINING
TARRYTOWN
NYACK
IRVINGTON
PIERMONT
DOBBS FERRY
HASTINGS
MAMARONECK
LARCHMONT
NEW ROCHELLE
PORT CHESTER
STAMFORD
NORWALK
BRIDGEPORT
STRATFORD
MILFORD
NEW HAVEN
YONKERS
TENAFLY
ORADELL
HACKENSACK
GEO. WASHINGTON BRIDGE
FT. LEE
PATERSON
PASSAIC
WEEHAWKEN
JERSEY CITY
NEWARK
ELIZABETH
FT. WADSWORTH
FT. HAMILTON
CONEY ISLAND
ROCKAWAY BEACH
LONG BEACH
JONES BEACH
JONES INLET
FREEPORT
BAY SHORE
FIRE ISLAND INLET
GLEN COVE
PORT WASHINGTON
GREAT NECK
OYSTER BAY
HUNTINGTON
NORTHPORT
SMITHTOWN
PORT JEFFERSON
PERTH AMBOY
VICTORY BRIDGE
SOUTH AMBOY
KEYPORT
HIGHLAND BEACH
SHREWSBURY RIVER

PLATE NO. 8



CLASSIFIED AREAS
OF THE
INTERSTATE SANITATION DISTRICT

COMMISSIONERS

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SETH G. HESS CHF ENGR-EXEC SECY	SANFORD E. STANTON ASS'T SECRETARY

SCALE OF MILES
1 0 1 2 4 6 8

DECEMBER - 1957

Section VII—Classification of Area

HEARINGS

The list showing the places where the Hearings were held, the date of the Hearing and the area covered by each Hearing has been set forth in Section I on pages 1 and 2.

DESIGNATION OF CLASSIFICATION

At the meeting of the Commission on December 8th, formal resolutions were passed designating the classification of the areas of Long Island Sound, the south shore of Long Island, lower New York Bay, Raritan and Sandy Hook Bays.

There is shown herewith a map which indicates the areas which have been classified and the designation made by the Commission.

Having reviewed existing information concerning zoning and property surveys, conducted by other agencies, it became unquestionably apparent that there was not sufficient current or accurate information, concerning the present use of properties along the shores of the Interstate Sanitation District to permit an accurate determination of the predominant use of the area. Furthermore, it was deemed necessary to have incontestible evidence to support any future legal actions, which might have to be taken. In establishing the work to be undertaken by the Works Progress Administration Project sponsored by this Commission, a careful study was made and as a result, forms were prepared for field parties making this survey. These field parties visited all of the built-up shore line of the District and recorded the full information concerning the use of each piece of property. The information secured by these field parties includes the location of the property, the approximate frontage, the name of the owner, the name of the occupant, the use being made of the property and in addition to that, information is obtained concerning the number, size and point of discharge of sewer outfalls or other points of pollution, in order to verify information obtained from other sources. From City records there is obtained the assessed land valuation and the value of improvements on the property. From this information, maps were prepared showing property use and dividing the use into operating, industrial or commercial, non-operating industrial or commercial, public property in use, public property vacant, public property-recreational, institutional property, residential property, private property-recreational, and private property vacant. The percentage of each type of property is then computed. This information furnished a sound basis upon which to premise our studies of the predominant use. It is recognized that the Compact considers only the predominant use of water area, but unquestionably, the use of the land area has a marked influence on the use of the water area. The use being made of the land area can be much more definitely ascertained and has been of immeasurable value to us in determining the use of the water area.

The District was divided into areas of common interest and use. A detailed report was submitted to the Commission upon the expected predominant use of each area. Each report also contained a summary of the testimony offered at each Hearing, extracts of communications and other relevant data to base conclusions upon classification. Maps were furnished showing the zoning ordinances affecting the use of shore property, data on shellfish areas and locations of parks, boat clubs, beaches and other recreational facilities.

Each report summarized the conclusions and contained a recommendation for designation of classification.

Section VIII—Action Taken Towards Abatement

At a meeting of December 8th, the Commission passed resolutions directing the Secretary to inform the State Departments of Health of the designation of the areas classified and to further request the cooperation of the Departments of Health in obtaining from the municipalities a schedule of the time when various steps would be taken toward the abatement of pollution. The four municipalities called upon to furnish a statement to the Commission are:

Glen Cove, New York
Port Jefferson, New York
Keansburg, New Jersey
South Amboy, New Jersey

ORDERS ISSUED

As outlined heretofore, the policy of the Commission at the present time, is to request the cooperation of the State Departments of Health in obtaining from the municipalities their proposed schedule for the time of taking various steps toward the abatement of pollution. It is proposed to give the municipalities an opportunity of indicating their intended action before the Commission takes any more formal steps in the matter of issuing orders or mandates.

Resolutions of this nature have been passed in connection with the four above mentioned municipalities.

Section IX—Public Opinion

METHODS OF DISSEMINATING INFORMATION

One of the principal methods used in disseminating information to the public, concerning the activities of this Commission has been the daily press. The reports of the Hearings furnished an excellent opportunity of reporting to the press the purposes and activities of the Commission. Press representatives took the opportunity of making full use of the facilities offered and as a result, the following table shows the number of clippings, as well as the number of inches of space given by the daily press to each of the Hearings.

In addition to the news copy, the Commission has been able to obtain a number of favorable editorials. The total number of editorials during the past year in the metropolitan papers is 29. These represented 307 inches of space. Some of the more outstanding editorials are made a part of the Appendix of this report.

Special articles have appeared in the Sunday Supplements of the metropolitan newspapers, as a result of interviews which this Commission has invited and given. Each of the major New York Sunday newspapers has devoted at least one special article to this Commission in their Sunday Supplement. These articles appeared during the bathing season and were intimately connected with the recreational facilities within the metropolitan district.

Articles have been written for the technical press and have appeared in such magazines as, the American City, the Engineering News-Record and others.

The Commission was given the facilities of broadcasting an interview with its Chief Engineer, outlining the activities and purposes of this Commission. Two such fifteen minute broadcasts were made.

A number of talks, both formal and informal, have been made by members of the Commission and the staff at various functions, such as, the Long Island Section of the New York Sewage Works Association, Conferences called by the Supervisors of the Towns of Islip and Brookhaven in the Village of Port Jefferson.

The effect of this publicity has made the Interstate Sanitation Commission reasonably well-known within the Interstate Sanitation District and has made the public acquainted with the problems of sanitation. The Commission anticipates a more active program to acquaint the public with the effects of pollution and the benefits of sanitation during the coming year.

The accompanying Table on page 42, of this Section indicates the publicity received in connection with the various Hearings. We have also shown on the Table the number of press releases mailed, the number of notices and invitations issued, as well as the attendance at the Hearings. It is interesting to see that the greatest amount of publicity was obtained during the height of the bathing season, irrespective of the amount of advance notice given the Hearing, or the number of persons attending.

The Table on page 42 shows where the greatest newspaper publicity was obtained. Very much more publicity was received in New York State than in New Jersey; and New York City afforded the Commission a greater amount of publicity than any county.

Newspaper editorials are usually considered excellent means of judging public opinion, therefore we have listed the more important editorials referring directly to the work of the Commission. Again it should be noticed that more editorials appear during the bathing months of July and August

than any of the other months. This is illustrated by Tables on page 43.

The accompanying chart on page 44 shows graphically the amount of publicity received each month.

1937—PUBLIC HEARINGS ON CLASSIFICATION—1937

Date	*Place*	*Number of Press Releases*	*Notices and Invitations Issued*	*Attendance*	*Testifying Representatives*	*Number of Communications Received*	*Press Clippings*	*Inches*
Mch. 30	Bayonne, N. J.	24	210	65	5	1	3	47
Mch. 31	West New Brighton, S. I.	24	175	45	11	1	2	88
Apr. 21	Elizabeth, N. J.	64	100	26	10	2	7	64
Apr. 28	Perth Amboy, N. J.	80	190	23	6	0	10	52
May 19	New York, N. Y.	80	110	50	18	4	33	243
May 25	Newark, N. J.	40	106	30	7	5	12	80
June 9	White Plains, N. Y.	40	104	25	7	2	17	114
June 23	Long Island City, N. Y.	40	115	25	12	4	15	113
July 8	Yonkers, N. Y.	45	105	35	18	8	18	233
July 14	Mineola, N. Y.	40	118	25	9	3	21	237
July 21	Keansburg, N. J.	94	86	25	10	3	4	37
July 28	Huntington, N. Y.	47	147	45	21	26	29	299
Aug. 10	Nyack, N. Y.	94	170	18	6	4	6	44
Aug. 18	Brooklyn, N. Y.	50	150	75	17	6	13	183
Sept. 8	Queens, N. Y.	100	235	35	14	8	13	119
Sept. 22	Jersey City, N. J.	100	400	25	3	3	5	36
	Totals	962	2521	572	174	79	208	1989

1937—PUBLICITY—1937

NEW YORK STATE

Counties	*Inches*
Erie	3
Nassau	206
New York	1698
Oneida	13
Onandaga	4
Rockland	68
Suffolk	388
Westchester	691
	——3071 Inches

NEW JERSEY

Counties	*Inches*
Atlantic	11
Bergen	32
Essex	136
Hudson	147
Mercer	33
Middlesex	95
Monmouth	71
Passaic	29
Union	30
	—— 584 Inches

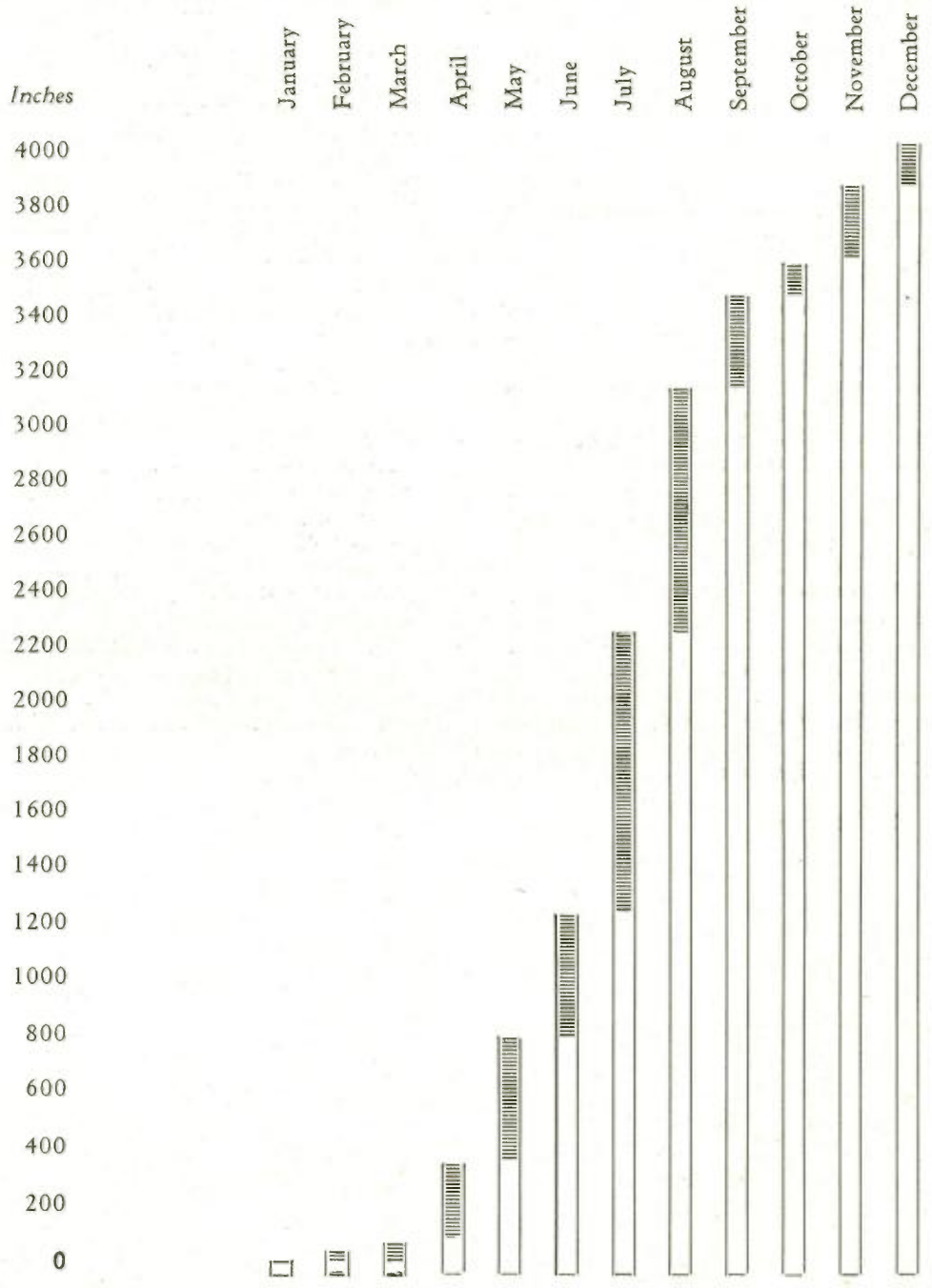
Total ..... 3655 Inches

1937—PUBLICITY—1937

NEWSPAPER EDITORIALS

Publication	*Date*	*Title*	*Inches*
Elizabeth, N. J., Journal	Apr. 24	"The Pollution Problem"	8
Perth Amboy, N. J., News	May 15	"Anti-Pollution Progress"	9½
Red Bank, N. J., Standard	May 19	"Pollution Must Be Ended"	5
Hackensack, N. J., Bergen Record	May 27	"Sewerage"	11
Brooklyn, N. Y., Times-Union	May 28	"For Cleaner Waters"	12
Hoboken, N. J., Observer	June 1	"Newark Bay Pollution"	3½
Newark, N. J., News	June 2	"Problems of Pollution"	11
Staten Island, N. Y., Advance	June 4	"Mt. Loretto Follows Suit"	8
New York, N. Y., Herald-Tribune	June 11	"For Cleaner Waters"	5
New York, N. Y., Daily News	June 11	"Hudson Polluted"	14
Dobbs Ferry, N. Y., Sentinel	June 11	"Hudson Polluted"	7
Yonkers, N. Y., Herald-Statesman	June 12	"Pollution"	17
Yonkers, N. Y., Herald-Statesman	June 12	"Naming Names"	8
Flushing, N. Y., North Shore Journal	June 28	"Pollution"	4
Jamaica, N. Y., L. I. Daily Press	June 28	"Clean-up Is a Big Task"	9
Yonkers, N. Y., Herald-Statesman	July 2	"New Sewage Systems"	17
Yonkers, N. Y., Herald-Statesman	July 7	"Bathing Beaches On Our Waterfront"	24
Jamaica, N. Y., L. I. Daily Press	July 15	"Save The Beaches"	14
New Rochelle, N. Y., Standard Star	July 21	"Clean Waters"	7½
Jamaica, N. Y., L. I. Daily Press	July 29	"Beach Pollution Drive"	6
Sea Cliff, N. Y., News	July 30	"Hope Revives"	10
Nyack, N. Y., Journal News	Aug. 12	"Rockland Will Help"	18
Paterson, N. J., Call	Aug. 19	"Cleaning Up New York Bay"	6
Brooklyn, N. Y., Eagle	Aug. 20	"Clearing Way For New Beaches"	10
New York, N. Y., Daily News	Aug. 21	"Moses Wants More Parks"	26
Newark, N. J., News	Aug. 23	"Good Work Goes On"	10
Westhampton, N. Y., Weekly Chronicle	Aug. 27	"The County Health Dept."	8
Brooklyn, N. Y., Eagle	Sept. 11	"Zoning Borough Waters"	9
Jamaica, N. Y., L. I. Daily Press	Nov. 6	"Polluted Waters Can Be Purified"	10
Total: 29 Editorials			307½

1937—PUBLICITY—1937



Section X—Works Progress Administration Project

POLLUTION SURVEY

During the past year through the Works Progress Administration Project sponsored by the Interstate Sanitation Commission, a sanitary survey of the waters in the Interstate Sanitation District has been under way and at the present time is partly completed. This survey is Project No. 465-97-3-131 (old No. 165-97-6999). The main objective of this work is to obtain data relative to the use of property along the shore line and to obtain data as to the location of municipal and private sewer outlets and of other pollutions, such as manufacturing wastes.

While the survey is incomplete, enough information has been obtained to show the widespread character of the pollution entering the harbor waters. In order to illustrate what the survey has disclosed in specific localities, the following discussion of several of them is included.

Along the Kill van Kull a little more than 38,000 feet of water frontage were inspected. This included 3.22 miles of coast line in New Jersey and 4.04 miles in New York State, or a total of 7.26 miles of shore line.

The results of this particular survey are that while available office records indicated that there were only five (5) sewer outlets along the shore, a total of seventy (70) of them were found. This indicates the character of the work that must be done in order to remove all of the raw polluting material from waters. Not only the wastes from public sewers must be collected and properly treated, but also wastes that are discharged from very many private sewers over which the City may not have control and also from the discharge of the manufacturing or trade wastes. The trade wastes may be in many instances, special problems, as under certain conditions it is not wise to take them into a common municipal sewer. In such a case it is necessary to find a satisfactory method of treating the wastes, which often requires research. The trade wastes, even from the same kind of factory, may differ widely as to the chemicals or material contained in the sewage that flows into the waterways.

A sample copy of data sheet used in making this survey is given below.

KILL VAN KULL SHORE LINE

	New York State	*New Jersey*
Length of Shore Line inspected	21,387 feet	17,000 feet
Occupied for Industrial Use	12,017 "	9,550 "
Residential	1,720 "	.... "
Public Recreation	150 "	1,300 "
Publicly owned Property	1,500 "	350 "
Institutions	2,400 "	.... "
Vacant	3,600 "	5,900 "
	21,387 feet	17,100 feet

	New York State	*New Jersey*	*Total*
Number of City Sewers	23	6	29
Number of Private Sewers	30	11	41
Total	53	17	70
Number of Polluted Creeks	2	2	4

During the course of the survey, several badly polluted sections of the waterways were found. Of the Kill van Kull, it can be said that a great amount of sewage and trade wastes are discharged directly into it or into open creeks or brooks which are tributaries. Along the portion of the shore not filled out to the bulkhead line, there are extensive sludge banks which give off offensive odors, particularly during the summer, at low tide.

On the interior of Staten Island, it is reported that there are several hospitals and private institutions, the sewage from which is discharged directly into Fresh Kill or its tributaries from which it flows into Arthur Kill.

At City Island the sewage flows directly into Eastchester Bay or Long Island Sound. In the survey of this area along approximately six and one-half miles of the shore, 147 sewer outlets were found. This would indicate that the average distance between outlets was about 200 feet, and, therefore, none of the surrounding waters could be considered as free from sewage pollution of local origin.

Other badly polluted sections of the harbor waters which are offensive during the summer months are mentioned as parts of the Harlem River, Pugley's Creek, Westchester Creek, Newtown Creek and Gowanus Bay and Canal. Some of these may be considered as open sewers due to the large amount of pollution that is entering them.

Up to the present time approximately 700 miles of shore line out of a total of 850 miles have been inspected. The large amount of data that has been obtained is rapidly being put into a form, where it may be readily used and should be of great assistance to municipalities in removing unsanitary conditions in the future.

SURVEY OF ECONOMIC DAMAGE

When sewage and trade wastes are discharged into any body of water in such quantities that they impair the quality of the natural waters, a large amount of damage is incurred by people residing nearby, who use waters for almost any purpose. The amount of the damages is often very difficult to evaluate. Much of the damage resulting from pollution comes from a psychological reaction of the people to the environment, as for example, one may move from desirable dwellings because the nearby waters are polluted to such an extent as to cause conditions which are offensive to the people. Therefore, while the property itself may not have changed materially, the value of it may be markedly decreased, due to the above cause.

Property along waterways are often used as pleasure resorts, bathing beaches, boating centers for passenger traffic or innumerable other purposes, all of which uses may be adversely affected by pollution. Bay or tidal waters can be used for the growing of shellfish and this business may be entirely destroyed when sewage is discharged into them, as it makes it possible for disease to be transmitted by shellfish when eaten in a raw condition. Under such conditions health authorities would prohibit the taking of shellfish from the waters for human consumption. In the past, serious economic losses have been caused in these ways.

In an attempt to arrive at the amount of some of these damages in a few typical cases, the workers on the survey project have been studying the loss of business at a large amusement park, where, at the present time, the building stands practically unoccupied during the summer months although in the past it is reported that large groups flocked to the area for amusement and bathing purposes.

It is reported that the weekly income dropped from $90,000 during the period before the pollution was excessive to approximately $2,000 during the summer months. It is further reported that this is due almost entirely to the ban placed upon bathing and adjacent harbor waters, by Health Officials.

At the present time these studies have not been completed, but it is hoped that they will be of considerable value when completed as showing an isolated case of monetary losses resulting from excessive sewage pollution in natural waterways.

Sheet No.: 1.
State: New Jersey.
County: Hudson.
Municipality: Bayonne.

INTERSTATE SANITATION COMMISSION
SEWER OUTLET SURVEY
Water Boundary
KILL VAN KULL

Survey No.: 1.
Date: 3-9-37.
Observer: Davis.

Location	*Effluent*	*Dimens.*	*Material*	*Point of Discharge*	*Tide Level*	*Flow Depth*	*Discoloration*	
							Area—Sq. Ft.	*Color*
1 On Hook Road	Private Combined	24″	C. I. Pipe	A. L. W. Bulkhead	—30 L. W.	½	10,000	Grey & Brown
2 Standard Oil Co. Yd. No. 1	Industrial	24″	C. I. Pipe	A. L. W. Bulkhead	—30 L. W.	¼	1,000	Grey & Brown
3 On Hook Road (Standard)	Priv. Sanit. Combined	24″	C. I. Pipe	A. L. W. Bulkhead	—1 hr. L. W.	Full	40,000	Grey & Brown
4 Oil Co. Marine Yard No. 2	Industrial	24″	C. I. Pipe	A. L. W. Bulkhead	—1 hr. L. W.	Not Obs.	None	None
5 Foot of Newman St.	City Sanitary	24″	C. I. Pipe	75′ from Shore Line	—2 hr. L. W.	Not Obs.	None	None
6 Foot of Newman St.	City Sanitary	72″	Concrete	75′ from Shore Line	—2 hr. L. W.	Not Obs.	None	None

Sheet No.: 1. INTERSTATE SANITATION COMMISSION Survey No.: 1.

SEWER OUTLET SURVEY

Water Boundary

KILL VAN KULL

Visible Solids	*Oil Film Area*	*Odors*	*Remarks*
1 Slight	Slight	Slight	Source of Pollution
2 Slight	Slight	Slight	None
3 Excessive	Slight	Excessive	Very Bad Source of Pollution
4 None	None	None	None
5 None	None	None	None
6 None	None	None	None

Sheet No. 1. U. S. WORKS PROGRESS ADMINISTRATION Survey No. 1.

PROJECT 165-97-6999 (6137-1214)

PROPERTY SURVEY

WATER BOUNDARY—KILL VAN KULL

Property Use	*Sewer or Drain Outlets*		*Shore Line Description*	*Protection Distance*	*Remarks*
	Number	*Pt. Disch.*			
1 Oper. Ind. Com. Oil Storage	None		Bulkhead	1200′	Have Separators and Water-front Patrol.
2 Oper. Ind. Com. Oil Refining	4 Private	A. L. W. Bulkhead	Bulkhead	3625′	Separators and Boom System, Waterfront Patrol.
3 Private Recreational. Boat Club	None		Bulkhead	150′	None
4 Institutional Boat Club	1 Private	B. L. W. Bulkhead	Bulkhead	300′	None
5 Oper. Ind. Com. Manufacture of Bolts	1 Private 1 City	B. L. W. Bulkhead	Bulkhead	300′	Heavy Sludge on Shoreline
6 City Owned Recreation Beach	2 City	B. L. W. 75′ from Shore	Bulkhead	550′	None
7 Private Residential	2 City	B. L. W. 75′ from Shore	Bulkhead	1300′	Complaints of Gaseous Odors
8 City Owned, Vacant	None		Bulkhead	200′	None
9 Private, Vacant	None		Natural	100′	None

State: New Jersey
County: Hudson
Municipality: Bayonne

INTERSTATE SANITATION COMMISSION
PROPERTY SURVEY
Water Boundary

Survey No.: 1.
Date: 3-9-37
Observer: Davis

	Location		Frontage	Owner	Occupant	Assessed Valuation	
	From	To				Land	Bldgs.
1	Bergen Pt.	Ave. A	1200′	Texas Co.	Same	$150,000	$75,000
2	On W. 22d St.		3625′	Stand. Oil Co.	Same	200,000	300,000
3	Rathbun	Trash St.	150′	Bayonne Yacht Club	Same	100,000	45,000
4	Trash St.	Humphrey St.	300′	Stevens Tech.	Same	15,000	15,000
5	Humphrey St.	Newman St.	300′	Bayonne Bolt Corp.	Same	75,000	90,000
6	Newman St.	Ave. C	550′	City of Bayonne	Same	80,000	110,000
7	Ave. C	Lexington Ave.	1300′	S. Palfrey	Same	90,000	80,000
8	Lexington Ave.	Hobart St.	200′	City of Bayonne	Vacant	10,000	75,000
9	Hobart St.	Ingham St.	150′	Stand. Oil Co.	Vacant	6,000	30,000

DISSOLVED OXYGEN IN HARBOR WATERS

As part of the above mentioned project, under the Works Progress Administration, there has also been carried forward during the summer months a series of analysis showing the amount of dissolved oxygen in various parts of the waters in the Interstate Sanitation District. This work began in the latter part of July and was continued into October. The result of this work is given in the following table:

PERCENT OF SATURATION OF DISSOLVED OXYGEN IN THE WATERS OF THE INTERSTATE SANITATION DISTRICT 1937—JULY TO OCTOBER

Portion of District	*Location*	*Low Observation* Date	%	*High Observation* Date	%	*Remarks*
Hudson River	Pier A	8/31	26	10/19	59	50′ from shore
	14th St.	8/10 8/25	27	8/18	48	50′ from shore
	42nd St.	8/11	18	8/18	44	100′ from shore
	125th St.	8/10	20	8/18	62	100′ from shore
	Spuyten Duyvil	8/10	26	8/17	92	Outside bridge
	Mt. St. Vincent	8/27	29	8/13	85	250′ off shore
	Yonkers	8/27	29	8/13	86	150′ off shore
	Hastings	8/27	46	8/17	91	200′ off shore
	Dobbs Ferry	8/27	47	8/13	91	200′ off shore
	Irvington	8/27	56	8/13	87	300′ off shore
	Tarrytown	8/27	64	8/13	94	400′ off shore
	Ossining	8/27	72	8/17	95	400′ off shore
	Croton Point	8/30	74	8/13	93	400′ off shore
	Indian Point	8/27	66	8/30	69	.....
	Bear Mt.	8/30	67	8/27	74	N. J. side
	Hoboken	10/18	51	....	..	N. J. side
	Alpine	....	..	10/18	86	N. J. side
Harlem River	Willis Ave.	8/10	1	8/18	16	.....
	155th St.	8/31	3	8/11	49	.....
	High Bridge	8/31	2	8/11	46	½ Way to Washington Br.
	Sherman Creek	8/18 8/31	1	8/11	42	
	Spuyten Duyvil	8/11	25	8/31	51	Inside bridge
East River	Pier 10	8/31	11	9/14	52	100′ off shore
	Wallabout Basin	8/31	5	9/14	44	Mouth
	23rd St.	8/31	7	9/14	29	100′ off shore
	42nd St.	8/31	8	9/14	35	50′ off shore
	106th St.	8/31	3	8/25	24	.....
	Whitestone Pt.	8/25	28	7/22	70	200′ off shore
	Flushing Bay	7/31	9	....	..	.....
	Flushing Bay	....	..	8/11	74	Buoy No. 4
	Hell Gate	8/7	13	9/14	28	.....
	Eastchester Bay	7/28	32	8/10	83	.....
	Pelham Bay	8/18	45	8/17	96	.....
	Riker's Island	7/31	8	9/14	62	North Channel
	Classon Point	7/28	16	7/22	52	.....
	Riker's Island	7/28	9	7/22	42	South Channel
	Fort Totten	8/20	23	8/20 7/22	57	100′ off shore
	½ Way between Ft. Totten and Ft. Schuyler	9/1	29	7/22	82	.....
	Ft. Schuyler	7/28	28	7/22	71	.....
	Manhasset	8/24	42	8/20	96	.....
Raritan Bay	(various)	7/14	64	7/14	94	.....
Lower Bay	New Dorp	7/12	58	10/5	84	.....
	Midland Beach	10/7	68	7/12	91	.....
Arthur Kill	(various)	7/19	43	7/19	54	.....

Only the low and high observations of the percentage of dissolved oxygen in the waters are given, as the small number of samples collected in particular locations make an average figure unreliable. The work appears to agree with the data obtained by other groups, which have been, in the past years, making similar determinations in the Harbor waters.

As only a small number of samples was obtained at some points, the above data may be materially changed in succeeding years, as this annual work is continued. After two or three years, sufficient data will be collected for more definite conclusions concerning the minimum and average dissolved oxygen contents of the waters at various localities. These analyses were made on water taken about five feet below the surface and usually some distance from the adjacent shore line.

The waterways included in the survey were: the Hudson River, from the Battery to Bear Mountain; Long Island Sound from Glen Cove to the East River; the East River; Harlem River; Upper New York Bay; Arthur Kill and the Raritan, Sandy Hook and Lower New York Bays.

CURRENT SURVEY

The effect of the pollution in Newark Bay upon Overpeck Creek was raised at the public hearing held in Newark, New Jersey.

The Director of the New Jersey State Department of Health requested the cooperation of this Commission in determining the degree, if any, to which Newark Bay waters flood into Overpeck Creek, and suggested the cooperation of that Department in a Works Progress Administration project for the study.

The project sponsored by this Commission already contemplated surveys upon the effects of pollution and it was therefore deemed unnecessary to apply for a separate project for this study. This Commission, the New Jersey Department of Health, and the Works Progress Administration project cooperated in a detailed study of the problem. It was jointly determined that data should be obtained to determine float progress and chemical and bacteriological analyses of the water.

The down stream float study provided for depositing a float at the upper end of Overpeck Creek at high tide and following it continuously for 72 hours, taking water samples periodically at the float.

Upstream float study provided for placing a float at the mouth of the Hackensack River and following it upstream for three flood-tide movements removing the float at full high tide and again replacing it at the position from which it was removed at low tide. The float was thereby followed upstream for three incoming flood-tide movements. Throughout this study water samples were taken periodically at the float.

Velocity studies were made for the purpose of determining the quantity of flow in the upper Overpeck Creek, as well as at a station near its confluence with the Hackensack River. Periodically water samples were also taken during the studies.

The details and results of these studies will be included in the Works Progress Administration report to this Commission and used in connection with the report upon the determination of classification of the water of Newark Bay.

We wish to acknowledge our appreciation of the close cooperation which we received from the New Jersey State Department of Health. Their representatives took active parts in the accumulation of field data and water sample analyses were run in the Trenton laboratories. Dissolved oxygen determinations, however, were made in the field using the Commission's portable laboratory apparatus.

We have developed several unique operations in connection with the work done under the project. These are summarized but will be reported in greater detail at a later date.

DISSOLVED OXYGEN SAMPLES

It has been customary to take dissolved oxygen samples in a double container at the end of a rope or chain dropped overboard. This procedure usually necessitates stopping a boat whenever a sample is taken. In place of this procedure a hand-operated rotary pump was mounted on the boat and a predetermined length of suction hose adequately weighted was installed to carry the suction to the proper depth for sampling. Experiments indicated that the suction required to lift the water did not change the oxygen content in the short period of time that the water was being carried through the pump. The pump is, of course, adequately flushed before the sample is taken, so that all entrained air was removed. Parallel runs using this apparatus and the usual sampling method indicate that the pump furnishes a satisfactory sample for dissolved oxygen analysis. However, the work has not yet progressed sufficiently to warrant adopting this method of sampling without the standard method as a control.

The advantages of the pump are ease of operation and the ability to take samples in swift currents and while a boat is in motion.

TURBIDITY

Some work was done to determine if turbidity could be used as a rough measure of pollution. A modification of the usual pin method was adopted and was found to give reasonably uniform results.

DISSOLVED OXYGEN LABORATORY

A portable laboratory was developed to permit dissolved oxygen determinations in the field. The carrying case was similar in many respects to that used by the New York State Department of Health.

Section XI—Recommendations

1. An amendment of the laws of the State of New York to permit the Director of the Division of Sanitation to be designated to serve on this Commission, either as proxy for, or in the place of, the Commissioner of Health.
2. An amendment in the law in the State of New Jersey to admit of the appropriation of more than $15,000 for the appropriation of the Interstate Sanitation Commission.

Summary

A Summary of this report will be found on the sheet preceding Section I.

Bibliography of Articles

concerning

Pollution and Its Abatement

in the

Interstate Sanitation District

JUNE, 1892—FEBRUARY, 1937

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Screening grit chamber of fine screens for part of New York Sewage. Screens of revolving disc type. Plant serves an area of 345 acres of which about 17% is built up with apartment houses.	Charles E. Gregory	Engineering News Record Vol. 82, No. 14 Pp. 672-674	Apr. 3, 1919

Title	*Author*	*Publication*	*Date*
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Oil Pollution of New York Bay and Harbor.	Staten Island Beach Land Impr. Co.		1920
Brooklyn, N. Y. Some results of the Brooklyn, N. Y., Sewage Treatment Experiment. Data pertaining to Imhoff tank operation, trickling filters, etc. Data on sewage treatment methods and experiments. Plans adopted in Brooklyn, N. Y., and account of experimental work from study in sedimentation. It is concluded that retention period of sewage in passing through settling chambers should be short—not less than one or more than three hours; depth of digestion chamber at the mouth of a sludge pipe should not be less than 20 feet from water line of tank, etc.; the two Riensch-Wurl Screens are said to have given reliable and excellent results. Description of sprinkling filters, etc.	Geo. T. Hammond	Engineering & Contracting Vol. 53, No. 2	Jan. 14, 1920
	Geo. T. Hammond	Pp. 39-41	
		Fire & Water Engineering, Vol. 67, No. 24 Pp. 1278-1282	June 16, 1920
Screening Plant; operating results of Dyckman St. Sewage Screening Plant. Table giving results of test of Riensch-Wurl Screens.	Charles E. Gregory	Engineering News Record. Vol. 84, No. 4, Pp. 171-172.	Jan. 22, 1920
Report of Richmond Borough Sewage Tests, N. Y. City.		Engineering News Record Pp. 1130-1131.	Dec. 9, 1920
The Pollution and Sanitation of Jamaica Bay. Abstracts of address with discussions.	Royal S. Copeland. Abstracts and discussions by K. Allen & Geo. T. Hammond	Municipal Engineer's Journal, Pp. 18-24.	Jan., Feb., March, 1921
The Oil Menace in New York Harbor.		Fire & Water Engineer, Pp. 20-21.	Jan. 5, 1921
N. Y. C. Sinking Fund, Commissioner of Docks Dept. Communications from, with ref. to pollution of N. Y. Harbor by the discharge of oil refuse from ships and manufacturing plants.	Commissioner of Docks Dept.	Proceedings of Sinking Fund, P. 855.	Sept. 29, 1921
N. Y. C. Board of Estimate & Apportionment Communication from the Commissioner of Docks, relative to pollution of N. Y. Harbor by discharge of oil refuse from ships and manufacturing plants.	Commissioner of Docks	Calendar, Board of Estimate & Apportionment, P. 103.	Sept. 30, 1921
The Sanitary Condition of N. Y. Harbor; during past ten years there has been a steady depletion of dissolved oxygen in harbor waters and situation is now grave.	Kenneth Allen	Public Works Pp. 428-431.	Dec. 3, 1921
The Area of Water Surface as a Controlling Factor in the condition of Polluted Harbor Waters.	Richard H. Gould	American Soc. C. E. Proceedings, Pp. 603-616.	1921 Dec.

Title	*Author*	*Publication*	*Date*
The Pollution of Tidal Waters by Sewage, with special reference to New York Harbor.	Kenneth Allen	American Soc. C. E. Proceedings, Pp. 622-624.	1921 Dec.
The Sanitary Condition of New York Harbor.	Kenneth Allen	American Soc. for Municipal Improvements, Proceedings, Pp. 126-138.	1921
Stream Pollution and Sewage Disposal Symposium. The Pollution of Tidal Harbors by Sewage with especial reference to N. Y. Harbor.	Kenneth Allen	American Soc. of C. E. Proceedings, Vol. No. 47, No. 10.	Nov., 1921
Use of Fine Sewage Screens in New York City.	Allen V. Kenneth	Municipal & County Engrs. Pp. 219-221.	Dec., 1921
The Pollution and Sanitation of Jamaica Bay; Abstract of Addresses with Discussion by Royal S. Copeland, Kenneth Allen and Geo. T. Hammond.	Royal S. Copeland, Kenneth Allen and Geo. T. Hammond	Municipal Engineers Journal, Pp. 18-24.	First Qr., 1921
The Cleansing of N. Y. Harbor.	S. A. Reeve	Geographical Review, V. 12, Pp. 420-423.	1922
Oil in Harbor.		Fire Service, P. 12.	March 31, 1923
Report on Sewage Disposal Methods for the Borough of Manhattan.	President of Borough of Manhattan	Annual Report, Pp. 23-41.	1923
Construction of Sewage Treatment Plant on Ward's Island. In minutes of June 29, 1923.	N. Y. C. Board of Estimate & Apportionment, Pp. 4845-4849	Minutes for:	June, 1923 Sept., 1923 Jan. 23, 1924
Passaic Valley Sewer Prediction is Fulfilled; outlet at Robbins Reef, a peril to navigation.		Greater New York, P. 22.	Jan. 7, 1924
Appointment of Committee on Main Drainage and Study of Sewage Treatment. Minutes of 12/19/25. Sanitary Condition of waters of N. Y. Harbor.	N. Y. C. Board of Estimate & Apportionment, Also report of Kenneth Allen	City Record, Pp. 690-692.	Jan. 29, 1924
Brooklyn and the Sewerage Problem: Part 1—Earlier Days. Part 2—Present Time. Part 3—Polluted Waters. Part 4—Sewage Disposal.	C. T. Schondelmeier	Brooklyn, Pp. 1-2. " Pp. 15-16. " Pp. 11-12. " Pp. 15-16.	Jan. 26, 1924 Feb. 21, 1924 Feb. 9, 1924 Feb. 16, 1924
New York City Board of Estimate & Apportionment—Committee on Main Drainage. Appointment of Committee on Main Drainage and study of sewage treatment. Report of Kenneth Allen and water pollution of New York Harbor.	Committee on Main Drainage and Kenneth Allen	Minutes, City Record, Pp. 690-692. Minutes B. of E., Vol. 9, Pp. 9409-9418.	Jan. 28, 1925 Dec. 19, 1924

Title	*Author*	*Publication*	*Date*
Compact Underground Sewage Works in Lower New York, Fine Screens, Chlorinators and Automatic Pumps of 40 M.G.D. Capacity beneath the Street except small entrance building.	William Goldsmith	Engineering News Record. Pp. 611-613.	Apr. 9, 1925
Appointment of Committee on Main Drainage and Study of Sewage Treatment. Includes Report on Water Pollution of New York Harbor.	Report by Kenneth Allen	Also in Bound Vol. of Minutes, V. 3. 4/24/25. Pp. 3364-3368.	Apr. 24, 1925
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage.	Committee on Main Drainage	Minutes of 4/24/25, City Record, Pp. 4146-4147.	May 19, 1925
A Sewerage & Sewage Disposal System.	N. Y. Board of Trade and Transportation	Docket, Pp. 11-13.	Oct. 14, 1925
Rebuilding Old Sewage Works in Borough of Brooklyn; tanks made over for Reinsch-Furl type screens. Excess storm flow diverted through new outfall. New 26-ft. diameter screen installed.		Engineering News Record. Pp. 864-868.	Nov. 26, 1925
Ward's Island for Treating New York's Sewage. Sewage from three boroughs to be treated on the northern part of this Island, if it can be recovered from the State, to which it has been leased.		Public Works. Pp. 438-440.	Dec. 1925
Treatment of New York's Sewage. Proposed Island Disposal Plants for three boroughs.		Surveyor and Municipal and County Engr. P. 64.	Jan. 15, 1926
The Canal Street Sewage Treatment Plant of New York City; Another Step Taken to Clean Up New York Harbor.		American City Pp. 53-54.	Jan., 1926
Control of Stream Pollution; Classification of pollution; legislation; resolutions adopted at meeting of paper industry at N. Y. C. Suggests rules or constructive program for controlling problem of waste disposal and stream pollution.	C. G. Daker	Municipal and County Engr. Vol. 70, No. 5, Pp. 283-288.	May, 1926
Enforcement of Regulations to Control Main Drainage.	N. Y. C. Board of Estimate & Apportionment	City Record, Minutes of 1/29/26, Pp. 1187-1189.	July 17, 1926
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Report of Chief Engineer, submitted to the Committee on Main Drainage, urging that legislation be secured which would permit of using a portion of Ward's Island as a site for a Sewage Disposal Plant.	Chief Engineer Board of Estimate	Report No. 33863.	Oct. 1, 1926
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Sanitary Conditions of N. Y. Harbor. Includes preliminary report on the results of dissolved oxygen tests of the Harbor waters during the past summer.	Committee on Main Drainage	Minutes of 10/21/26, City Record, Pp. 8360-8362. Also in bound vol. minutes V-5, Pp. 6749-6751.	Nov. 23, 1926 Oct. 21, 1926

Title	*Author*	*Publication*	*Date*
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Bd. of Est. & App.—Pollution of Water adjacent to City of New York.	Committee on Main Drainage	Minutes, Pp. 7897-7900.	Nov. 18, 1926
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Bd. of Est. & App.—Methods of Sewage Disposal in the City of New York.	Committee on Main Drainage	Minutes, Pp. 7888-7893.	Nov. 18, 1926
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Report urging the use of a portion of Ward's Island as a site for a Sewage Disposal Plant.	Committee on Main Drainage	Minutes Pp. 7893-7897.	Nov. 18, 1926
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Improvement of Sanitary Conditions of New York Harbor.	Committee on Main Drainage	Minutes Pp. 7886-7887.	Nov. 18, 1926
Sewage Treatment for N. Y. C. Methods available for the Metropolis outlined in report to Main Drainage Committee of Board of Estimate & Apportionment.	Allen V. Kenneth	Water Works Vol. 55 Pp. 588-592.	Dec., 1926
New York City proposes activated sludge plant for N. Y. C. Parts of Manhattan and Bronx with estimated population of 1,100,000 in 1930 to be served by 180,000,000 gallons daily. Plant of diffused air type at cost of $30,000,000 including tunnels.		Engineering News Record, Vol. 103, No. 26.	Dec. 26, 1926
The Jamaica Sewage System and Disposal Plant.	S. F. Sammarco	Municipal Engrs. Journal. 2nd Quarterly. Pp. 85-87.	1927
Formal Opening of the Jamaica Fine Screening Plant by Borough Pres. Connolly on Dec. 15th.	N. Y. C. Bd. of Est. & App.	Sewage Disposal Bulletin, Pp. 15-16.	Jan. 1, 1927
The Jamaica Sewage Disposal Plant.		American City, Pp. 331-334.	March, 1927
Report on New York's Sewage Disposal. Recommends construction in East River of activated sludge plant of 240,000,000 gallons capacity, fertilizer to be manufactured from sludge; report of G. W. Fuller, highly recommended adoption of activated sludge process; cost of Ward's Island plant est. at $15,950,000.	Report of G. W. Fuller	Public Works, Vol. 59, No. 6. Pp. 226-228.	June, 1928
Sewage Conditions of New York City.	Louis I. Harris	The Citizen, P. 24.	Sept., 1927
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Report of the Chief Engineer, submitted to the Committee on Main Drainage on the general features of a plan for the utilization of Ward's Island as a site for a plant for the treatment of sewage now discharging into the East River and into the Harlem River.	Chief Engineer, Board of Estimate		Oct. 25, 1927

Title	*Author*	*Publication*	*Date*
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Sewage Pollution of Waters of New York Bay and Harbor; Report of Committee on Public Service in Metropolitan District.	Report of Committee on Public Service, Chamber of Commerce, N. Y. C.	Monthly Bulletin Pp. 133-143.	Nov., 1927
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Report to the Committee of the results of tests made the past season of the dissolved oxygen content of the waters of New York Harbor.	Report of Kenneth Allen	Minutes, City Record, Pp. 2162-2163. Minutes Bd. of Est. Vol. 1, Pp. 1150-1153.	March 13, 1928 Feb. 16, 1928
Sewage Treatment in New York.		Public Works, P. 138.	April 1, 1928
N. Y. State Sewage & Sewerage Treatment in N. Y. State. Over 300 Municipalities are provided with sewer systems. Represent population of over 8½ million or 78% of population of State. Descriptive data of sewerage and sewage treatment system.	N. Y. State Dept. of Health	American City, Vol. 38, No. 4, Pp. 133-136.	April, 1928
Reports of Activated Sludge Plants. After inspecting ten such plants, Committee recommends that New York City adopt activated sludge for Disposal Plant on Ward's Island.		Public Works, Vol. 59, No. 5, Pp. 203-205.	May, 1928
Sewage Disposal Bulletin, Supplement to No. 24—Sewage and Disposal.	N. Y. City Bd. of Est. & App.		May, 1928
Proposed Sewage Treatment Plant on Ward's Island.	N. Y. City Bd. of Est. & App.	Filed under N. Y. C. Disposal of Sewage.	May 7, 1928
The Ward's Island Project.	N. Y. City Bd. of Est. & App.	Sewage Disposal Bulletin, Pp. 23-24.	July 1, 1928
N. Y. C. Board of Estimate & Apportionment —Committee on Main Drainage. Improvement of Conditions of New York Harbor.	Committee on Main Drainage	Minutes of Meeting 6/7/28 in City Record, Pp. 6646-6649. Also in bound Vol. Min. V-4, Pp. 5421-5433.	Aug. 3, 1928
New Ward's Island Sewage Plant; Dumping of Sewage into Harlem River will end when big treatment plant is put in operation.		Harlem Magazine, Pp. 3-16.	Sept., 1928
Science an Ally in City's War on Waterway Pollution.	Arthur Tuttle	Real Estate Mag. Pp. 15, 38, 39, 49.	Dec., 1928
Unique contract for design of Sewage Works for New York. Plans for 180 M.G.D. activated sludge plant to be made by Fuller & McClintock for $605,000 including consultant's fees; cost of treatment works not to exceed $20,000,000. See Editorial—N. Y. Sewage Treatment for New York City.		Engineering News Record, Vol. 101, No. 23. Pp. 851-852.	Dec. 6, 1928

Title	*Author*	*Publication*	*Date*
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The Ward's Island Treatment Plant.	N. Y. C. Bd. of Est. & App.	Sewage Disposal Bulletin, P. 28.	April 1, 1929
Action of Current on Floating Materials. To determine to what extent pollution of shores might have been caused by refuse deposited at sea by N. Y. City, 7,433 bottles were released in three lots; of 2,444 bottles recovered, none had been reported at points along Atlantic Coast to east or north of Long Island, indicating that normal action of currents in open water outside of N. Y. Harbor is seaward.		Municipal News, Vol. 76, No. 5, P. 206.	May, 1929
N. Y. Sewage Disposal. Proposed activated sludge plant to serve population of 1,100,000.		Surveyor & County Engr. P. 57.	Jan. 17, 1930
New York's Sewage Problem.	Geo. A. Soper.	Municipal Sanitation Pp. 147-151.	March, 1930
New York's Sewage Problem.	Geo. A. Soper.	Municipal Sanitation Pp. 205-211.	April, 1930
World's Largest Activated Sludge Plant for New York City.	Richard H. Gould	Municipal Sanitation Pp. 262-265.	May, 1930
Schroeder Proposes Sewer Rent System.	Mchts. Assn. of New York	Greater New York, P. 2.	Nov. 19, 1930
N. Y. C. asks for bids on Sewage Disposal Plant for Ward's Island.		Engr. News Rec. P. 293.	Feb. 12, 1931
N. Y. C. Sanitation Dept. Preliminary reports on the general plan for sewage disposal for the City of N. Y. presented to Hon. James J. Walker by Wm. Schroeder, Jr.	William Schroeder, Jr.		Feb. 25, 1931
A Milestone in Sewage Disposal. Relating to Ward's Island Plant for New York.	Abel Wolman	Municipal Sanitation P. 113.	March, 1931
Mamaroneck, N. Y. Operation of Municipal Plant handling only Domestic Sewage. Also Plant with cap. 190 gal. per capita per day.	A. J. Foote	Amer. City. Vol. 45, No. 1, P. 101. Sewage Works J. Vol. 3, No. 3.	July, 1931 July, 1931
Mayor James J. Walker Starts Work on Big Sewage Plant on Ward's Island—estimated cost $30,000,000.		Bulletin of General Contracting Assn. Pp. 150-152.	July 19, 1931
Ward's Island Sewage Treatment Plant Begun; activated sludge process selected for first unit for New York's Sanitation Program.	Geo. W. Fuller	Civil Engineering, Pp. 1260-1265.	Nov., 1931

Title	*Author*	*Publication*	*Date*
Report of Committee on Sanitation, Public Health & Water Supply. (On plans for sewage disposal for the City of New York, submitted to Mayor by the Sanitary Commission.)	Chairman of Sanitary Commission, Merchts. Assn. of New York.		Dec. 7, 1931
Merchants Association Report on Sewage Disposal Plans. Committee points way to enormous saving.	Merchants Assn. of N. Y.	Greater New York, Pp. 1-3.	Dec. 21, 1931
N. Y. C. population overestimate reduces volume of N. Y. sewage needing treatment. Engineering Com. of Mchts. Assn. believes population will be not more than 10,250,-000 in 1960 instead of 14,675,,000. Sedimentation for Hudson sewage.	Engineering Com. of Mchts. Assn. of New York	Engineering News Record, P. 92.	Jan. 21, 1932
Tri-State Treaty Commission for Control of Pollution at N. Y.			Jan. 7, 1932
Chamber of Commerce, State of New York. Special Committee on Health & Sanitation. The sanitation of the city should be given serious attention by the Mayor. The Sanitation Commission in relation to sewage and refuse disposal and Harbor pollution.	Special Committee on Health & Sanitation, Chamber of Commerce, State of N. Y.	Monthly Bulletin, Pp. 514-521.	April, 1932
Tri-State Compact Recommended for Control of Pollution at New York.		Engineering News Record Pp. 574-575.	April 21, 1932
Sodium Nitrate used to control nuisance. (Sewage Treatment for Coney Island Creek.)	William T. Carpenter	Water Works & Sewage, Pp. 175-176.	May, 1932
Hackensack Valley Sewerage; long time solution to replace temporizing.		New Jersey Municipalities, Pp. 9, 30.	May, 1932
Abatement of Pollution in New York Harbor.	Gerald W. Knight	Military Engr. Pp. 221-224.	May & June, 1932
Sewage Disposal Trends in the N. Y. C. Region.	George W. Fuller	Sewage Works J. Pp. 637-646.	July, 1932
Construction of Ward's Island Sewage Treatment Works. Design and Construction.	Richard H. Gould	Design & Const. Vol. 3, No. 3, Pp. 154-157.	March, 1933
Abatement of Pollution in New York Harbor.	Gerald W. Knight	New Jersey Municipalities Pp. 27-28.	March, 1933
The Pollution of N. Y. Harbor. A study of the Relation between total sewage pollution and resultant harbor conditions as influenced by various physical factors.	Earle B. Phelps & Clarence J. Velz	Sewage Works Journal Pp. 117-157.	Jan. 1933
Joint Sewerage Works for 12 Municipalities in N. J.	A. Potter	Sewage Works J. V. 6, No. 1, Pp. 58-59.	Jan., 1934

Title	*Author*	*Publication*	*Date*
Chemical Precipitation at Freeport, L. I.	L. L. Luther	Public Works, V. 65, No. 1, Pp. 20-22. Sewage Works J. V. 6, No. 3, Pp. 635-36.	Jan., 1934 May, 1934
Symposium on Organization, Construction & Operation of Westchester County Sanitation Sewer Commission Projects.		Sewage Works J. V. 6, No. 2, Pp. 289-317.	March, 1934
N. Y. Supply Requires Diversity of Treatment.	F. E. Hale	Engr. News Record, V. 112, No. 22, Pp. 703-706.	May 31, 1934
Studies of Pollution of N. Y. Harbor & Hudson River. Discussion.	E. B. Phelps	Sewage Works J. V. 6, No. 5, Pp. 998-1003, Pp. 1004-1008.	Sept., 1934
Sewage Disposal in City of N. Y. Survey of Pollution of waters around N. Y. C. Outline of proposed treatment projects for boroughs in N. Y. C. Chemical precipitation for Coney Island Plant.	Richard H. Gould	Civil Engr. NY Pp. 158-161. Mch. P. 37. June.	1935
Proposed Coney Island Sewage Treatment Works of N. Y. C. Plans.	R. H. Gould.	Water Works & Sewerage V. 82, No. 2, Pp. 53-57.	Feb., 1935.
Sewage Disposal in the City of N. Y. (with map).	R. H. Gould.	Civil Eng. V. 5, Pp. 158-161. Public Works, V. 66, P. 27.	March, 1935. April, 1935
Wards Is. Sewage Treatment Works, N. Y. C. Views & Plans.		Arch. Rec. 77, Pp. 347-350.	May, 1935.
Sewage Containing Unusually High Amounts of Sulphates & Chloride, Sludge Disposal.		Engr. News Rec. V. 115, No. 15, Pp. 489-493.	Oct., 1935.
Policies & Progress in Sewage Treatment in N. Y. State.	Earl Devendorf.	Sewage Works J. V. 82, No. 2, Pp. 272-281.	March, 1936.
Surveying Sewage Pollution in Shellfish Producing Waters.	A. B. Miller.	Eng. News Rec. V. 117, No. 2, Pp. 49-50. Sewage Works J. V. 8, No. 4, Pp. 634-646.	July 9, 1936. July, 1936.
Comprehensive Sewage Disposal Plant of Nassau County.	C. MacCallum.	Sewage Works J. V. 8, No. 5. Pp. 829-834.	Sept., 1936.
Sewage Treatment in New York. Pollution Problem in Harbor Waters (with map).	W. D. Binger. R. H. Gould.	Civil Eng. V. 6. Pp. 789-793. No. 12.	Dec., 1936.
Progress in Sewage Treatment for New York City. Abstract.	R. H. Gould.	Water Works & Sewerage, V. 84, Pp. 55.	Feb., 1937.
Proposed Sewage Disposal Plans Submitted to Mayor John P. Mitchell by Committee on Pollution & Sewage.	Mchts. Assn. of New York.	Typewritten.	
Sewage Disposal in the City of New York. A Resume of 30 Years' Investigations.	President, Borough of Manhattan.		

Appendix A-1

Abstract of:

Report on Condition of the Water

ARTHUR KILL—August 1937

Received from: Joint Meeting in Letter dated November 22, 1937

GENERAL PROCEDURE

A series of water samples were collected for fifteen consecutive days between August 23rd and September 6th, 1937. Dissolved Oxygen tests were run immediately following collection, remaining portions of the samples were diluted and incubated for periods of five days to determine Biochemical Oxygen Demand.

Since the receiving water is strongly influenced by tidal conditions, it was imperative that the determinations be made so as to include all stages of the tide. This was obtained by taking the samples at the same time each day, while the stage of the tide varied throughout the complete cycle.

METHODS OF PROCEDURE

1. The sampling points were located as follows:
   - A. The Southernmost dock of the Standard Oil Company.
   - B. Adjacent to the Joint Meeting Outfall. (At ebb tide the sample was taken NORTH of the outfall, and at flood tide SOUTH of the Outfall.)
   - C. The Central Railroad Pier, at the Southern end of Newark Bay.

   In general the above points correspond with the locations selected last year and are approximately one mile on either side of the outfall sewer.
2. The samples were collected the same time each day.

   Since the stage of the tide is approximately 50 minutes later every day, this means that samples are collected under different tidal conditions daily for a fortnight.
3. The samples were collected at a uniform depth of five feet below the surface of the water.

SEWAGE CONTRIBUTED TO ARTHUR KILL AND ADJACENT WATERS

During the past year a considerable reduction in the amount of the untreated sewage discharged into waters influencing Arthur Kill has been accomplished.

During the year 1937, the following plants have been completed and placed into operation:

The Joint Meeting Sewage Treatment Plant at Elizabeth—serving 12 municipalities in Essex and Union Counties with an estimated connected population of 300,000 people and a daily flow of approximately 25 million gallons.

The Rahway Valley Joint Meeting Plant at Rahway—serving an additional 9 municipalities in Union County with an estimated connected population of 60,000 people and a daily flow of approximately 6 million gallons.

(The above plants formerly discharged raw sewage into Arthur Kill.)

Several Plants in the Raritan River valley, noticeably New Brunswick and Highland Park. It may be considered here that in view of the improved condition of the Raritan Valley that effects of sewage pollution from this source may be eliminated from consideration in relation to Arthur Kill.

A year ago (July 1936) reliable figures published in the *Sewage Work Journal* indicated the following:

SEWAGE INFLUENCING ARTHUR KILL

	Treated	*Partly Treated*	*Untreated*	*Industrial*
1936	10.5 MGD	17.9 MGD	80 MGD	Unknown
(the above figures considering influence of Raritan Valley)				
1937	5.1 MGD	44.7 MGD	32.7 MGD	Unknown
(the above figures do not consider influence of Raritan Valley)				

In short, the year 1937 has seen the volume of untreated sewage in Arthur Kill reduced by almost 60%.

The sewage polluted waters of the Kill move back and forth with the tidal currents for an indefinite period before being ebbed to sea. Fuertes estimated in 1921 that the detention period was from 2 to 3 days. The direction of flow and the velocity of the current at any point depends upon the state of the tide. A complete picture of the tidal movement may be had from examination of Publication 555 of the U. S. Coast and Geodetic Survey entitled "Tidal Currents in New York Harbor."

In brief, a typical example of an EBB tidal current flow in Arthur Kill follows:

The flow from Newark Bay is moving South. A portion flows into Arthur Kill (the balance moving out Kill van Kull.) The flow from Arthur Kill moves south, joins the Raritan River flow at the channel junction in Raritan Bay and goes east to Sandy Hook. The velocity at the mouth of the Elizabeth River varies from 0.6 to 1.3 knots at Spring tides.

A brief description of the opposite FLOOD tidal movement:

A portion of the flow from Raritan Bay is moving north into Arthur Kill. The water in Arthur Kill is moving north into Newark Bay. The velocity at the mouth of the Elizabeth River at Spring tide varies from 0.7 to 1.7 knots.

DISSOLVED OXYGEN FOUND IN ARTHUR KILL—1937

The average Dissolved Oxygen content over the whole area sampled was 19% (average of 45 tests) of saturation. On two occasions there was no dissolved oxygen present in the samples taken; on six occasions there was less than 1%. The maximum amount found during the test was 63%. Condensed figures for each sampling point follow:

Dissolved Oxygen—Percent Saturation

Sampling Point	*Avergae*	*Minimum*	*Maximum*
A. (Standard Oil)	11	0	25
B. (Outfall Sewer)	14	0	25
C. (Newark Bay C. R.)	31	1	63
Whole area-average of all tests		19	

In comparison with the results of 1936, the average of 45 tests showed an increase of 46% in the amount of dissolved oxygen found. The minimum amount showed no improvement—being entirely absent in both cases. The amount of maximum dissolved oxygen present showed 61% improvement.

Conclusions: The amount of Dissolved Oxygen in Arthur Kill waters south of the Joint Meeting Outfall has shown no appreciable improvement during the year. This is also the case of the conditions determined adjacent to the outfall itself. A great improvement however has been noticed at the southerly end of Newark Bay and in the Elizabeth River. (It is here noted that the old outfall of the Joint Meeting at the foot of Bayway Avenue about 1,200 feet south of the New Outfall continues to be used by the City of Elizabeth and discharges about 10 Million Gallons of untreated sewage daily.) This amounts to about 40% of the Joint Meeting flow.

VARIATIONS IN DISSOLVED OXYGEN WITHIN SAMPLED AREA

Figures of the amount of dissolved oxygen near the end of the flood and ebb currents, as well as figures for the flood and ebb currents follow:

Dissolved Oxygen, Percent of Saturation

Sampling Point	*Near End of Flood*	*Near End of Ebb*	*Average Flood*	*Average Ebb*
A. Standard Oil	4	10	8	13
B. (Outfall Sewer)	3	22	8	20
C. (Newark Bay)	1	51	6	48
Whole Area	3	28	7	27
Reference	5th-6th day	11th-12th day	Average of 6 tests	Average of 9 tests

The results obtained from five day Biochemical Oxygen Demand tests at 68° F. follow:

Sampling Point	*No. Samples*	*Five Day B. O. D. Average*	*Maximum*	*Minimum*
A. (Standard Oil)	15	6.6	12.2	0.7
B. (Outfall Sewer)	15	3.7	15.1	0.6
C. (Newark Bay)	15	2.0	6.9	0.4
Whole Area	45	4.1 Average		

DISCUSSION

Results this year show slightly higher B.O.D. values than last year. Minimum values show improvement as a definite result of reduced pollution. Maximum values show increase due to the fact that during the 1936 series of tests Point B was 1200 feet away from the then used sole outfall sewer, while in the present series Point B is immediately adjacent to the Joint Meeting Plant main outfall.

APPENDIX B

ARTHUR KILL AND RARITAN BAY

DISSOLVED OXYGEN—1915

U. S. PUBLIC HEALTH SERVICE

Name of Station	*Distances from Junction Arthur Kill and Newark Bay Nautical Miles*	*Number of B. Coli per c.c.*	*Total Count on agar at 37° C.* Average	High	Low	*Dissolved Oxygen Percent Saturation.* Average	High	Low
Junction of Kill Van Kull and Newark Bay	0.0	31.6	3,165	4,500	1,830	47.1	48.6	45.5
Milliken Iron Works	1.1	316	3,050	3,800	2,300	40.1	42.8	37.4
Mouth of Elizabeth River	1.8	31.6	5,100	6,700	3,500	34.3	39.5	29.0
Outlet of Joint Trunk Sewer	2.4	1,000 +	10,700	15,800	5,600	39.7	40.2	39.1
Graselli	3.6	316	4,910	9,200	620	35.4	35.7	35.0
Above mouth of Rahway River	4.75	316	2,075	3,000	590	34.0	37.7	29.0
Below mouth of Rahway River	5.1	31.6	1,060	1,770	320	35.5	41.6	32.4
Mouth Fresh Kills	6.25	5.6	885	1,450	460	36.0	42.3	30.4
Opposite P. R. R. docks	7.7	17.8	648	1,000	370	48.2	56.9	41.0
Red Buoy above Tottenville	8.75	10	193	350	40	60.2	62.8	54.9
Buoy off Tottenville	10.8	1. +	160	160	160	61.5	61.5	61.5
Opposite Perth Amboy Yacht Club	11.75	6.3	177	330	60	69.2	71.2	65.5
Opposite South Amboy	12.75	10. +	180	180	180	56.4	56.4	56.4
Great Beds Light	13.75	10. +	98	98	98	61.8	61.8	61.8
Junction of Arthur Kill and Raritan River	14.0	46.8	149	320	60	62.1	70.0	52.9
Princess Bay	16.75	1 +	100	120	80	71.8	78.0	65.6
Nun Buoy entrance to Cut-off Channel	18.6	3.2	100	130	70	81.8	88.7	74.8
Nun Buoy No. 2, off Great Kills	21.25	3.2	175	270	80	88.6	89.6	87.5

APPENDIX C

EDITORIALS

1937

Publication	*Date*
New York Daily News	June 11th
Newark, N. J., News	June 2nd
New York Herald-Tribune	June 11th
Staten Island, N. Y., Advance	June 4th
Brooklyn, N. Y., Times-Union	May 28th
Red Bank, N. J., Standard	May 19th
Yonkers, N. Y., Herald Statesman	July 7th
Long Island Daily Press	June 28th
Yonkers, N. Y., Herald Statesman	June 12th
Long Island Daily Press	July 15th
Long Island Daily Press	July 29th
Sea Cliff, N. Y., News	July 30th
Brooklyn, N. Y., Daily Eagle	Aug. 20th
New York Daily News	Aug. 21st
Newark, N. J., News	Aug. 23rd
Brooklyn, N. Y., Daily Eagle	Sept. 11th
Long Island Daily Press	Nov. 6th

To Commissioners and Counsel: June 18, 1937

The Commission has received considerable amount of favorable comment in the press. Some of the representative editorials are as follows:

New York Daily News, June 11th, 1937:

HUDSON POLLUTED

We quote from the remarks made from James L. Barron, Westchester Sanitation Director, at an Interstate Sanitation Commission hearing held day before yesterday at White Plains:

> At present, recreational uses along the Hudson River are being sacrificed and gradually destroyed by the discharge of untreated or inadequately treated sewage from Irvington, Tarrytown, North Tarrytown, Briarcliff Manor, Sing Sing Prison, Ossining, New York Central Harmon Shops, Croton-on-Hudson and Peekskill, and, to a lesser degree, by many communities outside.
>
> The river water has now reached the critical limit of bacterial pollution, and dissolved oxygen is seriously depleted at certain points.

We're in favor of any measures that will halt this pollution of the Hudson River, one of America's most beautiful rivers, sometimes compared favorably with the Rhine. We think the Hudson is more beautiful than the Rhine.

The Hudson's west shore Palisades have been protected for years from various kinds of gouging and defacement. Evidently the time has arrived to take steps for protection of the Hudson's east shore.

Of course, if the river itself is polluted to the infectious point by riverside towns' discharge of untreated sewage into its waters, its banks necessarily become unsafe for bathing beaches, boat clubs and the other recreational activities that belong on the banks of a beautiful river. The Hudson east shore ought to be given over to these purposes as largely as may be, for the benefit of both Westchesterites and New Yorkers.

Sanitary sewage disposal, either by incinerators or sewage treatment plants, is no cheap job for any city or town. But we believe the Hudson River towns will save themselves money in the long run by attacking this problem with ample funds now. Their choice appears to be limited to two things: either adequate sewage disposal, or shrinkage of property values and business because fewer and fewer people will want to play along a polluted Hudson.

Newark, N. J., News, June 2nd, 1937.

"PROBLEMS OF POLLUTION"

Public attention has been focused again on control of tidal water pollution in the metropolitan area as a result of a hearing held by the Interstate Sanitation Commission on the status of Newark Bay. The commission will determine whether the bay shall be designated as Class A or Class B; that is, whether, under Class A, the waters are to be reserved for recreational pursuits and fish culture, or whether the bay shall be placed in Class B and used for industrial purposes. As usual with public questions, final disposition is not simplified by the conflicting interests of the municipalities involved.

Whatever the outcome, authorities predict the controversy will bring at least partial abatement of present pollution in the bay. That will help, but the bay figuratively is a drop in the bucket in the regional scheme of pollution control. Engineers have variously estimated the cost for the tidal waters of New Jersey, New York and Connecticut at $300,000,000 to $400,000,000. Obviously the tri-state project could not be carried to fulfillment without federal aid because the problem is constantly becoming more ramified. As the density of population increases and industrial expansion continues, the danger to public health grows more acute wherever adequate control of sewage is not in effect.

Necessary measures for the disposal of industrial and household wastes must be taken if health hazards are to be reduced and invaluable recreation facilities preserved. The Legislature has voted $100,000 to establish a new state park at Raritan Bay and Cheesequake Creek. The waters at that point are dangerously contaminated. Sponsors of the park in the Legislature have promised conditions would be corrected. It is the Legislature's obligation to compel correction.

Years and hundreds of millions of dollars will pass before this region's problem is surmounted. Yet New Jersey knows that progress is possible. Compare conditions along the bathing beaches of the North Jersey coast today with what they were a few years back. It took expensive litigation and time to reduce pollution, but reduced it was. Meantime the State Department of Health continues its valuable contribution to the work by compelling communities to comply with legal sanitary standards designed to reduce the hazards and nuisance of pollution.

Herald-Tribune, June 11th, 1937.

"FOR CLEANER WATERS"

It is encouraging to learn that Westchester County is showing renewed interest in the problem of keeping the waters of Hudson and Long Island Sound clean. Not that Westchester has been remiss in this respect. Quite the contrary. Westchester County has done what it could to put an end to indiscriminate disposal of sewage and industrial refuse. The

significance of the latest move lies in the fact that Westchester is once more setting an example to other counties. Only by co-operation between the counties and towns along the Hudson, Long Island Sound and New York Harbor is there any hope of ever ending the pollution of waters in and about these regions.

New York City and the industrial regions of New Jersey are, of course, the worst offenders. The Interstate Sanitation Commission has been doing what has been practicable to arouse local officials to the need for co-operation in fighting this evil. Here in New York spasmodic efforts have been made to improve conditions. But the city authorities have steadfastly failed to accept any of the long-term proposals made with a view to keeping ahead of population growth. Long Island presents special problems. These must all be co-ordinated and effectively pushed.

But if anything is to be accomplished public opinion must be aroused. This the Westchester meeting has done—at least locally. The condition of the Hudson is, of course, only in part due to local pollution. If more regions would show the same intelligent interest as Westchester the pollution problem would be sooner settled.

Staten Island Advance, June 4, 1937.

"MT. LORETTO FOLLOWS SUIT"

Inch by inch, public demand for elimination of pollution is getting results. Recently Richmond Memorial Hospital began to operate its chlorination plant. Yesterday Mount Loretto, a town in itself, announced that construction on a $15,000 sewage treatment plant will be started within a week or ten days.

This voluntary action by two large institutions will cleanse a large beach frontage which two years ago showed a bacterial count almost as great as water samples taken near the Narrows during tests conducted by the Staten Island Advance in collaboration with Wagner College.

It is safe to assume that similar results are being achieved in other communities fronting the waters which empty into New York Bay.

The cleansing process will be gradual, of course, but under stimulation by the Tri-State Pollution Commission, our beaches should recover a semblance of their former cleanliness within the next decade or two, so that oyster dredging, clamming and lobster fishing may flourish again in years to come.

The benefit to beachfront property owners and the public, of course, is obvious.

Brooklyn, N. Y., Times Union, May 28, 1937.

"FOR CLEANER WATERS"

With the coming of warm weather and the recurrent, natural desire of many thousands of the city's seven million population for a cooling and invigorating plunge into salt water for a good old-time swim there bobs up the old vexed question of where to find clean beaches.

New York, with a magnificent harbor and a city laved all sides with an abundance of water, has had to face year after year the problem of contamination and to find its bathing facilities ever more restricted because of that problem. For a city with its miles of waterfront it has suffered a heavy handicap so far as swimming goes.

Brooklyn has its Coney Island, to be sure, where millions bathe in the waters of the ocean; there are Jones Beach and Long Beach and various smaller beaches, many of them privately owned, but the question of sanitary bathing places is as pressing as ever.

Late as they may be, steps have at last been taken to render the waters about New York purer and to reclaim some of the waterfront for recreation purposes. Park Commissioner Robert Moses' letter to the Interstate Sanitation Commission, making an earnest plea for the halting of beach contamination and outlining plans for thirty-seven new waterfront park developments, is the most recent of these steps.

With a regretful look back over the past, Commissioner Moses notes that "it is one of the tragedies of New York life and a monument to past indifference, waste, selfishness and stupid planning that the magnificent boundary waters of the city have in a large measure been destroyed for recreational purposes by haphazard industrial and commercial developments and by pollution through sewage, trade and other waste."

It is not proposed, Mr. Moses states, that natural bathing be provided on the shores of Manhattan or those of Brooklyn, Queens, or the Bronx, opposite Manhattan, but that every effort be made "to purify these waters to such an extent that tidal movements will not result in contamination of water in the natural bathing areas along the other water frontage of the city."

Increasing population means greater demand for sanitary bathing places, and it is never too late to clean house.

Red Bank, N. J., Standard, May 19, 1937.

"POLLUTION MUST BE ENDED"

The Interstate Sanitation Commission held a public hearing this morning in New York City. Of late we have not heard much of the perils of pollution, but it was not so long ago that bayshore shellfishermen were up in arms at health restrictions laid down on their catches by New York City on the grounds that Raritan Bay was polluted. We wonder just how many shellfishermen were at this morning's hearing, to assist in clearing up the difficult problem. Pollution is one subject which has been politely waived with only a passing, and general, reference being made occasionally. The cure, in our opinion, would be a campaign of public education such as the one which has transformed venereal diseases from a hopeless ailment, never discussed and seldom the occasion for visiting a reputable doctor, into a disease which requires treatment the same as any other malady.

In addition to the editorials, accounts have appeared in daily press concerning each of our Hearings. During our first Hearings accounts were primarily confined to the local press of the city where the Hearing was held. Now, however, reports concerning the Commission's activities are gaining wider recognition, to the extent that on June 10th the "New York Times" ran an 11-inch column concerning our Hearing at White Plains.

Some excellent publicity was obtained as a result of a letter from Robert Moses addressed to Commissioner Maguire.

Editorial from Yonkers Herald-Statesman of July 7th, 1937.

BATHING BEACHES ON OUR RIVERFRONT

It is difficult for the average resident—even for the taxpayer, who should be deeply concerning—to visualize the possibilities for recreational development along this city's four and one-half miles of riverfront.

Few cities in the New York region—indeed, few cities in America—have such an extensive and such beautiful water frontage as has Yonkers, yet there is probably no portion of the municipality which receives less attention and consideration from the authorities and from the general public.

Although all of the riverfront is zoned for industry, only a limited portion is so utilized. Approximately one-half of the entire strip is vacant and undeveloped in private ownership. The city owns about 3,000 feet; the county, nearly 400; the state, slightly over 400; charitable institutions, 900. The remainder, aggregating about 18,000 feet, is largely undeveloped.

Whatever may have been the former prestige of the Hudson River as a freight carrier to and from Yonkers during the heydey of the sugar refineries, the fact remains that such use has sharply declined.

A portion of the river is utilized in the Summer for bathing purposes—under the severest condemnation of the Health Department.

The City Planning Commission has recommended that city-owned waterfront lands be filled in by the Department of Public Works and thus be made eminently suitable for park and other recreational development. It has also advocated such service by the city "without charge to the owners" for privately owned waterfront. For various reasons this project has been repeatedly blocked.

Such filling in—with clean ashes—would at once solve the municipality's problem of finding a dumping place for this material and at once contribute to a reclamation program of incalculable future values. Ample scope for such fill-in has been provided by the United States War Department, which has officially approved bulkhead lines at a point several hundred feet out from shore, varying with the shoreline.

The Yonkers Chamber of Commerce, perennially approaches the problem of industrial development of the waterfront but virtually everybody has forgotten the need of recreational development. A single set of plans, by which the riverfront at Trevor Park would have been transformed into a cove for swimming, boating, playgrounds and other facilities, has been dust-gathering in City Hall pigeonholes for years.

The reason that few wax enthusiastic about the possibilities of opening the Hudson River shore here to swimming and other river sports—as is done on a limited scale on the New Jersey side—is that the water is so badly polluted that to expose the human body thereto is actually perilous. The B coli bacilli, when coming in contact with mucous membranes, can cause such irritations and damage that the results may be grave.

But now an approach is being made to curb the pollution, perhaps to eliminate it completely. This is a long-term program—perhaps requiring decades for completion—but it is a gigantic task very much worth doing.

Tomorrow morning at City Hall, the Interstate Sanitation Commission will hold a hearing to ascertain the wishes of Yonkers officials and Yonkers residents as to the riverfront's future. It will seek information, upon which to base a decision whether Yonkers is to be Class A frontage or a Class B. The former means that it will be so protected that the waters will eventually be so clean that they will be accessible for bathing, fishing and other purposes; the latter means that they will perpetually continue for industrial purposes.

In more practical language, it means that Yonkers may be in a position—now, this week—to choose whether it wants the best treatment which a two-state anti-pollution authority can provide, or whether it chooses to be classified as meriting little or no consideration.

It means that we shall know whether some day Yonkers boys and girls will have swimming beaches and swimming pools all along the river front, and boating coves and playgrounds too, or whether it will still be necessary for Yonkers residents to travel to Long Island Sound, or even to Long Island itself, to take a swim and loll on a public beach.

There is room to have our industrial piers and bulkheads—and to lay the foundations for a recreational future which can bring the city eventual dividends of inestimable scope and value.

But it can't be done by wishing. It can be done by speaking up before the Interstate Sanitation Commission and by following through—in months and years to come—with official, semi-official, group and individual pressure to achieve such eminently salutary ends.

Extracts From Editorials

Some Editorials have appeared in the Newspapers since the last meeting of the Commission, but due to their length, they will be summarized instead of being quoted verbatim.

The Long Island Press, Jamaica, New York, under the date of June 28th, carried an editorial "Pollution Widespread," expressing the hope that pollution of New York Harbor will be reduced through the activities of the Interstate Sanitation Commission and stated "the Commission should attempt to educate the public to what is required, and advertise its plans so that progress can be followed."

The Yonkers Herald Statesman of June 12th, carried a reprint of a recent editorial of the Herald Tribune, copies of which were sent to the Commissioners. It also carried an editorial headed "Naming Names" stating that the hearings have been more valuable than appeared on the surface, not merely to receive evidence but quite as important a frank "getting down to brass tacks, the naming of names." It further states that although the abatement of pollution is an exceedingly expensive procedure, still if Westchester county wished to utilize its river recreational resorts and capitalize the lovely river banks an ambitious beginning will have to be made. "So great a community asset is our riverfront that the greatest possible precaution and provision are warranted—and a considerable outlay of public funds to safeguard the river and the public health as well can also be regarded as a decidedly sound investment.

There have been several articles in the Hudson River Valley papers which do not refer specifically to the Interstate Sanitation Commission but rather to the problem of abatement of pollution.

The Beacon News of June 21st, states, "Before the State Health Department can force Hudson River towns to spend millions on disposal plants it would have to prove that sewage discharged into the river is a menace to public health. This it cannot prove. It has yet to cite any precise reason why the taxpayers should be overburdened to change over their sewer systems. The feeling of citizens is not hostile to disposals as an eventuality, but they contend that until more prosperous conditions prevail they should not have their taxes added to.

The Newburg News also carried the same article. A previous issue of June 16th, referred to an article in the Peekskill Star summarized below. The Newburg News went on to question, why the river should be made pure for recreational purposes. It stated that "we have hundreds of lakes and numerous interior rivers and streams and a far-flung seacoast for swimming."

The Peekskill Star of June 12th, carried a long editorial indicating that the spending of many thousands of dollars for sewage treatment is likely to bring to the public mind the fear of pouring dollars down a "rat-hole," it states however, that it has to be done. It further states that there is a bright side to this big community project. A satisfaction of knowing that all communities along the Hudson River are obliged to make the same sacrifice for the sake of eliminating the pollution of this beautiful stream.

The Poughkeepsie Evening Star of June 11th, carried an editorial: "We Are Among the Guilty." It states that movements to end the pollution along the Hudson are long overdue, that it would cost a good deal of money and take years to correct, but it is a task which must be attacked eventually. It states: "in reference to the dilatory tactics in connection with the abatement of pollution and the construction of sewage plants, we're getting away with it now—by our evasion tactics—but that can't last long"

Jamaica, L. I., N. Y.-L. I. Daily Press editorial, July 15, 1937.

Save the Beaches

POLLUTION A PROBLEM

No more important task faces the Interstate Sanitation Commission than prevention of pollution in waters which lap the shores of Nassau and Suffolk counties.

Point Lookout, Long Beach, Fire Island State Park, Heckscher Park, the fashionable Hamptons and a score of other smaller beaches on both shores are concerned in the persistent spread of pollution which, if not checked, will render this entire area unfit for bathing.

The Long Island State Park Commission has millions of dollars invested in state-owned resorts along the south shore. This investment will go to pot if the Atlantic Ocean and Great South Bay become contaminated. There is scarcely one beach along the entire New York City waterfront where bathing is entirely safe. The Rockaways prove the exception, thanks to the broad sweep of the Atlantic Ocean at this point. Jamaica Bay areas are polluted; the entire stretch of the East River into Long Island Sound is contaminated.

Water pollution is not impossible to prevent. In congested areas it might not be possible to maintain Grade A areas but contamination can be kept to a minimum.

Independent tests at Jones Beach indicate that water pollution is increasing there on the bay side. It has not, of course, reached the danger stage by any manner of means, but there is handwriting on the wall which cannot be ignored.

Park Commissioner Robert Moses has written to Seth G. Hess, Chief Engineer of the Interstate Sanitation Commission, as follows:

> "The question of sanitation in Nassau County, with particular reference to the disposal of sewage is becoming more vital every day. . . .
>
> "My own experience in New York City in connection with the effect of water pollution on recreational areas serves to emphasize the im-

portance of avoiding on Long Island east of the city line, the tragic mistakes which have been made by the city in the past in the pollution of its once matchless shorefront."

Mr. Moses echoes the sentiment of every Long Island resident who loves and appreciates the Island's beaches.

Water pollution must be stopped!

Editorial from Jamaica, N. Y., Long Island Press of July 29, 1937.

Beach Pollution Drive

A noteworthy committee

Without any fanfare, a non-salaried commission of citizens has been carrying on an important survey, the study of pollution along Long Island's shores which is under the direction of the Interstate Sanitation Commission.

A series of hearings will be completed next month and then the State of New York and New Jersey will be handed recommendations for alleviating the conditions which are slowly spoiling invaluable natural waters and harbors.

The spread of conditions which have spoiled Jamacia Bay and other waters in the vicinity of New York Harbor is fully recognized now as a stupid waste of public wealth. The development of Jones Beach has shown the public how this natural wealth can be used. Whatever the Interstate Sanitation Commission can do to check the tide of pollution will pay dividends of health and recreation for this and future generations.

Editorial from Sea Cliff, N. Y., News, July 30, 1937.

Hope Revives

Pure water along the North Shore of Long Island is a matter of great importance. Having struggled with Hempstead Harbor for the past seven years and despaired upon various occasions, it was positively inspiring to feel that Sea Cliff was having part in a tremendous program. We listened intently to testimony and resolutions presented to the Interstate Sanitation Commission at Huntington Wednesday.

The beaches in the area between the city line and Port Jefferson are within motoring distance of millions of persons recreation bent. At this moment 750,000 bushels of oysters are languishing in the Nissequogue River under State ban for human food; this might mean an annual revenue of $250,000 if the waters had not been polluted. The Coast Guard reported that in one year, during daylight hours when visibility was good 222,497 craft had entered an area between Lloyd and Eaton Necks and 95 percent of them on pleasure bent. Experts believe that the degree of pollution has even now begun to subside and that certain clean-water-loving fish are returning. It was reported that it is not impossible to lift a ban once established against the taking of shellfish for human consumption. Every official representative offered complete cooperation to the Commission—which was just as well since this Commission has real authority to enforce its mandates on the degree of treatment of all pollution entering the waters under its jurisdiction.

The most gratifying feature of the situation is the awakening of public opinion on the subject of water pollution. There are enough laws now in force to cover the situation, but without municipal and personal cooperation, to restore the clarity and purity of the waters would be hopeless.

Editorials from Brooklyn, N. Y., Eagle of August 20, 1937.

Clearing Way for New Beaches

If Brooklyn, and through it the whole city, is to get the full use, for both bathing and boating, of the waters that lave its shores, it will have to be done through the exercise of great patience and a careful following out of suggestions laid before the Interstate Sanitation Commission at a recent meeting in Canarsie. In fact, the meeting might well be regarded as the start of a movement for the restoration to the city of some of the benefits of the ocean by which it is practically surrounded—benefits that were lost years ago through indifference to rapidly increasing population and pollution of waters which that population might now be enjoying. The beginning of the restoration lies in the existence of the commission itself, for it was established to make an investigation of the waters surrounding New York City and northern New Jersey and ascertain to what extent there has been an elimination of sewage pollution and in what areas.

Much depends upon the results of this investigation, especially in Brooklyn, for as Park Commissioner Moses has pointed out to the commission, the complete development of such projects as the waterfront parks at Canarsie, at Dyker Beach and others must wait some time before the water in these particular areas is suitable for bathing. The Park Commissioner's suggestion that all the tidal waters of the city south of the Narrows on the Brooklyn, Queens and Richmond shores be designated as Class A, and so call for the maintenance of a high standard of purity, is a practical one.

The demand for additional bathing beaches has become more pressing with each successive Summer season. Those already used are overcrowded, so much so that many venture elsewhere to bathe in waters still clean. Sewage disposal plans are going forward, though the work is necessarily slow. It is a herculean task, but with patience and diligence it can be accomplished by pushing ahead on the lines already laid out.

From New York, N. Y., Daily News of August 21, 1937.

MOSES WANTS MORE PARKS

Park Commissioner Robert Moses advises the Interstate Sanitation Commission:

> The other two proposed beaches at Carnasie and Dyker Beach are badly needed, as evidenced by the numbers of people who go swimming at and near these locations in spite of the highly polluted waters. We realize that it may be some time before the waters adjacent to these two beaches will be suitable for bathing, if present schedules for sewage disposal are carried out.

We'd like to see the city take this hint to heart and hurry up the sewage disposal schedules so that these two proposed large beach parks can get under way. If Mr. Moses says there should be a park at such-and-such a place, we feel that there should be.

Moses was once accused by Mayor LaGuardia of being a genius, with all the temperament that frequently goes with genius. People who come in contact with him confirm this charge. But that is for those people—the Mayor, Col. Somervell, etc.—to worry about. Those of us who merely stand off and watch the doings of city officials know that Moses has been the most energetic and constructive Park Commissioner New York City has had in decades, if not generations.

From Newark, N. J., News of August 23, 1937.

THE GOOD WORK GOES ON

New York wants to develop waterfront parks at Canarsie and at Dyker Beach, Brooklyn, but finds "the water isn't suitable," which is to say it is polluted. This is an old story to New York and New Jersey. The Interstate Sanitation Commission has heard it before and will hear a lot more of the same before it concludes its survey of tidal waters around New York and Northern New Jersey. To clean up completely the sources of contamination in this region is going to take time and money. It has been a long discouraging fight, but happily gains have been made and more will be made as the public becomes increasingly cognizant of what man has done to our priceless resources.

Parks Commissioner Moses, long active in the fight to salvage recreational facilities, has cited the progress made by New York in recent years, and it has been substantial. New Jersey got results and cleaner beaches through the litigations which suppressed New York's garbage scows. Since then our relations with out neighbor have been more amicable, as shown by the spirit of co-operation which led to the creation of the Sanitation Commission, which indicates a mutual desire to correct an intolerable condition.

The demand for Class A waters, devoted exclusively to recreation, as contrasted to Class B, which are used for industrial pursuits, grows as population increases. As Commissioner Moses assured the Sanitation Commission, the population increase in the metropolitan district is incessant. Aside from the healthful benefits to be derived from clean waters there is the financial aspect. As a state that derives millions from recreation, we know the dividends that will follow development of our natural facilities to their fullest.

Editorial from the Brooklyn, N. Y., Eagle of September 11, 1937.

ZONING BOROUGH WATERS

Differences of opinion as to the degree of purity to be attained by the East River, as developed at the Interstate Sanitation Commission's hearing of testimony on the classification of waters off Brooklyn and Queens shores from the Narrows to Sanford Point, near Hell Gate, appear to have left the original general purification plan in a somewhat uncertain state. Though Park Commissioner Robert Moses differs in his view from that of the engineers of the Board of Estimate by recommending that the commission designate the East River from Governor's Island to Hell Gate as Class B and the rest of the waters under consideration as Class A, it is apparent that there may be common ground for eventual agreement in the fact that all the officials concerned favor greater cleanliness than now exists. Class A, as has already been pointed out, would mean a zone devoted essentially to swimming and other forms of recreation, whereas Class B. would permit general commercial use, though with insistence on some standards of purity.

There is no question that, as Commissioner Moses argues, the waters of Flushing Bay boat basin and the proposed bathing facilities at Dyker Beach Park on Gravesend Bay, urged as a Class A area, would be affected, through tides and currents, by the polluted water in the East River and would therefore require a reasonable degree of purity in the latter. The problem will undoubtedly be that of attaining that reasonable degree. The protection of shore parks present and to come, and the sanitary preservation of the city's shore fronts for the benefit of the public are the main consideration in one of the most important projects yet undertaken in the metropolitan area.

Editorial from Long Island Press, Jamaica, New York, November 6, 1937.

POLLUTED WATERS CAN BE PURIFIED

Buried in the Day's News is a most encouraging report for those who realize the dangers of destroying Long Island's natural waters and harbors by pollution.

The Interstate Sanitation Commission, composed of public spirited citizens of New York and New Jersey who serve without pay, has just estimated that, with governmental cooperation, pollution in the

waters around Long Island can be eliminated within 10 years.

That pollution will not be eliminated for a decade, even with care, shows how dangerous the situation was when the commission was appointed to alleviate it.

That pollution can be eliminated, even in 10 years, is an encouraging result of this commission's study.

Meeting the problem will call for intensive sewage treatment throughout the metropolitan area, not only in New York and New Jersey but also in Connecticut. Connecticut is not represented in the commission but there are indications that it will cooperate with its neighbors. It should be represented because all three states face a common danger.

With the commission studying causes and suggesting remedies, it now becomes the duty of municipalities to provide the plants necessary to treat sewage so that it may be emptied without impairing a priceless natural resource.