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.

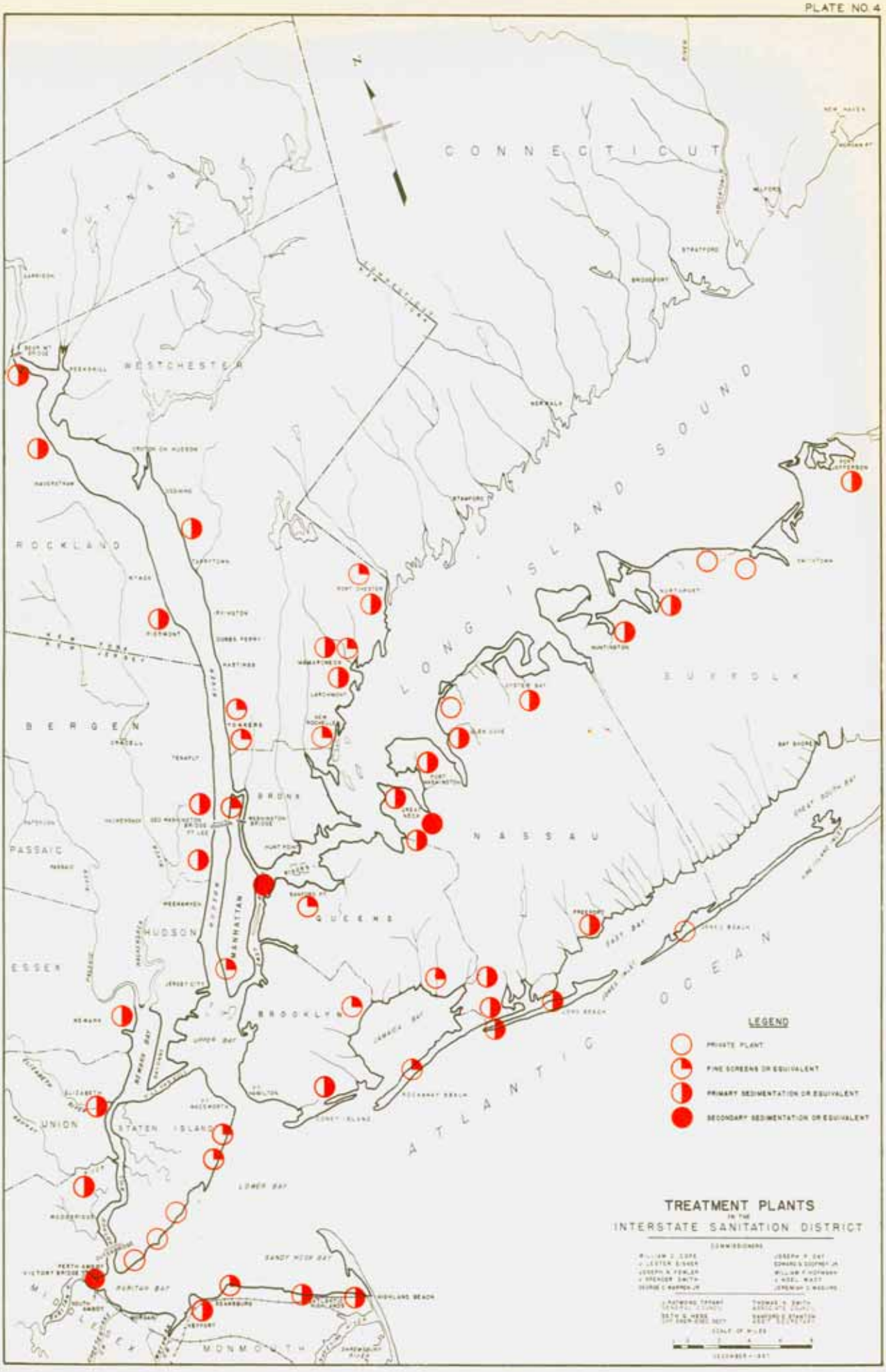
DESCRIPTION OF EXISTING SEWAGE TREATMENT PLANTS AND AREA

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

PLATE NO. 4


CONNECTICUT
LONG ISLAND SOUND
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
ESSEX
HUDSON
UNION
BRONX
MANHATTAN
QUEENS
BROOKLYN
STATEN ISLAND
NASSAU
SUFFOLK
ATLANTIC OCEAN
LOWER BAY
RARITAN BAY
SANDY HOOK BAY
MONMOUTH
OCEAN
LEGEND
PRIVATE PLANT
FINE SCREENS OR EQUIVALENT
PRIMARY SEDIMENTATION OR EQUIVALENT
SECONDARY SEDIMENTATION OR EQUIVALENT
TREATMENT PLANTS
IN THE
INTERSTATE SANITATION DISTRICT

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 6¼ 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.

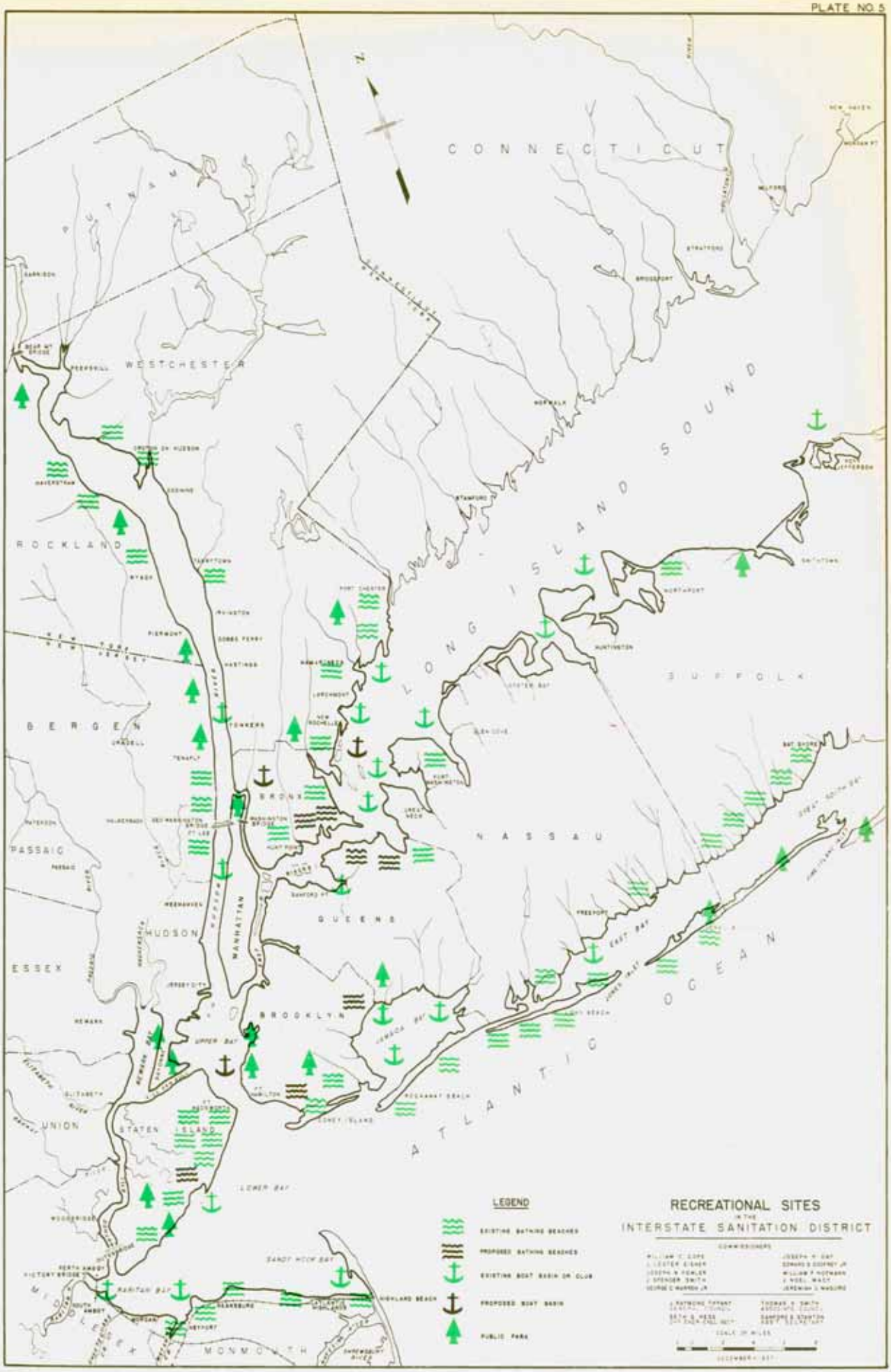
Section IV—Use of Area

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

PLATE NO. 5


CONNECTICUT
LONG ISLAND SOUND
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
HUDSON
ESSEX
UNION
STATEN ISLAND
BRONX
MANHATTAN
QUEENS
BROOKLYN
NASSAU
SUFFOLK
MONMOUTH
OCEAN
ATLANTIC
LEGEND
EXISTING BATHING BEACHES
PROPOSED BATHING BEACHES
EXISTING BOAT BASIN OR CLUB
PROPOSED BOAT BASIN
PUBLIC PARK
RECREATIONAL SITES
IN THE
INTERSTATE SANITATION DISTRICT
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ASSOCIATE DIRECTOR
SCALE OF MILES

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.

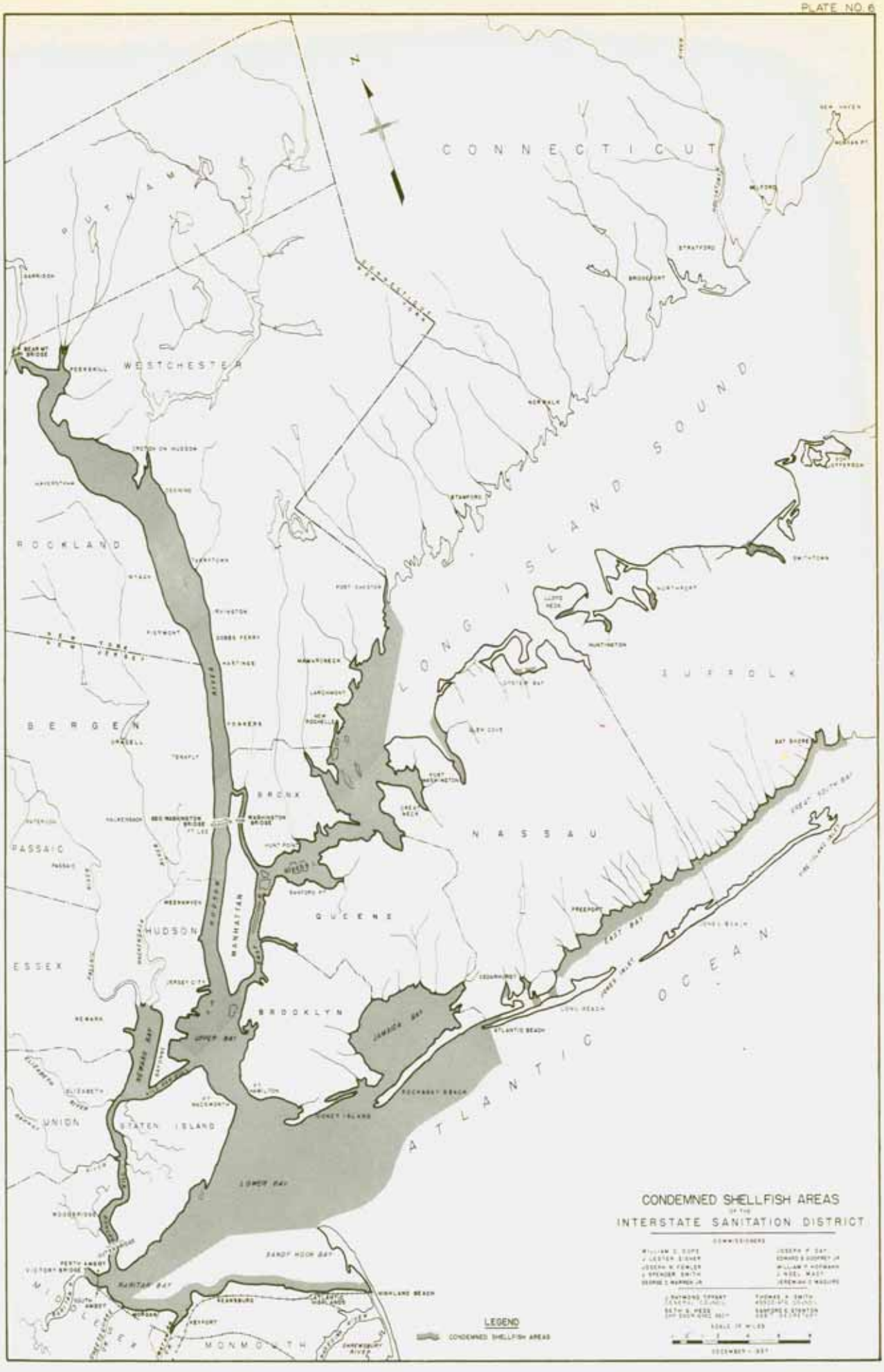
In October, 1935, arrangements were completed by which the ungranted lands under water along their front were turned over to the City by the State. While transportation to the shore is not yet sufficient to make these areas effective in serving the central part of the City, they have been wisely acquired 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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SCALE IN MILES

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DECEMBER - 1931

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

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.