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REPORT OF  
**ALEXANDER POTTER,**  
CIVIL ENGINEER.

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On Drainage of  
**Meadow District.**

AUGUST, 1904.

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—TO—

MAYOR AND COUNCIL,

HOBOKEN, N. J.

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THE OBSERVER PRINT,  
1904.



*Hoboken, N. J. Sewers*

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August 23rd, 1904.

The Hon. Adolph Lankering, Mayor, and Members of the City Council,  
Hoboken, N. J.:

Gentlemen—I have the honor to present the following report in connection with that important improvement, the drainage relief of the Meadow District.

After notification from the City Clerk that I had been retained to report upon the feasibility and practicability of a plan already prepared for the relief of storm water and sewerage from the Meadow District of the City of Hoboken, in company with the Mayor, I called upon Thomas H. McCann, M. Am. Soc. C. E., the Civil Engineer who had prepared the plan in question. Mr. McCann courteously agreed to deliver to me copies of all plans in his possession, also copies of all estimates made by him. A list of the plans received from Mr. McCann is as follows:—

General map of the City of Hoboken, showing the existing and proposed sewers with their depths and sizes.

Five sheets of profiles of the main and lateral outlet sewers contemplated.

Three sheets of plans of pumping station.

One sheet of details of tidal gate.

I was also furnished with a copy of Mr. McCann's detailed estimate and computations.

**EXAMINATION OF EXISTING SEWER.**

An examination of the existing sewer was made by me for the purpose of determining, if possible, the cause of the apparent irregularities in the grades, and the question will be discussed in a subsequent part of the report.

**DETERMINATION OF STREET LEVELS.**

I also ran an independent line of levels over the surface of the streets upon which the sewer is proposed to be laid for the purpose of noting if any settlement had occurred in these streets since the grades were established, or in the grades of the pavements, which extend over certain sections of the work, since they were laid. I find material variations between the surface of the streets when the grades were established and their present elevations, which leads me to the logical conclusion that some settlement has taken place in the street surfaces, as there is less likelihood of engineering errors in the elevations as delineated upon the plans.

This settlement must, in my opinion, to a greater or less extent affect both grade and alignment of existing sewers unless the foundations placed under the sewer are of a sufficient strength to withstand the loads transmitted to them from the surface. While theoretically the support given the sewers should have been sufficient to prevent any settlement in the sewer, it is hardly possible that the irregular grade of the existing sewers was altogether intentional or due to carelessness in construction, but much of it is probably the result of settlement after construction.

In view of this, I have therefore thought it advisable and have increased the estimates for piling fifty per cent more than called for in the plans of Mr. McCann. This, I think, is a necessary precautionary measure.

#### SIZES.

I have gone over the sizes of sewers designed and find, with but few exceptions, that they are satisfactory; however, a few cases where it is essential in my judgment to modify the plan of Mr. McCann are noted. I concur with Mr. McCann's assumption in arriving at his sizes. These sizes were determined on the basis of maintaining the tidal outlet extending from the intersection of Ferry Street and Adams Street to the head of the Canal.

This tidal outlet varies in size from 4'6"x6' box culvert to an 8'x8' box culvert at the Canal. The effective capacity of this outlet is greatly reduced because it is throated to a 30" pipe as it passes under the Delaware, Lackawanna and Western Railroad track. This reduction in area of the pipe decreases the discharging capacity of the outlet fully seventy-five per cent. This condition should be remedied.

#### RECOMMENDATIONS.

After a careful study of the problem of relief through the tidal outlet, giving due weight and consideration to its advantages and disadvantages, it is advisable to make proper provision therefor. During the period when the tidal relief is effective the flow in the sewer from Jefferson Street to Grand Street, instead of being in the direction of Grand Street will be in the direction of Jefferson Street, and as the flow in the upper end of Grand Street will be towards Ferry Street we are obliged to assume the sewer from Grand Street to Jefferson Street as caring for the water from the upper end of Grand Street and the east end of Ferry Street, from Garden Street to Grand Street. I would therefore recommend the increasing of the present 42-inch and 38-inch sewers on Ferry Street to a 60-inch circular sewer.

I would recommend a change of the size of the main outlet on Fifteenth Street from the pumping station at the corner of Fifteenth Street and Park Avenue to Grand Street. On this street Mr. McCann designs

an outlet sewer 58 inches by 8'6" from Willow Avenue to Park Avenue and a 5'6"x8'3" egg-shaped sewer from Willow Avenue to Grand Street. I would recommend the substitution of a 9'8"x9'5" circular sewer in place of the sizes designed. The cost of these changes has been included in my estimates.

I would recommend that concrete reinforced with steel be substituted for brick work in the construction of all sewers completed under the plans. In the construction of sewers of the sizes enumerated in the plans this construction can be built cheaper than brickwork and at the same time be constructed more watertight. The use of steel in concrete gives not only additional vertical and lateral stability, but also horizontal stability to the sewer. In soils such as are found at Hoboken this additional increase in strength and watertightness is absolutely essential.

At the time that Mr. McCann made his design the use of concrete steel for sewer construction had not reached that state of perfection that it has at the present day. At that time it had not truly passed beyond the experimental stage, but now in its use as demonstrated throughout the country, it has passed beyond that stage and its utility is now upon such a sure basis that there remains no doubt as to its strength and practicability for sewer construction. Under such conditions as we will have at Hoboken a saving of twenty per cent over the cost of brick sewers has been demonstrated over and over again to be possible of attainment and I have no question as to the wisdom of the recommendation of its use for the sewers at Hoboken.

A sewer thus constructed through the material to be encountered on Grand Street can with reasonable care be made watertight and thus insure no lowering of the present ground water line, a contingency more to be feared with ordinary brick construction unless under rigorous inspection and with the use of waterproofing.

#### THE DESIGN.

Mr. McCann's design contemplates pumping the sewage of that portion of Hoboken lying west of and including Garden Street, from Ferry Street to Eleventh Street, and west of and including Park Avenue, from Eleventh Street to Nineteenth Street. The general scheme is the construction of a main outlet sewer along Grand Street, from Newark Street to Fifteenth Street, thence along Fifteenth Street, from Grand Street to Park Avenue, to the pumping station, the sewage is then pumped through a conduit over the right of way of the Hoboken Railroad, Warehouse and Steamship Connection Company to the end of their pier, near the Sugar Refinery, with a storm water outlet at the head of the basin back of the Wall Paper Factory,

While this location is in general satisfactory it might be possible to secure a site nearer the water where coal could be handled directly from

barges into the coal bins and thus save expense of handling. Besides this main sewer through Grand Street there is a lateral outlet which is to be constructed on Ferry Street, from Garden Street to Harrison Street, on Third Street, from Jefferson Street to Marshall Street, on Seventh Street, from Grand Street to Harrison Street, on Eleventh Street, from Grand Street to Jackson Street, and on Fifteenth Street, from Garden Street to Madison Street. The sizes of these sewers are shown upon the plan and are enumerated in the list attached to this report.

The necessity of treating this section of the City by pumping is so obvious that it is quite unnecessary to discuss the various other methods which have from time to time been advanced for the treatment of the sewerage and drainage of this area. I thoroughly endorse the plan of Mr. McCann for pumping, and with the few and slight changes recommended, it has my general endorsement.

In my opinion the best interest of the City will be subserved by the construction of an independent steam pumping plant. Mr. McCann suggests the use of electric motors with power furnished by the Public Service Corporation or other power company. At the time Mr. McCann made this report the Public Service Corporation was in a better position to quote a low rate for power than at present.

The business you would have for the Public Service Corporation is not desirable business because the range between your normal and maximum load is so great, and the Power Company will be required to respond to your calls so promptly, that the hour of your maximum service might coincide with the hour of their own maximum service.

In such a contingency one or the other would have to suffer and to avoid this it would be necessary for them to keep in reserve for your use alone about 350 H. P. of boiler and electric motor capacity. They, therefore, are not anxious to handle all your work, although they offer a comparatively reasonable rate for the handling of the normal flow of sewage. To avail yourselves of their electric power for the normal flow of sewage would necessitate the installation of a gas engine plant to care for the storm flow in the sewers which in such large units as are required at Hoboken would be expensive and complicated mechanisms.

So far as learned the Public Service Corporation does not desire to operate the plant themselves, they simply desire to furnish power. This being the case, it will be necessary to engage electricians and engineers to operate your plant in any event. With the necessity of engineers or electricians at your pumping station acknowledged, the simplest and best method of treating the problem under the peculiar conditions at Hoboken is by steam-driven centrifugal pumps, as the additional cost of operation of a boiler plant should not be greater than the cost of the power purchased from an independent power company.

The cost of motors does not differ materially from the cost of boilers. Nothing is saved, either, in the cost of operation or in the initial cost of the plant, by purchasing power, and with their own plant the City would have the advantage of fully controlling the situation themselves. The best available evidence warrants a statement that \$50,000 is a sufficiently liberal estimate for the erection of the power station and machinery. The estimates presented herewith do not include the cost of land required for the pumping station; they do, however, include the cost of new cast iron house connection pipes where existing sewers are found.

It will be noted that the estimated cost is in excess of the estimate furnished by \$33,902.50. The difference can readily be made up by direct assessment against over one thousand city lots which do not now have sewerage facilities. It is the custom in Hoboken to charge \$125 for each lot receiving sewerage facilities. By the construction of this system of main sewers there are approximately two hundred lots not already provided with sewerage facilities which will have direct benefit from the sewer, while there are eight hundred lots which will have indirect benefit by the construction of the sewers contemplated, and which can with equal justice be charged for the benefits received.

In the case of the two hundred lots it is proper to charge the usual price of \$125 per lot, and in the case of the eight hundred lots a sum should be charged representing the benefit to them of the construction of this system of main and lateral outlet sewers. By the construction of this sewer the cost of the sub-laterals will be reduced to not more than \$75 per lot and the general tax upon this property for the construction of this entire system now contemplated will approximate \$20 a lot.

This leaves \$30 per lot as representing the direct benefit that the construction of this system of main and lateral outlets is to the eight hundred lots in question. These two items will produce \$49,000, or about \$15,000 in excess of the increase in my estimated cost over the estimated cost presented by your engineer.

#### GRADES.

I have examined carefully into the grades and capacity of the sewer as recommended by Mr. McCann and find that they are satisfactory. The grades are sufficient to at all times produce a velocity to keep the sewers self-cleansed.

#### EFFECT OF THE CONSTRUCTION OF THIS OUTLET SEWER UPON EXISTING SEWERS.

It will be noticed that on the plan the proposed outlet sewer intersects the existing sewers at twelve different points and as the proposed sewer is from two to five feet lower than the intersecting sewers, twelve

free outfalls are given to the existing sewers. These free outfalls will exist at all times excepting during heavy rainstorms when all the sewers will be running full.

The effect of these free outfalls upon the existing sewers, which, as is known by all, are constructed on very flat grades, and are by no means self-cleansing, will provide a velocity in these existing sewers which will have a tendency to remove from them a great deal of the deposit which now collects in them because of the congested condition of these outlets, and even these are only available during a very short portion of the day.

Besides these free outfalls this system of main and lateral trunks intersects the existing sewers at eleven other points at slightly lower elevations, all of which have a tendency to greatly improve the condition of the existing sewers. That these existing sewers need immediate attention cannot be gainsaid by anyone who cares to make even a cursory examination of their condition, and the plan as recommended by your engineer will, in my judgment, do more to relieve their present condition than any other plan which can be devised, save their entire reconstruction.

I present herewith a detailed estimate of the cost of construction, together with a list of sizes of sewer with their locations.

Respectfully submitted,  
ALEXANDER POTTER.

TABLE OF LOCATION, SIZES AND LENGTH OF SEWERS  
CONTEMPLATED IN THIS REPORT.

Location.	Size.	Length.
Outlet from Pumps to Pier Line.....	4'6"x9'	1500
Storm water outlet.....	4'6"x9'	156
Grand Street, from 11th St. to 15th St., egg-shaped.....	5'2"x7'9"	1725
Grand Street, from 7th St. to 11th St., egg-shaped.....	4'10"x7'3"	1900
Grand Street, from 3rd St. to 7th St., circular.....	58"	1775
Grand Street, from Newark St. to 3rd St., circular.....	48"	1400
Seventh St. Sewer, from Willow Ave. to Grand St., circular..	48"	530
Seventh St. Sewer, from Park Ave. to Willow Ave., circular..	42"	265
Seventh St. Sewer, from Garden St. to Park Ave., circular..	36"	265
Newark St. Sewer, from Adams St. to Grand St., circular....	42"	293
Newark St. Sewer, from Jefferson St. to Adams St., circular..	38"	293
Newark St. sewer, from Madison St. to Jefferson St., circular.	34"	293
Newark St. Sewer, from Monroe St. to Madison St., circular.	32"	293
Newark St. Sewer, from Harrison St. to Monroe St., circular.	30"	520
Newark St. Sewer, from Willow Ave. to Grand St., circular..	48"	600
Newark St. Sewer, from Garden St. to Willow Av., circular.	42"	500
Third St. Sewer, from Madison St. to Jefferson St., circular..	44"	265
Third St. Sewer, from Monroe St. to Madison St., circular...	42"	265

Third St. Sewer, from Jackson St. to Monroe St., circular....	40"	265
Third St. Sewer, from Harrison St. to Jackson St., circular...	36"	265
Third St. Sewer, from Marshall St. to Harrison St., circular..	30"	265
7th St. Sewer, from Jefferson St. to Grand St., circular.....	48"	520
7th St. Sewer, from Madison St. to Jefferson St., circular.....	42"	265
7th St. Sewer, from Jackson St. to Madison St., circular.....	36"	520
7th St. Sewer, from Harrison St. to Jackson St., circular.....	30"	265
11th St. Sewer, from Jefferson St. to Grand St., circular....	48"	520
11th St. Sewer, from Monroe St. to Jefferson St., circular....	42"	520
11th St. Sewer, from north boundary to Monroe St., circular..	36"	1725
15th St. Sewer, from Adams St. to Grand St., circular.....	48"	265
15th St. Sewer, from Jefferson St. to Adams St., circular....	42"	1260
15th St. Sewer, from north boundary to Jefferson St., circular.	36"	350
15th St. Sewer, from Grand St. to Willow Ave., egg-shaped..	9'5"x8'3"	520
15th St. Sewer, from Willow Ave. to pumps, egg-shaped.....	9'8"x8'6"	1400

Total length of various sizes is as follows:

1,656 feet of sewer 4'6"x9'
1,725 feet of sewer 5'2"x7'9"
1,900 feet of sewer 4'10"x7'3"
1,775 feet of sewer 58"
3,875 feet of sewer 48"
265 feet of sewer 44"
2,383 feet of sewer 42"
265 feet of sewer 40"
293 feet of sewer 38"
1,582 feet of sewer 36"
293 feet of sewer 34"
293 feet of sewer 32"
1,017 feet of sewer 30"
530 feet of sewer 9'5"x8'3"
148 feet of sewer 9'8"x8'6"

Total 18,000 feet.

PRELIMINARY ESTIMATE, MAIN AND LATERAL OUTLET OF  
MEADOW DISTRICT, HOBOKEN, N. J., SEWER.

Excavation .....	cu. yds.	77,700	at \$0.40..	\$31,080 00
Piles .....	No.	5,200	at 6.00..	31,200 00
Timber in foundation.....	ft. B.M.	777M	at 40.00..	31,080 00
Sheeting .....	ft. B.M.	920M	at 20.00..	18,400 00
Rubble .....	cu. yds.	1,070	at 6.00..	6,420 00
Wrought iron .....	lbs.	79,000	at 0.04..	3,160 00

Steel reinforcement for concrete..... tons	80	at 90.00..	7,200 00
Concrete .....	cu. yds. 9,500	at 7.50..	71,250 00
Brick work .....	cu. yds. 100	at 10.00..	1,000 00
Manhole heads .....	No. 157	at 10.00..	1,570 00
Receiving basins .....	No. 95	at 50.00..	4,750 00
2-inch cast iron pipe.....	ft. 3,270	at 2.00..	6,540 00
6-inch cast iron pipe.....	ft. 13,400	at 1.00..	13,400 00
Repaving .....	sq. yds. 38,000	at 0.35..	13,300 00
Pumping station and machinery.....			50,000 00
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			\$290,350 00
15 per cent added for contingencies..			43,552 50
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Total .....			\$333,902 50





