



8

Water and Sewer Infrastructure

This chapter evaluates the potential for the Proposed Actions in connection with the Proposed Project to result in significant adverse impacts on the City's water supply, as well as its wastewater and stormwater conveyance and treatment infrastructure.

Introduction

The Applicant proposes to redevelop the Project Site with a new, approximately 925,630 gross square-foot (gsf), commercial office building of up to 1,050 feet with ground floor retail uses, and below-grade space (i.e., dedicated mechanical floors) (the Proposed Project). The Proposed Project would provide transportation improvements on-site that create new pedestrian access to, and egress from, the LIRR East Side Access concourse and improve the 45th Street pedestrian connection to Grand Central Terminal. It would also improve passenger circulation at the Grand Central – 42nd Street Subway Station—including improvements to passenger connections to the IRT Flushing Line (#7 Train) platform.

According to the *CEQR Technical Manual*, discretionary actions that would increase density or change drainage conditions may warrant a water and sewer infrastructure analysis. Specifically, development that would result in an exceptionally large demand for water (more than one million gallons per day [mgd]) or that are located in an area that experiences low water pressure require an analysis of potential impacts on the water supply system. Additionally, development located in a combined sewer area exceeding incremental development thresholds (above the predicted No-Action Condition) of 1,000 residential units or 250,000 square feet (sf) of commercial, public facility, and institutional and/or community

facility space in Manhattan, require an analysis of potential impacts on the wastewater and stormwater conveyance and treatment system.

Principal Conclusions

The Proposed Actions would not result in a significant adverse impact on the City's water and sewer infrastructure. Based on the methodology set forth in the *CEQR Technical Manual*, although the Proposed Actions would create new demand for water and treatment of sewage, the incremental increases would be within the capacity of the City's systems, and the impacts would not be considered significant or adverse.

Water Supply

New York City consumes approximately 1.3 billion gallons of water per day from a reservoir system with a total storage capacity of approximately 550 billion gallons. The total water usage as a result of the Proposed Project is calculated to equal approximately 0.23 mgd, which is an increment of approximately 0.11 mgd (or 100 percent), compared to the No-Action Condition projected demand of approximately 0.11 mgd. This incremental demand would represent 0.00002 percent of the City's overall water supply. As the total water usage as a result of the Proposed Project would result in less than 1 mgd, the Proposed Project would not have a significant adverse impact on the City's water supply or system water pressure.

Sanitary Sewage

Sanitary sewage generated by the Proposed Project would discharge to the Newtown Creek wastewater treatment plant (WWTP), which has a State Pollutant Discharge Elimination System (SPDES)-permitted dry weather flow capacity of 310 mgd. The average monthly flow to Newtown Creek WWTP over a 12-month period is 204 mgd. The Proposed Project has the potential to result in a total generation of 0.085 mgd of sanitary sewage discharge, an increment of 0.042 mgd (or 98 percent) over the No-Action total sewage generation, which is estimated at 0.043 mgd. This incremental increase in sanitary flow would represent approximately 0.01 percent of the Newtown Creek WWTP's SPDES-permitted capacity. As the projected increase in sanitary sewage would not cause the Newtown Creek WWTP to exceed its operational capacity or SPDES-permitted capacity, the Proposed Actions would not result in significant adverse impacts to sanitary sewage conveyance and treatment. In addition, per the New York City Plumbing Code (Local Law 33 of 2007), while not accounted for in the quantitative analysis, low-flow fixtures would be required to be implemented and would help to reduce sanitary flows as a result of the Proposed Project.

The Applicant would be required to file a site connection proposal for approval from the New York City Department of Environmental Protection (DEP) to tie into the City's sewer system. In order to obtain a sewer connection permit from DEP, the Applicant would be required to demonstrate that the existing system could handle the increased flows due to the Proposed Project. Any analysis and improvements, if required, would be undertaken prior to construction of the Proposed Project and would be coordinated with DEP for review and approval.

Stormwater Drainage and Management

The Project Area is served by a combined sewer system, collecting both dry-weather wastewater and stormwater. The Proposed Project would not result in an increase in impervious surfaces as compared to the No-Action condition and therefore is not expected to generate additional stormwater runoff. However, as the Proposed Project would result in increased sanitary sewage flows, the total volume to the combined sewer system would be increased. As noted previously, the incremental increase in sanitary flow is well within the capacity of the existing system and would not result in significant adverse impacts to the City's sewer infrastructure. Additionally, due to DEP's current stormwater management requirements, stormwater runoff from new developments is expected to measurably decrease as compared to Existing Conditions. Based on the analysis pursuant to the *CEQR Technical Manual*, with stormwater Best Management Practices (BMPs) implemented on the Project Site by the Applicant to reduce runoff, it is concluded that the Proposed Project would not result in significant adverse impacts on stormwater conveyance and treatment infrastructure.

Methodology

This analysis follows the *CEQR Technical Manual* guidelines that recommend a preliminary water analysis be completed if a project would result in an exceptionally large demand of water (over one million gpd), or is located in an area that experiences low water pressure (i.e., in an area at the end of the water supply distribution system such as the Rockaway Peninsula or Coney Island). The Project Site is not located in an area that experiences low water pressure, and the Proposed Project would generate a water demand of 227,002 gpd (an increase of 113,367 gpd compared with the No-Action condition). Therefore, the Proposed Project does not meet the *CEQR Technical Manual* threshold requiring a detailed water supply analysis. It is expected that there would be adequate water service to meet the incremental water demand and that there would be no significant adverse impacts on the City's water supply.

As described above, the Project Site is located in a combined sewer area and the Proposed Project would represent an increase of approximately 420,286 gsf of commercial space as compared to the No-Action condition, which exceeds the *CEQR Technical Manual* threshold of 250,000 square feet. Therefore, following the guidelines of the *CEQR Technical Manual*, an analysis of the Proposed Project's potential impacts on the wastewater and stormwater conveyance and treatments system was performed. No-Action and With-Action water demand and sanitary sewage generation are calculated based on use rates set by the *CEQR Technical Manual* (see **Table 8-1**). The DEP Flow Volume Calculation Matrix is then used to calculate the overall combined sanitary sewage and stormwater runoff volume discharged to the combined sewer system for four rainfall volume scenarios with varying durations. Relevant planned infrastructure improvements including the affected area, project components, and current schedules were also reviewed and described. The ability of the City's sewer infrastructure to handle the anticipated demand from the Proposed Project is assessed by estimating existing sewage generation rates, and then comparing these existing rates with the No-Action and With-Action conditions, per *CEQR Technical Manual* methodology.

Table 8-1 Water Consumption and Wastewater Generation Rates

Land Use	Rate			
	Domestic	Units	Air Conditioning	Units
Retail	0.24	gpd/sf	0.17	gpd/sf
Commercial/Office	0.10	gpd/sf	0.17	gpd/sf

Notes: Consumption rates obtained from the 2020 CEQR Technical Manual Table 13-2 "Water Usage and Sewage Generation Rates for Use in Impact Assessment"

As shown in **Table 8-2**, the Proposed Project would result in a total daily water demand of approximately 0.23 mgd¹ based on the rates in **Table 8-1**. Since the Project Area is not located in an area that experiences low water pressure and the Proposed Project would not result in a demand of more than one million gallons per day, no water supply system analysis is warranted.

Table 8-2 Incremental Water-Supply Demand and Sewage Generation by Use

	Rate (gpd/sf)	No-Action		With-Action		Increment	
		gsf	Consumption (gpd)	gsf	Consumption (gpd)	gsf	Consumption (gpd)
Commercial Office	Domestic 0.1	411,540	41,154	832,613	83,261	421,073	42,107
	Air Conditioning 0.17		69,962		141,544		71,582
Retail (local)	Domestic 0.24	6,144	1,475	5,357	1,286	(787)	(189)
	Air Conditioning 0.17		1,044		911		(133)
Total Water-Supply Demand			113,635		227,002		113,367
Total Sewage Generation			42,629		84,547		41,918

Source: 2020 CEQR Technical Manual

Existing Conditions

The Project Site consists of Manhattan Block 1279, Lots 23, 24, 25, and 48, and has a combined area of 25,105 sf with approximately 204 feet of frontage on Madison Avenue, and 128 feet of frontage on both East 44th Street and East 45th Street. The study area for this analysis is generally bounded by midblock between East 46th Street and East 47th Street to the north, Fifth Avenue to the west, East 42nd Street to the south, and the eastern portion of the Park Avenue Viaduct to the east. The Project Site contains three 13- to 20-story buildings that previously served as the headquarters of the MTA and a ventilation structure for MTA's East Side Access project, which is currently under construction.

Water Supply

The New York City water supply system consists of a network of reservoirs, lakes, and aqueducts extending north into the Catskill region, and a grid of underground distribution

¹ With Action total (0.23 mgd) differs from sum of reported No Action (0.11 mgd) and With Action increment (0.11 mgd) due to rounding.

mains that distributes water within the City. As mentioned earlier, approximately 1.3 billion gpd of water are consumed by New York City through this water supply system.

Most of New York City obtains water from three surface water supply systems operated by DEP – Delaware, Catskill, and Croton. The watersheds of the three systems cover almost 2,000 square miles, with 19 reservoirs and three control lakes, which have a combined storage capacity of approximately 550 billion gallons.^{2, 3}

Two of the three surface water systems, the Delaware and Catskill systems, collect water from watershed areas in the Catskill Mountains and deliver it to the Hillview Reservoir in Yonkers. From there, it is distributed to the City through three tunnels: City Tunnel 1, which runs through the Bronx and Manhattan to Brooklyn; City Tunnel 2, which goes through the Bronx, Queens, and Brooklyn (and from there through the Richmond Tunnel to Staten Island); and City Tunnel 3 (Stage 1), which goes through the Bronx and Manhattan and ends in Queens. Stage 2 of City Tunnel 3 is currently under construction in Queens and Brooklyn.

The third surface water system, the Croton system, collects water from watershed areas in Dutchess, Putnam, and Westchester Counties and delivers it to the Jerome Park Reservoir in the Bronx. From there, it is distributed to the Bronx and Manhattan through the New Croton Aqueduct.

Once in the City, the aqueducts distribute water into a network of water mains. Water mains up to 96 inches in diameter feed smaller mains, such as 20, 12, and 8-inch mains, which deliver water to their final destination, including to fire hydrants along many of the City's streets. Nearly all of the water reaches consumers by gravity alone, with roughly four percent (generally located at the outer limits of the system where in-line pressure is lowest, at high elevations, or at pressure extremity such as Far Rockaway) being pumped to its final destination. Water pressure throughout the City's water supply system is monitored and controlled by pressure regulators.

The existing site is currently vacant and therefore there is no water consumption or sewage generation; however, the future site would contain retail and commercial/office space.

Conveyance System

According to the *CEQR Technical Manual*, wastewater is considered to include sanitary sewage, wastewater generated by industries, and stormwater. Water used for air conditioning generates a negligible amount of wastewater as it recirculates or evaporates in the cooling and heating process. The Project Site is located in a part of New York City served by a combined sewer system that collects both sanitary sewage and stormwater. In periods of dry weather, the combined sewers (sized to convey an amount of sanitary sewage that is based on density levels according to zoning regulations) located in the adjacent streets convey only sanitary sewage. An existing sewer line runs southbound underneath Madison Avenue, to the west of the site, while two feeder lines run westbound along both East 44th and East 45th Streets and connect with this main line. The two westbound sewer lines consist of 15-inch diameter cross sections and begin midblock on both East 44th and East 45th

² Source: New York City's Wastewater Treatment System, New York City Department of Environmental Protection; <https://www1.nyc.gov/site/dep/water/>

³ Source: 2020 *CEQR Technical Manual*

Streets, near Vanderbilt Avenue. These two feeder lines merge with the larger southbound line, which consists of a 51-inch by 34-inch pipe cross section between East 44th and East 45th Streets.

The southbound sewer line serving the Project Site eventually connects to a larger sewer line running eastbound along East 41st Street to Regulator NC-M45. Regulators are structures that control the flow of sewage to interceptors, i.e., larger sewers that connect the combined sewer system to the City's sewage treatment system. From Regulator NC-M45, flow is conveyed to an interceptor sewer running south along the approach roads to the Queens Midtown Tunnel and First Avenue and across the East River to the Newtown Creek WWTP, the largest of the City's 14 WWTPs.

At the Newtown Creek WWTP, wastewater is fully treated by physical and biological process before it is discharged into the East River. The quality of the treated wastewater (effluent) is regulated by a State Pollutant Discharge Elimination System (SPDES) permit issued by the New York State Department of Environmental Conservation (NYSDEC), which establishes limits for effluent parameters (i.e., suspended solids, fecal coliform bacteria, and other pollutants). Since the volume of flow to a WWTP affects the level of treatment a plant can provide, the maximum permitted capacity for the Newtown Creek WWTP is 310 million gallons per day (mgd).⁴ During and immediately after wet weather, combined sewers can experience a much larger flow due to stormwater runoff collection. To control flooding at the Newtown Creek WWTP, the regulators built into the system allow only approximately two times the amount of design dry weather flow into the interceptors. The interceptor then takes the allowable flow to the WWTP, while the excess flow is discharged to the nearest waterbody as Combined Sewer Outflow (CSO). The average monthly flow to Newtown Creek WWTP over a 12-month period is 204 mgd.⁵ The Project Site is located within one CSO drainage area: in wet weather, sanitary flow and stormwater runoff is conveyed to CSO outfall NCM-037, located at the eastern end of East 41st Street.

The Future Without the Proposed Actions

As described in **Chapter 1, Project Description**, absent the Proposed Actions, the Project Site will be redeveloped with a No-Action development consisting of 411,540 gsf of office space and 6,144 gsf of retail.

Sanitary Flows

For purposes of analysis, the amount of sanitary sewage is estimated as all water demand generated by the various uses on the Project Site except water used by air conditioning, which is typically not discharged to the sewer system. **Table 8-3** summarizes the water and sewage generation of the No-Action building. The No-Action building is expected to generate an estimated 42,629 gpd of daily sanitary sewage with a total water demand of 113,635 gpd, based on CEQR rates for wastewater generation and water consumption from **Table 8-1**.

⁴ Source: New York City's Wastewater Treatment System, New York City Department of Environmental Protection.

⁵ 12-month period through April 2020

Table 8-3 No-Action Water Consumption and Sewage Generation

Land Use	Area (sf)	Dwelling Units / Hotel Rooms	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Retail	6,144	-	1,475	1,044
Commercial/Office	411,540	-	41,154	69,962
Water Consumption Subtotals			42,629	71,006
Sewage Generation Subtotal			42,629	
Total Water Consumption			113,635	
Total Wastewater Generation			42,629	

Stormwater Flows

In conformance with standards established in the NYC Zoning Resolution, a future sidewalk widening would expand the curb along Madison Avenue by an additional seven feet, reducing the building footprint on the west side of the block. As a result, the surface area of the site would no longer be entirely covered by the roof, as it is in the existing conditions. **Table 8-4** summarizes the surfaces and surface areas, as well as the weighted runoff coefficient (the fraction of precipitation that becomes surface runoff for each surface type).

The DEP Flow Volume Calculation Matrix was completed for the No-Action conditions⁶. The calculations from the Flow Volume Calculation Matrix help to determine the change in wastewater flow volumes to the combined sewer system from No-Action conditions and include four rainfall volume scenarios with varying durations. The summary tables of the Flow Volume Calculation Matrix are included in **Table 8-5** for Subcatchment Area NCM-037.

As shown in **Table 8-5**, depending on the rainfall volume and duration, the total volume to the combined sewer system from the Project Site under the No-Action conditions could be between approximately 0.007 and 0.075 mgd.

Table 8-4 No-Action Surface Coverage

Affected CSO Outfall	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scope	Total
NCM-037	Area (%)	94%	6%	0%	0%	100%
	Surface Area (sq. ft.)	23,702	1,403	0	0	25,105
	Runoff Coefficient ¹	1.00	0.85	0.85	0.20	-

Source: DCP Building Footprint; KPF ground floor area drawing

Notes:

¹ Runoff coefficients for each surface type as per DEP

⁶ Typically the DEP Flow Volume Calculation Matrix compares existing conditions with the proposed actions; however, the existing building is vacant and does not generate any flow volumes; see also Chapter 1, Project Description, for a discussion of the Analytical Framework.

Table 8-5 DEP Flow Volume Matrix – No-Action Conditions for NCM-037

Rainfall (inches) ¹	Duration (hours)	Total Area (acres) ²	Weighted Runoff Coefficient ³	Stormwater Runoff (MG) ⁴	Sanitary to CSS (MG) ⁵	Total Volume to CSS (MG)
0.00	3.80	0.58	0.99	0.000	0.007	0.007
0.40	3.80	0.58	0.99	0.010	0.007	0.017
1.20	11.30	0.58	0.99	0.020	0.020	0.040
2.50	19.50	0.58	0.99	0.040	0.035	0.075

Notes:

¹ Storm event rainfalls per NYCDEP Volume Calculation Matrix.² Total surface area onsite for the Project Site.³ Runoff coefficients for surface type area as per NYCDEP.⁴ Stormwater runoff derived from NYCDEP Volume Calculation Matrix.⁵ Sanitary volumes derived using methodology and consumption rates per the 2020 CEQR Technical Manual.

CSS = Combined Sewer System

MG = million gallons

The Future With the Proposed Actions

The With-Action condition would contain 421,073 gsf more office space and 787 gsf less retail space than the No-Action condition and would therefore consume more water and generate more sewage. The results of the analysis of the With-Action condition on water and sewer infrastructure are described below.

Sanitary Flows

As shown on **Table 8-6**, the With-Action condition is expected to generate 84,547 gpd of daily sanitary sewage with a total water demand of 227,002 gpd.

Table 8-6 With-Action Water Consumption and Sewage Generation

Land Use	Area (sf)	Dwelling Units / Hotel Rooms	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Retail	5,357	0	1,286	911
Commercial/Office	832,613	0	83,261	141,544
Water Consumption Subtotals			84,547	142,455
Sewage Generation Subtotal			84,547	
Total Water Consumption			227,002	
Total Wastewater Generation			84,547	

The incremental sanitary sewage generated by the With-Action condition, as compared with the No-Action development, would be 41,918 gpd. This incremental increase in sewage generation would be approximately 0.01 percent of the Newtown Creek WWTP capacity of 310 mgd. In addition, in accordance with the New York City Plumbing Code (Local Law 33 of 2007), the Proposed Project would be required to utilize low-flow plumbing fixtures, which would reduce sanitary flows to the plant. Therefore, the With-Action condition would not

result in a significant adverse impact to the City's sanitary sewage conveyance and treatment system.

Stormwater Flows

The With-Action condition would feature sidewalk widenings along 44th and 45th Streets; however, the building footprint along both of these frontages would not change. The street width on both roads would be reduced to accommodate the widening and therefore, the surface coverage from **Table 8-4** would remain the same.

The DEP Flow Volume Calculation Matrix was completed for the With-Action condition. The calculations from the Flow Volume Calculation Matrix help to determine the change in wastewater flow volumes to the combined sewer system from With-Action conditions and include four rainfall volume scenarios with varying durations. The summary tables of the Flow Volume Calculation Matrix are included in **Table 8-7** for Subcatchment Area NCM-037.

Table 8-7 DEP Flow Volume Matrix – With-Action Condition for NCM-037

Rainfall (inches) ¹	Duration (hours)	Total Area (acres) ²	Weighted Runoff Coefficient ³	Stormwater Runoff (MG) ⁴	Sanitary to CSS (MG) ⁵	Total Volume to CSS (MG) ⁶
0.00	3.80	0.58	0.99	0.000	0.013	0.013
0.40	3.80	0.58	0.99	0.010	0.013	0.023
1.20	11.30	0.58	0.99	0.020	0.040	0.060
2.50	19.50	0.58	0.99	0.040	0.069	0.109

Notes:

¹ Storm event rainfalls per NYCDEP Volume Calculation Matrix.

² Total surface area onsite for the Project Site.

³ Runoff coefficients for surface type area as per NYCDEP.

⁴ Stormwater runoff derived from NYCDEP Volume Calculation Matrix.

⁵ Sanitary volumes derived using methodology and consumption rates per the *2020 CEQR Technical Manual*.

CSS = Combined Sewer System

MG = million gallons

As shown in **Table 8-7**, for the With-Action condition, the total combined sewer system could be between approximately 0.013 and 0.109 mgd to Newtown Creek subcatchment area NCM-037.

Table 8-8 compares the estimated combined flows (stormwater runoff and sanitary flows) to the combined sewer system under No-Action and With-Action conditions using the DEP Flow Volume Calculation Matrix. As shown in the table, depending on the rainfall volume and duration, the With-Action increment to the combined sewer system could be between 0.006 and 0.034 mgd, a range of approximately 35.3 to 85.7 percent. Despite the high percentage increase of the site, this range of increments would equate to only about 0.002 to 0.011 percent of the total capacity of the Newtown Creek WWTP. Typically, an increase of 5.0 percent or more at the site over existing (or in this case, No-Action) conditions would warrant further review by DEP, in which the implementation of BMPs would help mitigate that increase.

Table 8-8 No-Action and With-Action Combined Stormwater Runoff and Wastewater Generation

Rainfall (inches) ¹	Duration (hours)	Total Volume to Combined Sewer System (MG)			Percentage Change (%)
		No-Action Conditions	With- Action Condition	Increment	
0.00	3.80	0.007	0.013	0.006	85.7%
0.40	3.80	0.017	0.023	0.006	35.3%
1.20	11.30	0.040	0.060	0.020	50.0%
2.50	19.50	0.075	0.109	0.034	45.3%

The Flow Volume Matrix calculations do not reflect the use of any sanitary and stormwater source control BMPs to reduce sanitary flow and stormwater runoff volumes to the combined sewer system. As noted above, the Proposed Project would incorporate low-flow plumbing fixtures to reduce sanitary flow in accordance with the New York City Plumbing Code. In addition, stormwater BMPs would be required as part of the DEP site connection approval process in order to bring the building into compliance with the required stormwater release rate. Based on the DEP Guidelines for the Criteria for Detention Facility Design, dated November 19, 2012, for new developments, the required stormwater release rate for the Proposed Project would be the greater of 0.25 cubic feet per second (cfs) or 10 percent of the allowable flow, unless the allowable flow is less than 0.25 cfs, in which case the stormwater release rate is equal to the allowable flow.⁷ To achieve this release rate, stormwater could be managed by utilizing one or a combination of detention or infiltration techniques identified in the *NYC Green Infrastructure Plan*. Green technologies could be implemented to retain or release stormwater with slowed discharge rates to control peak runoff rates. Specific BMP methods will be determined with further refinement of the building design.

The incorporation of the appropriate sanitary flow and stormwater source control BMPs that would be required as part of the site connection approval process, with the review and approval of DEP, would reduce the overall volume of sanitary sewer discharge and stormwater runoff as well as the peak stormwater runoff rate from the Project Site. Sewer conveyance near the Project Site and the treatment capacity at the Newtown Creek WWTP is sufficient to handle wastewater flow resulting from the Proposed Project. Therefore, there would be no significant adverse impacts on wastewater treatment or stormwater conveyance infrastructure.

⁷ Source: <https://www1.nyc.gov/assets/dep/downloads/pdf/about/water-and-sewer-forms/criteria-determination-detention-facility-volume.pdf>