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## CHAPTER 15: INFRASTRUCTURE

### A. INTRODUCTION

This chapter evaluates the potential impacts of the Proposed Action on three components of the city's infrastructure: water supply, wastewater treatment, and stormwater management. Though this chapter focuses on these three systems, the *CEQR Technical Manual* defines the city's "infrastructure" as the physical systems that support the city's population, which also includes, but is not limited to, the transportation network, solid waste and sanitation services and public transportation systems. Because these other components are addressed separately under CEQR and discussed in separate chapters of this document, this chapter will focus exclusively on the water supply, wastewater treatment and stormwater management systems. The analyses utilized in this chapter follow the guidelines contained in Section 3L of the *CEQR Technical Manual*.

### B. OVERVIEW

The Proposed Action would not result in any significant adverse infrastructure impacts. According to the *CEQR Technical Manual*, actions that could affect water pressure and would therefore require a detailed assessment include actions that would have an exceptionally large demand for water (power plants, large cooling systems, etc.); large developments (e.g., those that use more than one million gallons per day (mgd)); or actions taking place in locations that have weaknesses in the local water supply distribution systems (e.g., creating a large draw of water at locations at the end of the water system where water pressure is low or locations near pressure boundaries). The Proposed Action is expected to generate a net incremental increase in the demand for potable water of approximately 842,269 gallons per day (gpd) (0.842 mgd) - a 0.07 percent increase over the city's current water demand. Thus, a detailed analysis of potential impacts on water supply and pressure is not warranted. Given the size of the city's water supply system and the city's commitment to maintaining adequate water supply and pressure, the Proposed Action is not anticipated to result in a significant adverse impact on this system.

With respect to wastewater treatment, the *CEQR Technical Manual* states that a detailed analysis of wastewater treatment is warranted for those Proposed Actions that have the potential to generate large increases in sewage flows. The Proposed Action is expected to generate a net incremental flow in wastewater of approximately 543,786 gpd, representing approximately 0.18 percent of the treatment capacity of the area's water pollution control plant (Newton Creek). Given the insubstantial increase in incremental wastewater flow relative to the capacity of the water pollution control plant, the Proposed Action is not anticipated to result in a significant adverse impact on wastewater treatment.

The *CEQR Technical Manual* states that a detailed analysis of stormwater management is warranted if a Proposed Action involves certain types of industrial activities (e.g., manufacturing, processing, or raw materials storage); if actions would greatly increase the amount of paved area; if actions that would be served by a separate storm system and that would involve construction activities; or construction of a new stormwater outfall system. The Proposed Action has the potential to affect 34 projected development sites on approximately 12 acres of land~~which total approximately 18 acres. However, the majority of these sites are already occupied by buildings or other impervious surfaces (parking lots, etc.) and the redevelopment of these already paved parcels would not result in a substantial increase in impervious area. Consequently, an analysis of potential stormwater runoff impacts is not necessary. The net change in stormwater discharge from existing to build conditions is approximately 0.03 million gallons (MG) to 0.13 MG for the various rainfall intensity increments.~~

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The Proposed Action is expected to generate a net incremental flow of combined wastewater and stormwater discharge of 0.08 MG to 0.54 MG for the various rainfall intensity increments. While this combined wastewater generation and stormwater discharge is an increase from the existing condition, the Proposed Action will not have any significant adverse impacts to the combined sewer system, conveyance systems (i.e. regulators, outfalls) or City's wastewater treatment services.

### **C. METHODOLOGY**

The *CEQR Technical Manual* provides guidance on the methods to be used to assess impacts to the above-mentioned infrastructure systems. This chapter describes existing conditions, and examines future conditions with and without the Proposed Action. To determine potential impacts, future conditions with the Proposed Action are compared to future conditions without the Proposed Action, as described below.

#### **WATER SUPPLY**

The existing water distribution system serving the Project Area was described based on information available from the New York City Department of Environmental Protection (DEP). Using water demand rates contained in the *CEQR Technical Manual*, the current water usage in the area was examined, the likely demand was calculated for the future condition without the Proposed Action (No-Build) and the effects on the system were described. Future water demand for the projected developments introduced by the Proposed Action was then calculated and the effects of the incremental demand on the system were assessed to determine if there is sufficient capacity to maintain adequate water supply and pressure in the area.

#### **SANITARY SEWAGE AND STORMWATER MANAGEMENT**

Existing sewers serving the Project Area were described using information available from DEP. Existing and future sanitary and stormwater flows to the water pollution control plant (WPCP) that serves the area (the Newtown Creek WPCP) were calculated and estimated according to the guidance contained in the *CEQR Technical Manual*. Sanitary sewage and stormwater generation for the projected developments introduced by the Proposed Action were compiled based on water usage estimates, and the adequacy of the sewer system to meet the demand generated by the projected developments was qualitatively quantitatively assessed. The effects of the incremental demand on the system was assessed to determine whether there would be any impact on the WPCP, or on its State Pollutant Discharge Elimination System (SPDES) permit conditions.

### **D. EXISTING CONDITIONS**

#### **WATER SUPPLY**

##### *NEW YORK CITY*

New York City's water supply system serves the city and portions of Westchester, Orange, Putnam and Ulster Counties and is operated by DEP. The system utilizes three watershed systems which obtain water from 2,000 square miles of watershed in the mountains of upstate New York. Water is delivered from reservoirs within each of these systems by gravity through a network of tunnels and aqueducts.

The three systems are the Croton watershed, the Catskill watershed, and the Delaware watershed. The Croton watershed system consists of 12 reservoirs and three controlled lakes located in Westchester,

Putnam and Dutchess Counties. The smallest and oldest (1885) of the city's three watersheds, the Croton provides approximately 10 percent of the city's water, though in times of drought or maintenance shutdowns it provides up to 30 percent. The system's storage capacity is approximately 94.5 billion gallons.

The Catskill watershed system was completed in 1927 and consists of two reservoirs, the Ashokan and the Schoharie. The Catskill watershed provides approximately 34 percent of the city's water and has a storage capacity of approximately 140.5 billion gallons. The Delaware System was completed in the late 1930s and consists of three reservoirs located in the Delaware River Basin: the Cannonsville, Pepacton and Neversink Reservoirs, as well as the Rondout Reservoir located on Rondout Creek in the Hudson River Basin. The largest of the three systems, the Delaware has a storage capacity of approximately 345 billion gallons and provides approximately 55 percent of the city's water.

The Delaware and Catskill watershed systems deliver water to the Hillview Reservoir in Yonkers. From there, it is distributed to the city through two tunnels: City Tunnel No. 2, which goes through the Bronx, Queens, and Brooklyn (and from Brooklyn to Staten Island through the Richmond Tunnel) and a partially complete third tunnel, City Tunnel No. 3, which currently serves the Bronx, upper Manhattan, and Roosevelt Island. The construction of City Tunnel No. 3, which will serve Midtown and Lower Manhattan, as well as Brooklyn and Queens, is scheduled for completion in 2025.

Once in the city, a network of approximately 6,500 miles of distribution mains distributes water to consumers. Large mains – up to 96 inches in diameter – feed smaller 8-, 12- and 20-inch mains that provide water to individual locations and fire hydrants. Approximately 96 percent of the city's water is delivered to consumers by gravity. The remainder, usually located at pressure boundaries, high elevations or at pressure extremities such as Far Rockaway, is pumped to its final destination. Pressure regulators are located throughout the city that monitor and control water pressure. The city's current water demand is approximately 1.2 billion gpd.

### *PROPOSED REZONING AREA*

Land use in the Project Area is best described as largely underutilized, containing a significant inventory of vacant buildings and lots as well as industrial, community facility, residential and transportation uses. The 34 projected development sites currently contain 13 dwelling units, 14,344 square feet of commercial space and 83,775 square feet of industrial space. Table 15-1 presents the existing estimated water consumption and sewage generation at the projected development sites based on rates by land use type contained in the *CEQR Technical Manual*. Because the *CEQR Technical Manual* does not provide rates for industrial/manufacturing uses, rates were adopted from a DEP publication entitled, *Rules Governing the Design and Construction of Private Sewers or Private Drains*, dated April 13, 1999. To obtain a conservative analysis, all commercial use was assumed to be retail, since retail uses typically have higher water usage and sewage generation rates.

As shown in Table 15-1, the existing uses on the 34 projected development sites are estimated to consume approximately 25,471 gpd for domestic uses and an additional 20,378 gpd for air conditioning. Together, the estimated total water consumption emanating from these sites is approximately 45,848 gpd.

### **SANITARY SEWAGE AND STORMWATER MANAGEMENT**

#### *SANITARY SEWAGE COLLECTION AND TREATMENT*

Most sanitary sewage in the city is collected and conveyed through a combined sewer system operated and maintained by DEP. This system receives sanitary sewage from buildings, as well as stormwater runoff from roof and street drainage before sending the combined flow to one of the 14 WPCPs for treatment. In dry weather, only sanitary sewage is conveyed to the WPCP. In wet weather (e.g., rain or snow melt), both sanitary sewage and stormwater runoff are conveyed to the WPCP or to receiving waterbodies as combined sewer overflows (CSOs) dependent on the intensity of the rainfall event and capacity of the WPCP and its collection system. The WPCPs have a total daily treatment capacity of approximately 1.8 billion gallons.

All WPCPs in the city are issued operating permits by the New York State Department of Environmental Conservation (DEC) that regulate the flows and pollutant loads for the plant. A plant's permitted flow is calculated based on each plant's monthly average dry weather flow. Flow records for each WPCP are reported to DEC. The average daily flow rate is determined by compiling the average dry weather flows over a 24-hour period. The dry weather flow, which is defined as sanitary wastewater only, is variable throughout each 24-hour period, with peaks during times of meal preparation, personal hygiene or industrial processes. The average daily flow rate takes these variations into account. The average monthly flow rate is determined by compiling the average daily dry weather flows over a 30-day period.

The conveyance capacity of a sewer system is referred to as its wet-weather capacity. Because approximately half of the city's land area is served by a combined sewer collection system, the system's pipes have been designed to a size that can accommodate loads that are greater than the average dry-weather flow, or even the peak dry-weather flow. During wet weather, stormwater enters the combined sewer system along with sanitary sewage, and are both treated at a WPCP. However, during wet weather, rainfall runoff can reach 10 to 50 times the dry weather flow, sometimes well above the WPCP design capacity. To avoid flooding the WPCPs, built-in regulators act as relief valves to direct the excess water to an outfall. During storm events, sanitary sewage entering or already in the combined sewer system, stormwater and debris can be discharged (or overflowed) untreated into the nearest body of water. This untreated overflow is known as "combined sewer overflow" (CSO). As mentioned above, the majority of New York City wastewater is collected by a combined sewer system and treated by WPCPs, however small areas in Brooklyn, Queens and Staten Island either have separate sewer systems or use septic systems to dispose of sanitary waste. Wastewater in the Broadway Triangle neighborhood of Brooklyn is collected and conveyed through a network of combined sewers that direct the wastewater to water pollution control plants. Wastewater from the Project Area is treated at the Newtown Creek WPCP.

The Project Area is served by the Newtown Creek WPCP, the largest of New York City's 14 wastewater treatment plants. The Newtown Creek WPCP provides modified aeration treatment of the sanitary sewage, has a permitted capacity of 310 million gallons, has an average monthly flow (between January and November 2008) of 237 mgd, and serves approximately one million residents in a drainage area of more than 15,000 acres. Furthermore, the Newton Creek WPCP Upgrade is currently being constructed to bring the plant in compliance with the secondary treatment requirement of the Clean Water Act (85 percent removal of biochemical oxygen demand and total suspended solids.) The proposed upgrade is designed to provide treatment for an annual average flow of 310 mgd and a peak wet weather flow of 700 mgd, and is proposed to be completed by July 2013.

According to DEP, the Project Area and surrounding neighborhoods are currently subject to CSO events during heavy rainfall periods. Similar to the majority of Brooklyn and the city as a whole, the Project Area consists of mostly paved urban land that has a high runoff coefficient. Since projected development

under the Proposed Action will increase impervious surfaces and runoff sources, especially in portions of the Project Area that are currently vacant and unpaved, it is anticipated that over time the Proposed Action will exacerbate the current CSO problem in this area of Brooklyn. This is not considered a significant adverse impact because the problem would continue to exist irrespective of the Proposed Action. As described previously, the potential and projected development sites identified in the RWCDs for the Proposed Action contain a mix of publicly and privately owned properties. In recent years, the city has taken a proactive approach to addressing water quality issues, particularly CSOs, through the goals and objectives of PlaNYC 2030. As part of PlaNYC, the city launched the Interagency Best Management Practices (BMP) Task Force to pursue implementation of stormwater management strategies through all 16 relevant agencies, and the Task Force continues its work towards the release of a citywide stormwater management plan. As new development resulting from the Proposed Action begins to take place, it is anticipated that the consideration of stormwater Best Management Practices (BMPs) will be explored during the approval process for these projects.

To determine the Proposed Action’s impacts on the Project Area’s sanitary sewage system, guidelines set forth by the *CEQR Technical Manual* were used. The *CEQR Technical Manual* indicates that daily sanitary sewage generation is equivalent to the domestic water consumption rate with the exception of wastewater from air conditioning systems. Wastewater from air conditioning is not included in the overall volume used for analysis because minimal volumes of wastewater are generated from the recirculation and evaporation involved in the air conditioning process. As noted in Table 15-1, based on current domestic wastewater flows, the existing uses on the projected development sites generate approximately 25,471 gallons of sanitary sewage per day (0.025 mgd).

**Table 15-1  
Existing Water Consumption and Sewage Generation  
At Projected Development Sites**

Use	Consumption Rate <sup>1</sup>	Size	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)
Retail	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	14,344	2,438	2,438
Office <sup>2</sup>	Domestic: 25 gpd/person Air Conditioning: 0.10 gpd/sf	0	0	0
Industrial/ Manufacturing <sup>3</sup>	Domestic: 10,000 gpd/acre Air Conditioning: 0.17 gpd/sf	83,775	19,232	14,242
Residential <sup>4</sup>	Domestic: 112 gpd/person Air Conditioning: 0.17 gpd/sf	21,750 13	3,800	3,698
Hotel	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	0	0	0
Community Facility	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	0	0	0
<b>Subtotals</b>			<b>25,471</b>	<b>20,378</b>
<b>Total Water Consumption</b>			<b>45,848</b>	

**Notes:**

- 1 Usage and generation rates from the *CEQR Technical Manual* except where noted.
- 2 Assume one employee per 250 sf.
- 3 Because the *CEQR Technical Manual* does not provide industrial water consumption rates, DEP factors were used in determining industrial water demand. These factors are contained in DEP’s *Rules Governing the Design and Construction of Private Sewers or Private Drains*. The retail rate for air conditioning water demand was applied.
- 4 Residential calculations assume 2.61 persons per dwelling unit. Because the *CEQR Technical Manual* does not provide residential air conditioning water consumption rates, the retail rate for air conditioning water demand was applied.

Sources: *CEQR Technical Manual*.  
*Rules Governing the Design and Construction of Private Sewers or Private Drains*. NYCDEP. April 13, 1999.

## Broadway Triangle

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### STORMWATER MANAGEMENT

Introducing impervious surfaces (sidewalks, roofs, roads, driveways, etc.) to a landscape can substantially impact receiving water bodies by increasing both stormwater runoff and its associated pollutants. In addition, data indicate a direct relationship between the amount of imperviousness in a given watershed and the degree of water body degradation.

During wet weather, rainwater runoff or flows from melting snow may inundate the WPCPs, depending upon the size of the storm. To minimize this inundation, regulator chambers (relief valves) are built into the combined sewer system to shunt excess flow to the closest surface water body outfall. This is referred to as a combined sewer overflow (CSO) outlet. The city's WPCPs are designed to treat double the amount of average dry weather flow so as to accommodate surges from minor storms.

As indicated in Chapter 2, "Land Use, Zoning and Public Policy", the majority of the Project Area is heavily urbanized and is currently comprised of impervious surfaces that generate stormwater runoff. Individual development projects are required to have on-site stormwater runoff management in accordance with New York City Department of Environmental Protection (DEP) requirements. This is intended to ensure that a development properly controls its stormwater runoff corresponding to a five-year storm. To be issued a permit to connect to a city sewer (~~for all boroughs except Manhattan~~), DEP requires that stormwater runoff from new developments ~~in excess of the amount allowed under~~ should discharge at a rate equal to or less than the applicable drainage plan ~~be detained through~~ on-site detention. The method to be used to calculate this amount is described in the DEP document "Criteria for Determination of Detention Facility Volume," dated June 2002.

As stated above, the projected development sites in the Project Area are developed in some way with residential, commercial, or industrial uses. The majority of these sites are currently occupied by buildings or other impervious surfaces (e.g., parking lots, etc.) that have high runoff coefficients. A few parcels, however, do comprise of grassy areas or dirt and gravel-filled areas that are used as surface parking and storage areas. It is assumed that most of the buildings in the Project Area pre-date the DEP requirements and therefore do not provide any on-site detention.

Existing stormwater runoff from the projected development sites has been estimated based on existing surface conditions. The estimates were determined by applying standard runoff coefficients to the Rational Formula. The Rational Formula is used for estimating stormwater runoff rates from sites, which relates peak discharge from the site to the average rainfall intensity over the time period required for the flow to concentrate over the site (rainfall intensity), the surface characteristics of the site (runoff coefficient), and the site area (drainage tributary area). The runoff rate is greatest for a site that is covered by impervious surfaces such as building roofs and to a lesser degree for paved areas, and would be least for flat, landscaped areas designed to retain a majority of the rainfall through surface infiltration, absorption, and temporary storage.

Composite runoff coefficients, weighted to reflect the relative percentages of the various types of existing ground surfaces, have been calculated for the projected development sites, as shown in Table 15-2.

**Table 15-2**  
**Existing Composite Site Run-off Coefficient, C**  
**At Projected Development Sites**

<u>SURFACE TYPE<sup>1</sup></u>	<u>ROOF<sup>2</sup></u>	<u>PAVT &amp; WALKS<sup>3</sup></u>	<u>OTHER</u>	<u>GRASS &amp; SOFT SCAPE</u>	<u>TOTAL</u>
<u>AREA, %</u>	<u>54</u>	<u>3</u>	<u>0</u>	<u>43</u>	<u>100.0</u>
<u>SURFACE AREA, SF</u>	<u>280,402</u>	<u>14,101</u>	<u>0</u>	<u>224,514</u>	<u>519,017</u>
<u>RUNOFF COEFFICIENT</u>	<u>1.00</u>	<u>0.85</u>	<u>0</u>	<u>0.20</u>	<u>0.65</u>

Notes:

- 1 - Runoff coefficients for each surface type are as per NYCDEP.
- 2 - Total roof areas on projected development sites.
- 3 - Total paved areas on projected development sites.

The existing wastewater and stormwater discharge characteristics for the projected development sites were estimated for various rainfall events including an average rainfall event expected in a typical year, 90th percentile rainfall event, and 100th percentile rainfall event, to depict the existing discharge volumes into the combined sewer system. Using the existing sanitary sewage rates (see Table 15-1) for the projected development sites and the composite runoff coefficients (see Table 15-2), flow volumes from the projected sites have been estimated for a range of rainfall events, as shown on Table 15-3.

**Table 15-3**  
**Existing Stormwater and Sanitary Sewage Flow Volume**  
**At Projected Development Sites<sup>1</sup>**

<u>RAINFALL VOLUME (in)*</u>	<u>RAINFALL DURATION (hr)*</u>	<u>RUNOFF VOLUME TO RIVER (MG)</u>	<u>RUNOFF VOLUME TO CSS (MG)<sup>2</sup></u>	<u>SANITARY VOLUME TO CSS (MG)<sup>3</sup></u>	<u>TOTAL VOLUME TO CSS (MG)</u>
<u>0.00</u>	<u>3.80</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>
<u>0.40</u>	<u>3.80</u>	<u>0.00</u>	<u>0.08</u>	<u>0.00</u>	<u>0.08</u>
<u>1.20</u>	<u>11.30</u>	<u>0.00</u>	<u>0.25</u>	<u>0.01</u>	<u>0.26</u>
<u>2.50</u>	<u>19.50</u>	<u>0.00</u>	<u>0.53</u>	<u>0.02</u>	<u>0.55</u>

Notes:

CSS = combined sewer system

MG = Million Gallons

\* Based on Intensity/duration/Frequency Rainfall Analysis, New York City and the Catskill Mountain Water Supply Reservoirs, Vieux & Associates, Inc., April 4, 2006. The 24-hour rainfall volume is based on average rainfall intensity over 24-hours (inch/per) times 24 hrs. (Duration information provided by T. Newman & P. Jadhav, HydroQual).

1. Project Development Site Area = 519,017 sf (11.91 acres)

2. Runoff volumes for existing conditions have been calculated as follows:

$Qvol = [Rvol \times A \times RC \times 7.48gal/1,000,000mgd \text{ per gal}]$ , where

Qvol = Total volume of Rainfall for 24-hour storm event discharged offsite, mg

Rvol = Rainfall Volume, in inches for the corresponding Rainfall Return Period listed

A = Site Area, in sq ft

RC = Rainfall Runoff Coefficient, as per Table 15-2.

3. See Table 15-1 for estimate of existing sanitary flows.

Runoff rates from rainfall events are typically calculated as the volume of flow over a specific period of time. Sewage flows are more typically estimated based on average daily sewage flows in millions of gallons per day. As a result, for purposes of comparison to the CSS volumes, the flow volume tables show rates as converted from cfs and mgd to volumes in millions of gallons based on specific rainfall durations for an average rainfall year.

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Based on the volume estimates shown in Tables 15-3, it is clear that the existing project sites generate minimal sanitary sewage, and the majority of the demands on the City combined sewer system come from stormwater runoff.

### WATER CONSERVATION AND WPCP LOAD REDUCTION

During the 1990s, the City instituted various water conservation measures in response to excess flow to the City's WPCPs that exceeded the dry weather flow allowed in their respective SPDES permits. For example, fire hydrants were equipped with locks to prevent illegal use. In addition, all new plumbing fixtures in the City, including replacements in existing structures and new fixtures in new structures were required to be of a low-flow design (Local Law No. 29, 1989). The City also implemented a metering program, installing water meters at thousands of properties where water fees had previously been based on property frontage rather than usage. Metering provided a new financial incentive for consumers to conserve. The City also implemented leak detection programs to identify and repair leaks in the water distribution system. The programs described above have, on the whole, been successful, in that they have reduced water demand and the load on the City's WPCPs. At many WPCPs, this reduction has been in an order of magnitude of several million gallons per day. The NYCDEP projects that savings from the continued implementation of these conservation measures over the next decade would exceed any increase in water demand from consumers.

## **E. FUTURE CONDITION WITHOUT THE PROPOSED ACTION**

Under this scenario, the 34 projected development sites are assumed to either remain unchanged from their existing condition, or would be developed with uses that are permitted under the existing zoning regulations. Compared to existing conditions, in the future without the Proposed Action, it is anticipated that the Project Area would experience an increase of five residential units, a 203,860 square foot increase in commercial floor area, no change in the amount of community facility floor area (it would remain at zero square feet) and a 32,500 square foot decrease in industrial floor area. When added to existing conditions, these changes would result in a net-total of approximately 218,204 square feet of commercial floor area, 51,275 square feet of industrial floor area, no community facility floor area and 18 dwelling units. Additionally, as summarized in Table 15-24, these total values correspond to an associated water demand of approximately 102,748; 52,755 gpd for domestic uses and an additional 49,993 gpd for air conditioning. Finally, under this scenario, the 34 projected development sites would also generate approximately 52,755 gpd of sanitary sewage.

In the future without the Proposed Action, stormwater runoff would continue to be collected and directed through the existing combined sewer system and then conveyed to the Newtown Creek WPCP for treatment. No reduction in the amount of impervious surfaces is anticipated, as development under the No-Build conditions is expected to occur at five projected development sites. Without the Proposed Action, five projected development sites would experience either new construction or conversion of existing structures. No-Build development would include new commercial, office, and hotel uses (and, conversely, loss of industrial uses). As noted previously, NYCDEP requires stormwater detention in compliance with the applicable drainage plan for new developments if the developed site's storm flow exceeds the allowable flow of the drainage plan. As a result of these requirements, given that the existing development sites are mostly covered with impervious surfaces and do not provide detention, it is expected that there would be some reduction in uncontrolled runoff in the future without the proposed action, as these new developments would be required to incorporate stormwater detention measures to handle stormwater runoff from the developed site.

**Table 15-24**  
**Future Water Consumption and Sewage Generation**  
**At Projected Development Sites**  
**Without the Proposed Action**

Use	Rate <sup>1</sup>	Future without the Proposed Action			Increment from Existing Condition		
		Size	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)	Size	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)
Retail	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	83,944	14,270	14,270	69,600	11,832	11,832
Office <sup>2</sup>	Domestic: 25 gpd/person Air Conditioning: 0.10 gpd/sf	19,600	1,960	1,960	19,600	1,960	1,960
Industrial/ Manufacturing <sup>3</sup>	Domestic: 10,000 gpd/acre Air Conditioning: 0.17 gpd/sf	51,275	11,771	8,717	-32,500	-7,461	-5,525
Residential <sup>4</sup>	Domestic: 112 gpd/person Air Conditioning: 0.17 gpd/sf	32,670 (18 DUs)	5,262	5,554	10,920 (5 DUs)	1,462	1,856
Hotel <sup>5</sup>	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	114,660	19,492	19,492	114,660	19,492	19,492
Community Facility	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	0	0	0	0	0	0
<b>Total Water Consumption</b>		<b>Subtotals</b>	<b>52,755</b>	<b>49,993</b>		<b>27,285</b>	<b>29,615</b>
			<b>102,748</b>			<b>56,900</b>	

**Notes:**

- 1 Usage and generation rates from the CEQR Technical Manual except where noted.
- 2 Assume one employee per 250 sf.
- 3 Because the CEQR Technical Manual does not provide industrial water consumption rates, DEP factors were used in determining industrial water demand. These factors are contained in DEP's Rules Governing the Design and Construction of Private Sewers or Private Drains. The retail rate for air conditioning water demand was applied.
- 4 Residential calculations assume 2.61 persons per dwelling unit. Because the CEQR Technical Manual does not provide residential air conditioning water consumption rates, the retail rate for air conditioning water demand was applied.
- 5 Assume 400 sf per room and function space of 10 percent of total floor area.

Sources: CEQR Technical Manual;  
Rules Governing the Design and Construction of Private Sewers or Private Drains. NYCDEP. April 13, 1999.

Conservatively assuming that the area of impermeable surface within the study area would not change, and since there would only be a minimal increase in sanitary flow to the combined sewer, it is anticipated that no significant change in the frequency or duration of CSO events would occur as a result of development within the study area in the future without the Proposed Action.

## **F. FUTURE CONDITION WITH THE PROPOSED ACTION**

Under this development scenario, there would be a total of approximately 1,869 dwelling units, 230,352 square feet of commercial floor area, no industrial floor area, and 35,456 square feet of community facility floor area. Compared to the future condition without the Proposed Action, these figures represent a net increase of 1,851 residential units, a net increase of 12,148 square feet of commercial floor area, a net decrease of 51,275 square feet of industrial floor area, and a net increase of 35,456 square feet of community facility floor area.

### **WATER SUPPLY**

As summarized in Table 15-35, the total build out of the 34 projected development sites would result in an associated water demand of approximately 588,515 gpd for domestic uses and approximately 356,502 gpd for air conditioning. Together, these values total 945,017 gpd; a net increase over the No- Build Condition of approximately 842,269 gpd.

As noted previously, New York City consumes approximately 1.3 billion gallons of water per day. Given this level of consumption, this demand represents less than 0.1 percent of the city water supply demand. The project increment would therefore be unlikely to adversely impact the City's water supply or water pressure.

## **SANITARY SEWAGE AND STORMWATER MANAGEMENT**

### **SANITARY SEWAGE COLLECTION AND TREATMENT**

In the future with the Proposed Action, wastewater from the study area would continue to be treated by the Newtown Creek WPCP. The capacity of the plant would not change as a result of the Proposed Action and the facility would retain its SPDES permitted capacity of 310 mgd. Additionally, under this scenario, as shown in Table 15-5, the 34 projected development sites would generate a total of approximately 588,515 gpd of sanitary sewage; this represents a net increase of 535,760 gpd of sanitary sewage over the No-Build Condition. While this sanitary sewage generation represents an increase from the No Action condition, it is equivalent to less than 0.2 percent of the permitted capacity of the Newtown Creek WPCP. Since the demand associated with the Proposed Action is well within the capacity of the treatment plant, no significant adverse impacts to the City's wastewater treatment services would occur as a result of the Proposed Action.

### **STORMWATER MANAGEMENT**

Similar to the majority of Brooklyn and the City as a whole, the Project Area consists of mostly paved urban land that has a high runoff coefficient. Since projected development under the Proposed Action will increase impervious surfaces and runoff sources - especially in portions of the Project Area that are currently vacant and unpaved, and will also increase wastewater flows into the combined sewer system, it is anticipated that over time the Proposed Action may exacerbate current CSO volumes and/or number of events in the Wallabout Channel and the East River. In recent years, the city has identified sustainable

Table 15-35  
 Future Water Consumption and Sewage Generation  
 at Projected Development Sites  
 With the Proposed Action

Use	Rate <sup>1</sup> Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	Future with the Proposed Action			Increment from No-Build Condition		
		Size	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)	Size	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)
Retail		187,230	31,829	31,829	103,286	17,559	17,559
Office <sup>2</sup>	Domestic: 25 gpd/person Air Conditioning: 0.10 gpd/sf	43,122	4,312	4,312	23,522	2,352	2,352
Industrial/ Manufacturing <sup>3</sup>	Domestic: 10,000 gpd/acre Air Conditioning: 0.17 gpd/sf	0	0	0	-51,275	-11,771	-8,717
Residential <sup>4</sup>	Domestic: 112 gpd/person Air Conditioning: 0.17 gpd/sf	1,849,018 (1,869 DUs)	546,346	314,333	1,816,348 (1,851 DUs)	541,084	308,779
Hotel	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	0	0	0	-114,660	-19,492	-19,492
Community Facility	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	35,456	6,028	6,028	35,456	6,028	6,028
<b>Subtotals</b>			<b>588,515</b>	<b>356,502</b>		<b>535,760</b>	<b>306,509</b>
<b>Total Water Consumption</b>			<b>945,017</b>			<b>842,269</b>	

**Notes:**

- 1 Usage and generation rates from the CEQR Technical Manual except where noted.
- 2 Assume one employee per 250 sf.
- 3 Because the CEQR Technical Manual does not provide industrial water consumption rates, DEP factors were used in determining industrial water demand. These factors are contained in DEP's Rules Governing the Design and Construction of Private Sewers or Private Drains The retail rate for air conditioning water demand was applied.
- 4 Residential calculations assume 2.61 persons per dwelling unit. Because the CEQR Technical Manual does not provide residential air conditioning water consumption rates, the retail rate for air conditioning water demand was applied.

Sources: CEQR Technical Manual;  
 Rules Governing the Design and Construction of Private Sewers or Private Drains. NYCDSEP. April 13, 1999.

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strategies such as cost-effective source controls and implementation opportunities to address water quality issues, particularly CSOs, through the goals and objectives of the Mayor's PlaNYC 2030 and Sustainable Stormwater Management Plan (2008).

~~Between the Draft and Final EIS, The Proposed Action's increase in impervious surfaces and wastewater flows will be~~ were evaluated to determine ~~whether infrastructure improvements are necessary and to identify appropriate water conservation measures and stormwater best management practices (BMPs). The purpose of this analysis is to inform the city's sustainability strategies concerning water quality.~~ the Proposed Action's increase to combined sewer flows to the fronting and downstream sewer system and conveyance facilities including regulators and CSO outfalls.

Future stormwater runoff from the projected development sites has been estimated based on proposed zoning district requirements and the application of standard runoff coefficients to the Rational Formula. The Rational Formula is used for estimating stormwater runoff rates from sites, which relates peak discharge from the site to the average rainfall intensity over the time period required for the flow to concentrate over the site (rainfall intensity), the surface characteristics of the site (runoff coefficient), and the site area (drainage tributary area). The runoff rate is greatest for a site that is covered by impervious surfaces such as building roofs, and to a lesser degree for paved areas, and would be least for flat, landscaped areas designed to retain a majority of the rainfall through surface infiltration, absorption, and temporary storage.

Composite runoff coefficients, weighted to reflect the relative percentages of the various types of proposed ground surfaces, have been calculated for the projected development sites, as shown in Table 15-6.

**Table 15-6**  
**Future Composite Site Run-off Coefficient, C**  
**At Projected Development Sites**

<b><u>SURFACE TYPE<sup>1</sup></u></b>	<b><u>ROOF<sup>2</sup></u></b>	<b><u>PAVT &amp; WALKS<sup>3</sup></u></b>	<b><u>OTHER</u></b>	<b><u>GRASS &amp; SOFT SCAPE</u></b>	<b><u>TOTAL</u></b>
<b><u>AREA, %</u></b>	74	5	0	21	100.0
<b><u>SURFACE AREA, SF</u></b>	382,177	25,400	0	111,440	519,017
<b><u>RUNOFF COEFFICIENT</u></b>	1.00	0.85	0	0.20	0.82

Notes:

1 - Runoff coefficients for each surface type are as per NYCDEP.

2 - Total roof areas on projected development sites.

3 - Total paved areas on projected development sites.

The future wastewater and stormwater discharge characteristics for the projected development sites were estimated for various rainfall events including an average rainfall event expected in a typical year, 90th percentile rainfall event, and 100th percentile rainfall event, to depict the existing discharge volumes into combined sewer system. Using the future sanitary sewage rates (see Table 15-5) for the projected development sites and the composite runoff coefficients (see Table 15-6), flow volumes from the projected development sites have been estimated for a range of rainfall events, as shown on Table 15-7.

**Table 15-7**  
**Future Stormwater and Sanitary Sewage Flow Volume**  
**At Projected Development Sites<sup>1</sup>**

<u>RAINFALL VOLUME (in)*</u>	<u>RAINFALL DURATION (hr)*</u>	<u>RUNOFF VOLUME TO RIVER (MG)</u>	<u>RUNOFF VOLUME TO CSS (MG)<sup>2</sup></u>	<u>SANITARY VOLUME TO CSS (MG)<sup>3</sup></u>	<u>TOTAL VOLUME TO CSS (MG)</u>
0.00	3.80	0.00	0.00	0.08	0.08
0.40	3.80	0.00	0.11	0.08	0.19
1.20	11.30	0.00	0.32	0.25	0.57
2.50	19.50	0.00	0.66	0.43	1.09

Notes:

CSS = combined sewer system

MG = Million Gallons

\* Based on Intensity/duration/Frequency Rainfall Analysis, New York City and the Catskill Mountain Water Supply Reservoirs, Vieux & Associates, Inc., April 4, 2006. The 24-hour rainfall volume is based on average rainfall intensity over 24-hours (inch/per) times 24 hrs. (Duration information provided by T. Newman & P. Jadhav, HydroQual).

1. Project Development Site Area = 519,017 sf (11.91 acres)

2. Runoff volumes for existing conditions have been calculated as follows:

$Qvol = [Rvol \times A \times RC \times 7.48gal/1,000,000mgd \text{ per gal}]$ , where

Qvol = Total volume of Rainfall for 24-hour storm event discharged offsite, mg

Rvol = Rainfall Volume, in inches for the corresponding Rainfall Return Period listed

A = Site Area, in sq ft

RC = Rainfall Runoff Coefficient, as per Table 15-6.

3. See Table 15-5 for estimate of future sanitary flows.

Runoff rates from rainfall events are typically calculated as the volume of flow over a specific period of time. Sewage flows are more typically estimated based on average daily sewage flows as mgd. As a result, for purposes of comparison to the CSS volumes, the flow volume tables show rates as converted from cfs and mgd to volumes in millions of gallons (MG) based on specific rainfall durations for an average rainfall year.

Based on the volume estimates shown in Tables 15-7, the future projected development sites would generate sanitary sewage and stormwater flow that would place demands on the City combined sewer system.

The total combined stormwater and wastewater flow generated on the projected development sites in the future with the Proposed Action (Build) condition are presented in Table 15-7. As shown in the table, the flows range from approximately 0.08 MG to 1.09 MG for the various rainfall intensities. As shown in Table 15-8, the change between total combined stormwater and wastewater flow from existing to build conditions is approximately 0.08 MG to 0.54 MG for the various rainfall intensities. While this combined stormwater and wastewater generation is an increase from the existing condition, the Proposed Action will not have any significant adverse impacts to the combined sewer system, conveyance systems (i.e. regulators, outfalls) or City's wastewater treatment services.

While the Proposed Action would not result in significant adverse impacts to the City's wastewater treatment services, HPD is committed to encouraging water conservation and stormwater management practices. For HPD-funded developments within the area of proposed rezoning, HPD will encourage, to the extent practicable, that project sponsors incorporate water conservation measures and incorporate stormwater management practices into the building/site design. Water conservation may be accomplished through participation in United States Environmental Protection Agency's (US EPA) WaterSense® Program and with regard to stormwater management practices HPD will consult DEP during the design process. Required measures can be incorporated into the project through either the land disposition or loan agreement.

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For non-HPD-funded developments within the area of proposed rezoning, DEP has indicated that they may direct DOB so that DOB will not be able to accept self-certification for site connection permits. Applicants could be required to submit Site Connection Permits to DEP for review and approval. To offset the increase in sanitary flow, DEP would require that the allowable storm flow would be required to be reduced by an amount equal to increase in peak sanitary flow through on-site detention systems.

**Table 15-8**  
**Combined Stormwater Runoff and Wastewater Generation Increment (MGD)**  
**Comparison of Existing Condition to Future With Proposed Action Condition**

<b><u>RAINFALL VOLUME (in)*</u></b>	<b><u>RAINFALL DURATION (hr)*</u></b>	<b><u>EXISTING TOTAL VOLUME TO CSS (MG)</u></b>	<b><u>FUTURE TOTAL VOLUME TO CSS (MG)</u></b>	<b><u>INCREMENTAL TOTAL VOLUME TO CSS (MG)</u></b>
0.00	3.80	0.00	0.08	0.08
0.40	3.80	0.08	0.19	0.11
1.20	11.30	0.26	0.57	0.31
2.50	19.50	0.55	1.09	0.54

As described previously, the potential and projected development sites identified in the RWCDs for the Proposed Action contain a mix of publicly and privately owned properties. Stormwater attenuation and treatment mechanisms would be included in the city's design of publicly owned properties within the Project Area and the designs of these systems would be guided by the city's sustainability initiatives described in PlaNYC, Sustainable Stormwater Management Plan, NYSDEC Stormwater Management Design Manual, and DEP's detention requirements and guidance documents. As new private development resulting from the Proposed Action begins to take place, it is anticipated that BMPs would also be implemented as part of the approval process for these projects.

While unrelated to the Proposed Action several other rezonings have been approved for the affected combined sewer subcatchment area (NCB-014) in the recent past, which include and the Fort Green/Clinton Hill rezoning, the Bedford Stuyvesant South rezoning, and the Downtown Brooklyn rezoning. A description of these projects is contained below:

Fort Green/Clinton Hill: The rezoning generally consisted of contextual zoning map changes and a zoning text amendment for 99 blocks located within the Fort Greene and Clinton Hill neighborhoods including the Wallabout area of Community District 2, Brooklyn. The proposal was intended to protect and preserve the historic brownstone, row house character and prevent future out of scale developments while providing opportunities for apartment house construction and incentives for affordable housing on Myrtle Avenue, Fulton Street and Atlantic Avenue within the rezoning area.

Bedford Stuyvesant South: The project consists of zoning map amendments and a zoning text amendment for an approximately 206 -block area in the southern half of the Bedford-Stuyvesant neighborhood of Community District 3, Brooklyn. The rezoning area was generally bounded by Lafayette Avenue and Quincy Street to the north, Classon Avenue to the west, Saratoga Avenue and Broadway to the east, and Atlantic Avenue to the south. The intent of the proposal was to preserve neighborhood scale and character, maintain opportunities for mid-rise apartment building construction along appropriate corridors, and allow for residential growth with incentives for affordable housing along the Fulton Street transit and retail corridor.

Downtown Brooklyn: The project included a series of zoning map and zoning text changes, new public open spaces, pedestrian and transit improvements, urban renewal plan modifications, street mappings and other actions were approved to foster a multi-use urban environment to serve the residents, businesses, academic institutions and cultural institutions of Downtown Brooklyn and its surrounding communities. The area is, generally, bounded by Tillary Street to the north, Ashland Place to the east, Atlantic Center and Schermerhorn Street to the south, and Court Street to the west, and is a diverse area with a high concentration of major office buildings, regional stores, residential buildings, government offices and a number of major academic and cultural institutions.

As noted previously, NYCDEP requires stormwater detention in compliance with the drainage plan for existing or new developments fronting on streets with sewers, if the developments storm flow exceeds the allowable flow of the drainage plan. As a result of these requirements, given that the existing development sites are mostly covered with impervious surfaces and do not provide detention, it is expected that there would be some reduction in uncontrolled runoff from development sites in the future with the Proposed Action, as these new developments would be required to incorporate stormwater detention measures such as to handle stormwater runoff from the development site. Since the increment of combined flow is affected by the size of the storm events, the stormwater component of wet weather flow to the plant may potentially affect combined sewer overflow frequency or duration. Although there may not be a specified requirement for increased detention associated with the Proposed Action, the following Best Management Practices (BMPs) and sustainable design features could be incorporated into future development. BMPs would serve to decrease the potential for an increase to CSO frequency or duration and could include, but are not necessarily limited to: Increased quantity, density, and diversity of trees; Sustainable irrigation and landscaping practices; Graywater recycling for individual buildings; Integration of vegetated swales; Green roofs; Blue roofs; Rooftop storage and filters; Underground storage; Inline pipe storage; Decorative wet ponds; Detention dry ponds; Proprietary pre-treatment structures (e.g., Stormceptor); Bioengineered and structural practices to reduce and control runoff; and/or other low-impact, effective measures.

## G. CONCLUSION

As discussed in this chapter, the Proposed Action would not result in significant adverse impacts to the city's infrastructure management systems, including stormwater and wastewater management and treatment systems. Development on the 34 projected development sites would produce an incremental increase for water demand of 842,269 gpd when compared to No-Build conditions. This incremental increase of 842,269 gpd would represent a 0.07 percent increase over the city's current daily water demand of 1.2 billion gpd. Because this is less than one-tenth of one percent of the city's water demand, the Proposed Action would not result in a significant adverse impact to the city's water supply or water pressure. The Newtown Creek WPCP would receive approximately 535,760 gpd of additional wastewater compared to the No-Build condition as a result of the Proposed Action. This amount represents approximately 0.17 percent of the plant's treatment capacity. The combined sewer, conveyance system and Newtown Creek WPCP would receive up to approximately 0.54 MG of additional combined wastewater and stormwater discharge compared to the existing condition as a result of the Proposed Action at the various rainfall intensities. ~~and~~ Consequently, the Proposed Action would not result in a significant adverse impact to the combined sewer system, conveyance systems (i.e. regulators, outfalls) or City's wastewater treatment system. ~~As the Proposed Action's increase in impervious surfaces and wastewater flows will be further evaluated and appropriate water conservation measures and stormwater BMPs will be implemented, the Proposed Action is not anticipated to adversely impact the city's stormwater management system.~~

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While the Proposed Action would not result in significant adverse impacts to the City's wastewater treatment services, HPD is committed to encouraging water conservation and stormwater management practices. For HPD funded developments within the area of proposed rezoning, HPD will encourage, to the extent practicable, that project sponsors incorporate water conservation measures and incorporate stormwater management practices into the building/site design. Water conservation may be accomplished through participation in United States Environmental Protection Agency's (US EPA) WaterSense® Program and with regard to stormwater management practices HPD will consult DEP during the design process. Required measures can be incorporated into the project through either the land disposition or loan agreement.

For non-HPD-funded developments within the area of proposed rezoning, DEP has indicated that they may direct DOB so that DOB will not be able to accept self-certification for site connection permits. All applicants would be required to submit Site Connection Permits to DEP for review and approval. To offset the increase in sanitary flow, DEP would require that the allowable storm flow would be required to be reduced by an amount equal to increase in peak sanitary flow through on-site detention systems.

### **H. NEPA CONSIDERATION**

The CEQR analysis provided above has been relied upon to evaluate potential effects on infrastructure as a result of the Proposed Action. As discussed above, the Proposed Project would not adversely impact the city's infrastructure, particularly water supply, sanitary sewage, and stormwater management systems. Therefore, no further consideration under NEPA is required.