Chapter 10: Infrastructure

A. INTRODUCTION

The workers, visitors, and shoppers that would be introduced to the Kingsbridge Armory site as a result of the proposed project are expected to place new demands on New York City's water supply, sanitary sewage treatment, and stormwater discharge systems. This chapter evaluates the impacts of the proposed project on New York City's infrastructure.

As described in detail below, the analysis concludes that the proposed project would not result in any significant adverse impacts to the existing water supply, sewage treatment, and stormwater discharge systems.

B. METHODOLOGY

In accordance with the methodologies in the 2001 *City Environmental Quality Review (CEQR) Technical Manual*, the water and sewer demand on the project site was estimated for the existing condition, the future without the proposed project, and the future with the proposed project. These estimates were based on water and sanitary sewer generation rates provided in the *CEQR Technical Manual*. The adequacy of the City's water supply and wastewater treatment systems to handle these flows was then determined.

WATER SUPPLY

In accordance with *CEQR Technical Manual* guidelines, the study area for the water supply impact assessment includes the entire area serviced by the Croton gravity system in addition to pressure regulators from the Catskill/Delaware System. The water supply system is a gravity-fed system, which relies on the elevation gradient between the heights of Hillview Reservoir in Yonkers for Catskill/Delaware Water and the Jerome Park Reservoir in the Bronx for Croton Water. The estimated increment in daily water usage for future conditions over existing conditions was calculated using rates given in the *CEQR Technical Manual*.

The City has initiated a comprehensive water conservation program with the objective of reducing water use by implementing water metering programs and by requiring that existing and new structures be designed on the basis of low-flow criteria (Local Law No. 29, 1989). Additional measures, including leak detection programs and locking fire hydrants, are also intended to reduce water demand, as are plans by the New York City Department of Environmental Protection (DEP) to meter water usage in all buildings. The *CEQR Technical Manual* uses water usage rates that do not include the effects of these water conservation measures, which results in a conservative water consumption analysis.

SANITARY SEWAGE

In conformance with the *CEQR Technical Manual*, the study area for the sanitary sewage (or wastewater) analysis is the entire area served by the Wards Island Water Pollution Control Plant

(WPCP). Consistent with *CEQR Technical Manual* guidance, the increment in sanitary sewage from the proposed project to be treated at the Wards Island WPCP is assumed to be equal to the projected increment of potable water demand for the proposed project. The increment of wastewater generated from air conditioning use is considered to be minimal because of the recirculation and evaporation processes of water cooling systems, and is therefore not included in the overall increment in sanitary sewage volumes. The analysis includes an evaluation of whether the increased volume of sanitary sewage flows with the proposed project to the Wards Island WPCP would be within the limits of the State Pollutant Discharge Elimination System (SPDES) permit for the facility. The SPDES permit is issued by the New York State Department of Environmental Conservation (DEC). An adverse impact would occur if the proposed project resulted in a volume of sanitary sewage that exceeded the limits of the SPDES permit. Wards Island WPCP's current permitted flow limit is 275 millions of gallons per day (mgd) based on a 12-month rolling average.

STORMWATER

The *CEQR Technical Manual* requires an assessment of the potential impact of a project's additional volume of stormwater on the receiving water body, which in this case is the Harlem River. Under existing conditions, during wet weather events in the project area, excess diluted wastewater flows, or combined sewer overflows (CSOs) could be discharged into the Harlem River via outfalls. Impacts would occur if the proposed actions would result in significant degradation to the water quality of the Harlem River, increase the frequency or extent of flooding, or increase the levels of erosion and sedimentation from construction and operations activities.

C. EXISTING CONDITIONS

WATER SUPPLY

The New York City water supply system comprises three watersheds north and northwest of the city: the Delaware, Catskill, and Croton. From these watersheds, water is conveyed as far as 125 miles to the City via a system of reservoirs, aqueducts, and tunnels. Within the City, a grid of pipes distributes water to consumers. The average daily consumption in 2006 was 1.069 billion gallons per day according to DEP, the municipal agency that operates the system.

The Bronx's water supply comes primarily from the Croton system. Watersheds within the Croton system collect runoff from areas in Westchester, Dutchess, and Putnam Counties and deliver it via open channel streams and rivers to the New Croton Reservoir in Westchester County. From there, water flows to the Jerome Park Reservoir through the Croton Aqueduct, and from there to the low-lying areas of the Bronx and Manhattan. Water can also come from the Catskill/Delaware system, which originates in the Catskills. Water from this system is brought via aqueducts to the Kensico Reservoir in Westchester County. From the Kensico Reservoir, the water is conveyed to the Hillview Reservoir in the City of Yonkers. Hillview Reservoir serves to balance the fluctuating daily water demand and connects into the system of water pipes that deliver the water in New York City.

Average daily water consumption in the Bronx is estimated at about 187 mgd. Because of the size of the water supply system, little variation in water pressure occurs from hour to hour, except within the local distribution network. The average water pressure in the Bronx is 38

pounds per square inch (psi). A pressure of 20 psi is considered the minimum acceptable level for uninterrupted service.

The project area is serviced by a network of water mains forming an interconnected looped service. Portions of this looped service abut the project site; specifically a 48-inch diameter water main located along Reservoir Avenue, a 36-inch diameter main in West Kingsbridge Road, and a 36-inch diameter main in Jerome Avenue. These mains provide domestic and fire services to the Armory structure on the project site and to neighboring businesses, as well as to street hydrants for fire fighting.

The project site is occupied by the Armory, which is substantially vacant, as well as small portions of Reservoir Avenue and West 195th Street. A small portion of the Armory building is currently dedicated to parking for graffiti removal trucks. There is minimal water consumption by the current uses on the project site.

SANITARY SEWAGE

The project site is located in the service area of the Wards Island WPCP. This plant provides full secondary physical and biological treatment of sanitary sewage so that it can be discharged into the City's waterways without adversely affecting water quality. Secondary treatment requires the removal of at least 85 percent of the total dissolved solids and biochemical oxygen demand in the influent. In addition, the effluent is treated with chlorine to kill pathogens. Effluent from the Wards Island WPCP is discharged into the East River. As described above, discharges from the WPCP are regulated by a SPDES permit issued by the DEC, which allows an inflow of 275 mgd. As shown on **Table 10-1**, during the past 12 months the Wards Island WPCP had an average flow of 221 mgd, which is below the SPDES permit allowable limit. In addition, all other permit conditions were met.

Table 10-1
Actual Average Monthly Flows at Wards Island WPCP

Month	Actual Flow (mgd)
June 2007	238
July 2007	238
August 2007	243
September 2007	206
October 2007	214
November 2007	211
December 2007	227
January 2008	217
February 2008	227
March 2008	N/A
April 2008	216
May 2008	199
12-Month Average	**221**

Note: Permit Limit: 275 mgd.
Source: New York City Department of Environmental Protection.

For the conveyance of sanitary sewage, the project site is currently served by combined sewers. Combined sewers carry only sanitary sewage during dry weather and convey all sewage to the WPCP. During rain storms and other precipitation events, the combined sewer carries both sanitary sewage and stormwater runoff. The volume of water during a storm is occasionally too

great for the WPCP to handle. Therefore, the maximum amount of water that the WPCP can handle is sent to the plant, and the excess mixture of sanitary sewage and runoff is discharged into a receiving water body. In the case of the project site, the excess is discharged into the Harlem River.

A combined sewer under West Kingsbridge Road conducts flows in a southerly direction towards a regulating chamber at Landing Road. Dry weather flows in the 10-foot by 7.5-foot interceptor sewer are conveyed to a grit chamber in St. Ann's Avenue before flowing to the Wards Island WPCP. During wet weather, the excess flow is diverted into the Harlem River at a regulator at Landing Road.

As described above, the Armory on the project site is substantially vacant. A small portion of the Armory building is currently dedicated to parking for graffiti removal trucks. There is minimal sanitary sewage generated from the project site.

STORMWATER RUNOFF

The project site primarily consists of impervious surfaces (roof, pavement, roadway, sidewalk) with minimal landscaped or other pervious surfaces.

The method for calculating runoff uses DEP's "design storm" Rational Formula, which is as follows:

$Q = C_W \times I \times A$ where

Q is runoff in cubic feet per second (cfs),
C_W is the weighted runoff coefficient,
I is the rainfall intensity (5.95-inches/hour), and
A is the area in acres

Because the project site is largely impervious, the runoff coefficient value is 1.0, where essentially 100 percent of precipitation becomes surface flow. The design storm used by DEP is a rainfall intensity of 5.95 inches per hour. The surface area of the development parcels is approximately 6.5 acres. Therefore, the total runoff from the project site is estimated at approximately 38.7 cfs.

On the project site, most stormwater runoff is channeled to the City's combined sewer system because the project site is almost entirely covered with impervious surface. A typical outfall has regulators that divert the wastewater flow to interceptor sewers, which deliver wastewater to the Ward Island WPCP. The regulators are designed to allow two times the mean dry weather flow into the interceptor. Thus, in dry weather, all sewage from the trunk sewers flows into the interceptor. During storm events, twice the mean dry weather sewage is diverted to interceptors. Excess diluted combined flows divert to the CSOs, which discharge directly to the Harlem River.

Overflows to the Harlem River are relatively sporadic and result primarily from very wet weather events, systems/equipment malfunctions, or a combination of both. CSO events depend on the proper functioning of regulators and combined sewers as well as other factors such as system configuration, regulator weir elevations, and the wet weather pumping operations at the Ward Island WPCP. As a result, some outfalls are subject to more combined sewer overflow events than others in the Wards Island drainage area. CSOs located within the Wards Island WPCP drainage area discharge to the Harlem River and northern portions of the East River.

D. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, water consumption, sewage generation, and stormwater runoff are not expected to change significantly from existing conditions.

WATER SUPPLY

Water demand in the area would be expected to increase as a result of incidental growth; however, this increase is not anticipated to adversely affect the water supply system. The effects of water conservation measures, such as low-flow fixtures and metering, are expected to keep any growth in water demand to a minimum. No major changes to the water distribution system are planned by the City in the project area.

SANITARY SEWAGE

New York City regulations require all new construction and substantial renovation projects to incorporate low-flow fixtures for water conservation purposes. In addition, the City has an active program to install water meters in all buildings. Based on 1998 projections, DEP estimates that the flows to the Wards Island WPCP would increase by 4 percent to 230 mgd by the year 2015. Trends since 1998 have shown that sewage generation has been very close to the low end of the range. This estimated future flow is well below the SPDES permit level of 275 mgd.

STORMWATER RUNOFF

Without the proposed project, current runoff patterns at the project site are not expected to change.

E. PROBABLE IMPACTS OF THE PROPOSED PROJECT

WATER SUPPLY

As shown in **Table 10-2**, the net water consumption on the project site in 2013 is estimated at 195,162 gallons per day (gpd).

The proposed project's water demand is not expected to adversely affect the City's water supply or local water pressure. Pursuant to public law, all plumbing fixtures would be of low-flow design. Compared to the average daily water demand in New York City of about 1.1 billion gpd, the proposed usage represents 0.02 percent of the City's total consumption, which is an insignificant increase. The water supply system has adequate capacity to support the proposed project and would not experience a significant adverse impact.

SANITARY SEWAGE

The proposed project's estimated sanitary sewage generation would be the same as its estimated domestic water demand. The projected sanitary sewage flow from the proposed project would be approximately 195,162 gpd. This generation rate represents approximately 0.07 percent of the SPDES permitted flow of 275 mgd to the Wards Island WPCP and is considered to be insignificant. The proposed project would not exceed the capacity of the local sewer system. The proposed project would not have a significant adverse impact on the Wards Island WPCP's ability to properly treat and discharge sanitary sewage.

Table 10-2
Projected Water Consumption

Use*	Rate	Area (sf) or Persons	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)
Retail	domestic: 0.17 gpd/sf	**345,675**	58,765	
	air conditioning: 0.17 gpd/sf			58,765
Restaurant	domestic: 2 gpd/meal	**31,560**	6,168	
	air conditioning: 0.17 gpd/sf			5,365
Fitness Club	domestic: 65 gpd/patron	**33,240**	41,080	
	air conditioning: 0.17 gpd/sf			5,651
Community Facility	domestic: 25 gpd/person	**27,000**	2,700	
	air conditioning: 0.10 gpd/sf			2,700
Cinema	domestic: 5gpd/seat	**1,644** (seats)	8,220	
	air conditioning: 0.10 gpd/sf	**57,485**		5,749
		Subtotal	116,933	78,229
		Total	**195,162**	

Note: *There is no anticipated water usage and sewage generation in the parking area of the proposed project. Therefore, the parking garage is not included in the water consumption analysis.
Source: Rates from 2001 *City Environmental Quality Review Technical Manual*.

STORMWATER RUNOFF

As described above, the project site primarily consists of impervious surfaces, with minimal landscaped or other pervious surfaces. This condition would not change in the future with the proposed project. Therefore, there would be no measurable change to stormwater runoff generated by the project. In addition, current building requirements require the reduction in storm flows from new projects. These building requirements would be expected to reduce peak storm flows. Therefore, additional CSO events generated due to an increase in storm flows in the combined system are not anticipated. ✷