Chapter 13: Infrastructure

A. INTRODUCTION

This chapter evaluates the potential impacts of the proposed project on New York City's infrastructure, including the City's water supply, sanitary sewage treatment, and stormwater discharge systems. The area of the project site is bounded by Carroll Street to the north, Bond Street to the west, 2nd Street to the south, and the Gowanus Canal to the east. City sewers near the project site area are part of a combined system that convey sanitary and stormwater flows to the Red Hook Water Pollution Control Plant (WPCP). The Red Hook WPCP operated and maintained by the New York City Department of Environmental Protection (DEP), and is located along the East River in Brooklyn, north and east of the project site (See Figure 13-1).

The proposed project would redevelop this Gowanus Canal waterfront property with a predominantly residential development that would include market-rate and affordable housing with community facility, commercial retail space and accessory parking uses. These proposed uses would generate new demand on infrastructure services, including water supply, sanitary sewage, and stormwater. In addition, the proposed project would provide 0.7 acres of publicly-accessible waterfront open space on the Gowanus Canal along the entire project waterfront from 2nd Street on the south to Carroll Street on the north. In addition to redirecting stormwater runoff from the project site away from the combined sewer system to a separate storm sewer system, the proposed project would also change the land cover at the site by adding landscaped surfaces that would reduce stormwater runoff.

The infrastructure assessment provided in this chapter describes existing infrastructure conditions, describes future conditions through 2011 with the assumed continuation of the existing on-site uses, and then presents the impacts of the proposed project in 2011 with respect to infrastructure. In addition, this chapter provides a description, for informative purposes, of infrastructure and water quality conditions predicted to exist in 2013, the year in which DEP proposes to complete significant infrastructure improvements at the headwaters of the Gowanus Canal including upgrading the systems at the Gowanus Pump Station and force main and the Gowanus flushing tunnel.

PRINCIPAL CONCLUSIONS

The proposed project would not result in any significant adverse impacts related to infrastructure.

WATER SUPPLY

Water demands of the proposed project would not overburden the City's water supply system. Based on the *New York City Environmental Quality Review (CEQR) Technical Manual*, the incremental 114,032 gallons per day (gpd) of water supply demand from the proposed project would not adversely affect the capacity of the City's water supply system in providing water to

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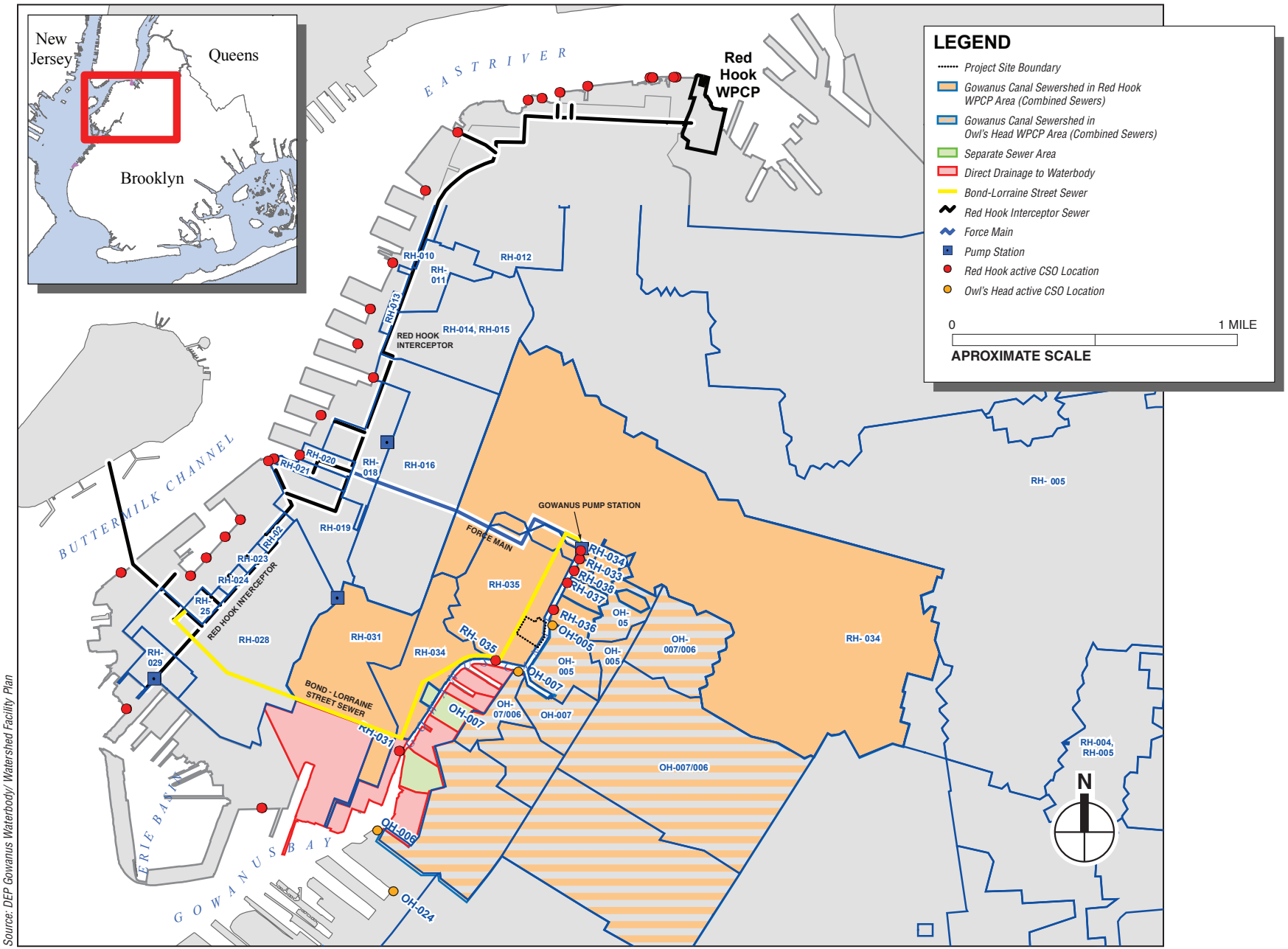


Source: DEP Gowanus Waterbody/ Watershed Facility Plan

Gowanus Canal Sewershed - Sewer System Components

Figure 13-1

the proposed project site nor would it impact water pressure for local users. Moreover, project-specific calculations developed by the applicant have disclosed that with the use of low flow fixtures the actual water demand rate would be much less than that projected under the *CEQR Technical Manual*, or 56,200 gpd, about half of the CEQR rates.

SANITARY SEWAGE

The Red Hook WPCP currently handles approximately 33 million gallons per day (mgd) of sewage flow and is designed to treat a dry weather flow of 60 mgd. Based on the *CEQR Technical Manual*, the added sanitary sewage discharge of approximately 114,032 gallons per day (gpd) resulting from the proposed project represents approximately 0.4 percent of the current 33 mgd of flow handled by the Red Hook WPCP. Thus, the projected increase in sanitary sewage resulting from the proposed project would not cause the Red Hook WPCP to exceed its operational capacity or the New York State Pollution Discharge Elimination System (SPDES) permitted capacity of 60 mgd. In addition, as stated above, project-specific calculations developed by the applicant have disclosed that with the use of low flow fixtures the actual water demand rate would be much less than that projected under the *CEQR Technical Manual*, or 56,200 gpd, about half of the sanitary wastewater rates used in this conservative impact analysis using CEQR rates.

STORMWATER

Currently, approximately one-third of the project site's stormwater runoff is discharged to the combined sewer in Bond Street. Under the proposed project, two new stormwater sewers would be installed (one at 1st Street and one at 2nd Street) that would convey all site-generated stormwater to the Gowanus Canal via two new storm sewer outfalls also to be constructed as part of the proposed project. Both of these new outfalls would require permits from the New York State Department of Environmental Conservation (DEC) and United States Army Corps of Engineers (ACOE).[1] In addition, to meet DEC requirements, the proposed project would provide pre-treatment for all stormwater collected from the two project blocks, prior to discharge to the storm sewers. This aspect of the project would eliminate any storm flows from the project site reaching the Bond Street combined sewer. Thus, with the proposed project, the project site would not contribute any stormwater flows to the combined sewer or to combined sewer overflow (CSO) discharges to the canal (see the discussion below). In addition to removing stormwater from the project site, the project also proposes to redirect stormwater runoff from the street in the area around Bond Street at 1st Street away from the combined sewers by providing drainage inlets at this location and connecting these inlets to the proposed new storm sewer to be built in 1st Street. The redirection of this additional stormwater runoff would improve conditions relative to local street flooding at this location.

COMBINED SEWER OVERFLOW (CSO) AND WATER QUALITY

An engineering modeling analysis was undertaken of the potential for the proposed project to affect CSO conditions along the Gowanus Canal. The nearest downstream combined sewer overflow location (CSO) from the project site is identified as RH-035 and is located at 4th and

[1] The applicant shall enter into an easement agreement and maintenance declaration with the City for the operation and maintenance of any outfalls it owns that traverse City-owned property.

Bond Streets (see Figure 13-1)[1]. As stated above, based on the *CEQR Technical Manual*, sanitary sewage generated by the project site would increase by approximately 114,032 gpd or 0.18 cubic feet per second (cfs) with the proposed project. This flow would be directed to the Bond Street combined sewer. However, as described above, the proposed project would also modify current stormwater flow patterns at the site by installing new storm sewers and creating new buildings and open spaces. As a result, with the proposed project, stormwater runoff from the project site would be conveyed through two new storm sewers that would outlet to the Gowanus Canal. In addition, with the treatment of the separated project stormwater runoff, a reduction in pollutant loadings from the project site to the Gowanus Canal would occur, providing a benefit for the water quality of the canal.

Based on infrastructure and water quality modeling using both *CEQR Technical Manual* sanitary flow rate calculations (approximately 114,032 gpd) and actual project-specific sanitary flow rates (56,200 gpd, about half of the CEQR-calculated rates), the following conclusions can be made:

- The proposed project would not result in any increase in the number of annual CSO events that are projected to occur in the canal in 2011 (73 total events).
- In 2011, assuming the *CEQR Technical Manual* sanitary flow rate calculations for the proposed project, there would be a very limited projected increase in CSO volume to the canal (over the 2011 No Build condition) of approximately 0.8 MG/yr (or 0.2 percent of the total CSO discharge to the canal).
- In 2011, assuming the project-specific sanitary flow rates (which incorporates actual design features such as low-flow fixtures), there is a limited projected decrease in CSO volume to the canal over the course of the year, of approximately 100,000 gallons annually.
- In no scenario would the proposed project result in any water quality impacts on the Gowanus Canal for principal water quality parameters such as dissolved oxygen and pathogens (See Appendix C and Chapter 10, "Natural Resources").

In 2013, proposed DEP improvements at the Gowanus Pump Station and the Gowanus Flushing Tunnel are scheduled to be completed. Once in place, these upgrades would significantly improve the water quality of the canal and also reduce the impact of the proposed project on CSO volumes. The improvements at the pump station would reroute flow directly to the Columbia Street Interceptor via a new force main, thereby relieving the Bond Street sewer, thus reducing the CSO discharges to the canal by eliminating the use of Bond Street combined sewer as a bypass. These actions would reduce the impact of the incremental sanitary flow contribution from the proposed project resulting in an overall reduction in the CSO volume. In addition, the upgrade and restoration of the Gowanus Flushing Tunnel would improve circulation through the canal. Both of these DEP capital improvement projects would improve the water quality of the Gowanus Canal and the proposed project would not adversely affect the water quality benefits that are projected with these system upgrades. Additional modeling results show that:

- The proposed project would not result in any increase in the number of CSO events that are projected to occur in the canal in 2013 with the proposed Gowanus Pump Station improvements in place (33 total events).

[1] DEP's *Gowanus Canal Waterbody/Watershed Facility Plan, (Draft)* September 28, 2007.

- In 2013 (with the Gowanus Pump Station and Gowanus Flushing Tunnel upgrades in place), assuming the *CEQR Technical Manual* sanitary flow rate calculations for the proposed project, the proposed project would result in a projected decrease in CSO volumes of 0.1 MG discharged to the canal over the course of the year.
- In 2013 (with the Gowanus Pump Station and Gowanus Flushing Tunnel upgrades in place), assuming the project-specific sanitary flow rates, there would be a reduction in CSO volumes of 0.1 MG discharged to the canal over the course of the year. See Appendix C, Table 1.

B. METHODOLOGY

This assessment considers the difference between the 2011 No Build condition (maintaining the existing uses at the project site) and the 2011 Build condition proposed project. Pursuant to the methodologies set forth in the 2001 *CEQR Technical Manual*, this analysis examines only the specific potential impacts created by the project condition.

The water supply assessment discusses current and future water demand from the project site based on both rates from the *CEQR Technical Manual* and project specific calculations and assesses effects on the water supply system serving the area. Due to the size of the City's water supply system, an individual project's demand on water consumption is generally not significant. In order to determine if there would be any water pressure issues for the project, DEP was contacted regarding water pressure conditions for the area.

The sanitary sewage and stormwater management analyses focuses on the effects of increased sanitary flows and changes in the sites stormwater management characteristics. In areas served by combined systems, both stormwater and sanitary flows can be released to the City's surface water bodies through combined sewer overflows that occur during storm events.

For this analysis current stormwater flows were determined based on standard calculations as set forth in the New York City DEP Rules and Regulations and applicable published and accepted DEP guidelines. Stormwater pollutant loading calculations were based on DEC's *Reducing the Impacts of Stormwater Runoff from New Development Guidelines*. Stormwater runoff patterns for the project site and adjoining streets were determined based on field surveys and investigations of existing on-site conditions (e.g., site and building drains) and current topography. The development of the design for the future stormwater management systems was determined based on consultation with DEP. Flow rates and calculations were then based on the design specifications of the proposed project.

In addition, modeling of future infrastructure and water quality conditions was performed (see Appendix C, "Infrastructure and Water Quality Modeling"). This modeling projects No Build and Build conditions for 2011, the anticipated year of occupancy, and for informative purposes, infrastructure conditions predicted to exist in 2013, the year in which DEP proposes to complete significant infrastructure improvements affecting the Gowanus Canal, including upgrading the systems at the Gowanus Pump Station and force main and the Gowanus Flushing Tunnel.

C. EXISTING CONDITIONS

WATER SUPPLY

The New York City water supply system is composed of three watersheds—Croton, Delaware, and Catskill—and extends as far north as the Catskill Mountains, delivering on average, approximately 1.2 billion gallons of water per day to its customers in the five boroughs and Westchester County. From these watersheds, water is carried to the City via a conveyance system composed of reservoirs, aqueducts, and tunnels extending as far as 125 miles north of the City. Within the City, a grid of water pipes distributes water to customers.

The Croton system collects water from Westchester and Putnam 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, which travels beneath the Bronx and Manhattan.

Water consumption in the City averages approximately 1.0 to 1.1 billion gallons per day (bgd). Average consumption in Brooklyn is estimated at 330 mgd; peak consumption is approximately 400 mgd. The Croton system has a lower pressure than the Delaware and Catskill systems and supplies an average of 110 mgd, primarily to domestic users in the areas of lower elevation. The Delaware and Catskill systems serve the fire hydrants and domestic uses in areas where both systems exist, and average about 310 mgd.

Currently, the project site is served by a 20-inch diameter water main beneath Bond Street, and 8-inch diameter water mains beneath Carroll Street, 1st Street, and 2nd Street. According to DEP, there are no operational problems with the water distribution or pressure in the project site area.[1]

As discussed in Chapter 1, "Project Description," the project site rezoning area is mostly vacant, but is currently occupied by some light industrial businesses, warehouses, and open vehicle storage. The existing water demand at the site is therefore limited.

SANITARY SEWAGE

DRY WEATHER CONDITIONS

The project site is located within the approximately 3,000 acre service area of the Red Hook WPCP (see Figure 13-1), which discharges treated wastewater or "effluent" into the East River. The Red Hook WPCP provides secondary treatment (85 percent removal of solids and biological oxygen demand organics), and discharges the clarified and disinfected effluent to the East River. The effluent from this WPCP is regulated by a State Pollutant Discharge Elimination System (SPDES) permit issued by the DEC. The Red Hook WPCP is permitted to treat a 12-month rolling average dry weather flow of 60 mgd. The treatment capacity of the WPCP is twice the design dry weather flow or 120 mgd. This allows the plant to treat a certain volume of combined sanitary and storm flows during wet weather events. The average dry weather flow rate at the plant for the latest 12 months of available DEP records is 30mgd, which is approximately half of the dry weather treatment capacity of the plant (see Table 13-1). Consequently, the Red Hook WPCP currently receives flow at approximately 55 percent of its permitted 60 mgd dry weather capacity.

[1] Correspondence with DEP Brooklyn Water Distribution Engineer's Office, March 2008

Table 13-1
Monthly Average Dry Weather Flows at the Red Hook WPCP

Year	Average Dry Weather Flow (mgd)	Year	Average Dry Weather Flow (mgd)
January 2007	31	July 2007	32
February 2007	30	August 2007	32
March 2007	33	September 2007	31
April 2007	38	October 2007	29
May 2007	33	November 2007	26
June 2007	35	December 2007	27

Source: DEP, March 2008.

WET WEATHER CONDITIONS

Most sewers within the Red Hook WPCP service area collect both sanitary sewage and stormwater runoff that comes from roof and street drainage. In dry weather, the collection lines convey only sanitary sewage to the Red Hook WPCP. However, during and immediately after precipitation events, such as rain and snow melts, the combined sewers carry both sanitary sewage and stormwater.

In New York City combined sewers were originally built to convey both sewage and stormwater to the nearest waterbody, and these sewers were sized to handle large storm events. When the public health consequences of discharging untreated sanitary sewage to ambient waters were realized in the early 1900s, a system of regional WPCPs was gradually constructed. Because construction of a new system of sanitary sewers was considered to be too disruptive and costly, a simpler system of "interceptors" was built to covey sanitary sewage from the existing combined sewer network to the WPCPs. Since it was prohibitively expensive to design the interceptors and WPCPs to handle the large storm events that the combined sewers could deliver, these facilities were sized to handle two times the design dry weather (sanitary) flow associated with each area. To limit the amount of flow that reaches the interceptors and WPCPs, a system of "regulators." allows excessive wet weather flows to bypass treatment and overflow to the receiving waters. When the combined sewer flow exceeds two times the design dry weather flow at the regulator, the flow goes over a weir in the diversion chamber and this overflow is discharged to the receiving water body as "combined sewer overflow (CSO)." By diverting excess flows to the receiving waters as CSO, the regulators protect the City's WPCPs from flooding and process disruptions, and also prevent upstream flooding from sewage backups into homes and streets. However, CSO discharges are untreated.

CSO events are defined as periods during which the sewer collection system exceeds its capacity and untreated combined sewage flows are discharged via outfalls to local receiving waters, e.g., the East River and the Gowanus Canal in the Red Hook WPCP service area. The impact of CSO events on local water quality is transitory at most locations. For example, given the flushing action of the East River, impacts of CSO events are less intensive, given the river's mixing capacity and the fact that sanitary flows are diluted by runoff. However, in a confined water body such as the Gowanus Canal, these impacts, which can include reduced dissolved oxygen and increased fecal coliform, are more noticeable. Because of the Gowanus Canal's confined physical structure and limited circulation, CSO discharges can cause more prolonged water quality impairments, with reduced levels of dissolved oxygen and elevated levels of coliform

bacteria. This is particularly a concern at the head of the canal, but less so near the mouth where tidal action mixing can better disperse CSO discharges. To address the concerns about water quality in the canal, DEP has reactivated a "flushing tunnel" that brings East River water into the head of the canal (see also the discussion below).

GOWANUS CANAL AND COMBINED SEWER OVERFLOWS

INTRODUCTION

The Gowanus Canal is approximately 5,600 feet long and about 100 feet wide with a water depth ranging from 4 to 16 feet. The canal watershed covers about 1,758 acres and has a population of about 108,000 people. It is primarily a residential watershed with industrial and vacant lands immediately along the canal waterfront.

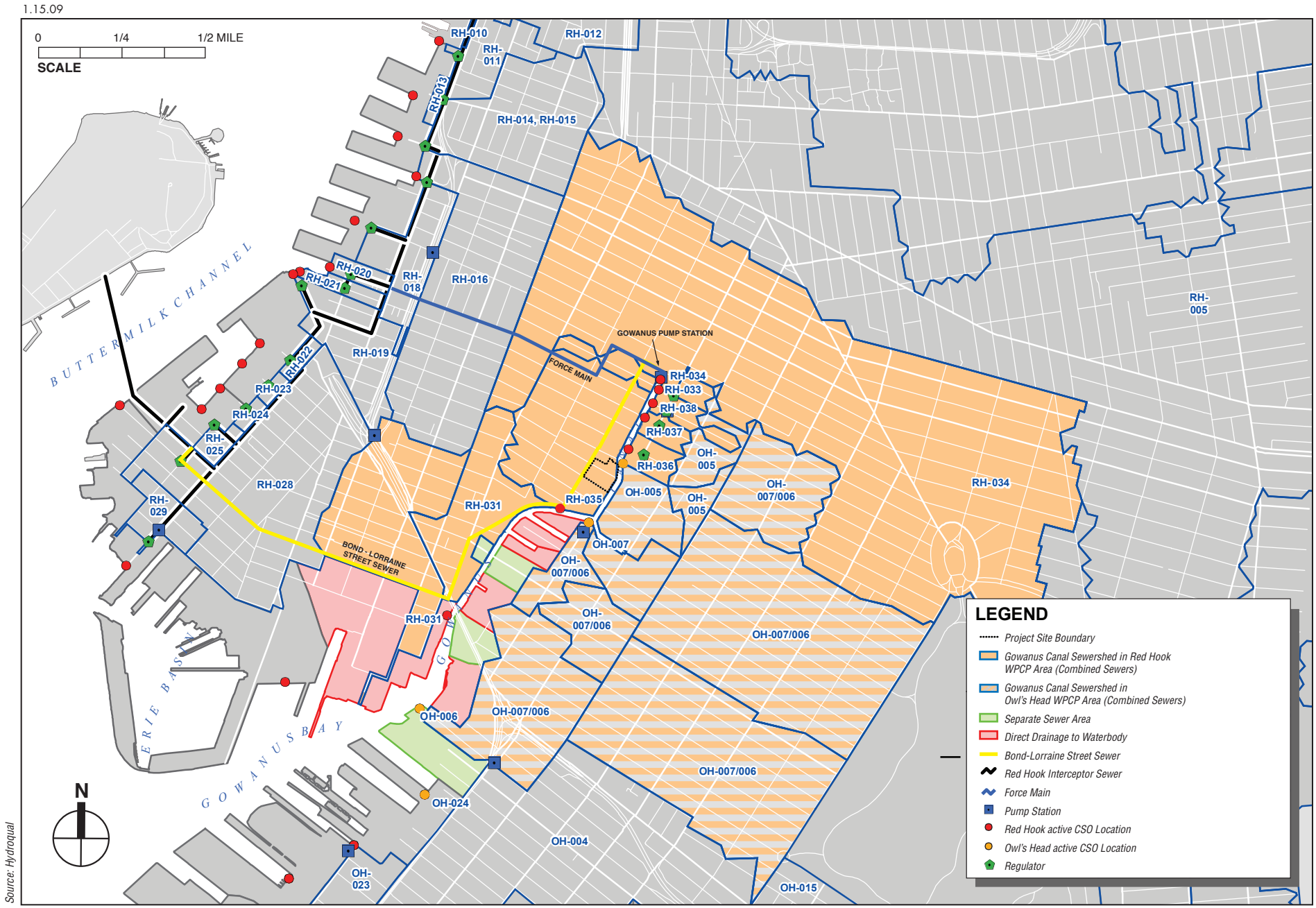
There are two WPCP drainage areas within the Gowanus Canal watershed. The majority of the flows on the west side of the canal are conveyed to the Red Hook WPCP. The majority of the flows on the east side of the canal are conveyed to the Owls Head WPCP (see Figure 13-1). The project site is on the west side of the canal, within the Red Hook WPCP. The Bond Street sewer, which is a 72-inch diameter combined sewer beneath Bond Street, currently serves the project site. The areas of Brooklyn that are served by the Red Hook WPCP include most of Downtown Brooklyn and a portion of residential Park Slope, as well as the Carroll Gardens, Brooklyn Heights, Cobble Hill, Boerum Hill, and Red Hook communities as well as the waterfront west of Gowanus Bay west of the Gowanus Canal and the East River waterfront north to the Brooklyn Navy yard. The Owl's Head WPCP is located south of the Red Hook WPCP service area, in the Sunset Park area. The areas of Brooklyn that are served by the Owls Head WPCP include most of the residential neighborhoods of Park Slope South and Sunset Park and the Sunset park industrial waterfront.

Approximately 92 percent of the Gowanus Canal's drainage basin is served by combined sewers that convey flows to either with the Red Hook or Owls Head WPCPs. Of this total about 53 percent is within the Red Hook WPCP service area and 47 percent is within the Owls Head WPCP service area. The canal's water quality is greatly influenced by wet weather conditions that lead to combined sewer overflow discharges directed into the canal. In total there are 11 active CSO outfalls that discharge to the Gowanus Canal: eight active outfalls are located within the Gowanus Canal Proper (six in the Red Hook portion and two in the Owl's Head portion of the Gowanus Canal Sewershed) and three active CSO outfalls are located in the region downstream that empties into Gowanus Bay and Upper New York Bay (one in the Red Hook portion and two in the Owl's Head portion of the Gowanus Canal Sewershed).

GOWANUS CANAL OUTFALLS AND PUMPING STATION

The Gowanus Canal outfalls located in the Red Hook WPCP service area (on the west side of the canal) are identified as RH-031, RH-033, RH-034, RH-035, RH-036, RH-037, and RH-038 There are four CSO outfalls on the east side of the canal that are within the Owls Head WPCP service area, including OH-005, OH-006, OH-007, and OH-024 (see Figure 13-2).

As described above, the project site is on the west side of the canal, within the Red Hook WPCP. The combined sewer discharge point RH-035 is located immediately south (downstream) of the project site at about 4th Street, Bond Street and the canal. It is one of the larger CSO discharge points on the canal as it handles the large (72-inch) Bond Street sewer.



Gowanus Canal Sewershed Detail

Figure 13-2

The area to the north and upgradient of the project site flows to the Gowanus Pump Station, which is located at the head of the canal. The Gowanus Canal Pump Station is shown on Figure 13-2 as RH-034. This pumping station is designed to convey wastewater flows through a force main directly to the Red Hook WPCP interceptor, which, in turn, conveys flow to the Red Hook WPCP. However, this force main is currently not operational, although improvements are proposed (see the 'Future Without the Proposed Project, below). Therefore, currently, and until the year 2013 (see the discussion below under the "Future Without the Proposed Project") the Gowanus Pump Station discharges to the Bond Street sewer which heads south (paralleling the canal) past the project site and then connects to the Lorraine Street sewer which heads west to the Columbia Street interceptor. The interceptor conveys flows to the Red Hook WPCP. The Gowanus Pump Station's conveyance capacity is determined by the design capacity of the mechanical pumps to lift wastewater from the influent well. The pump station currently has the capacity to divert up to 28.5 mgd into the Bond Street sewer.

As a result of both CSO events and stormwater runoff, annual wet weather discharges to the canal amount to an estimated 473 million gallons (mg), of which 80 percent comes from CSO discharges and 20 percent comes from separate stormwater runoff. It is estimated that CSO discharges total 377 mg annually to the canal (80 percent of its wet weather inflow). Stormwater outfalls contribute the balance with an estimated 74 million gallons mg of flow per year, or roughly 16 percent of the total wet-weather discharge volume. Uncollected runoff that flows directly into the canal at street ends and other locations comprises the balance or 4 percent. Table 13-2 presents data on the annual CSO discharges to the canal. The maximum number of CSO events (75) at any one CSO location occurs at the outlet at Bond Street and the canal (RH-035). As shown in the table, RH-034 at the head of the canal has the second greatest number of CSO events (56) followed by OH-007 on the east side of the canal (47).

Table 13-2
Annual CSO Discharge to Gowanus Canal: Baseline Conditions

CSO Outfall	Volume (mg)	Events (annual)
RH-034 (Gowanus Pumping Station)	121.1	56
RH-033	0.2	14
RH-038	0.9	18
RH-037	0.5	16
RH-036	1.6	21
OH-005	0.7	5
OH-007	69.4	47
RH-035	111.3	75
RH-031	35.3	33
OH-006	12.6	33
OH-024	23.4	35
Total	**377**	

Source: Gowanus Canal Waterbody/Watershed Facility Plan (Draft), DEP, September 2007

Heavy organic material and grit carried through combined sewers during wet weather events settle out soon after being discharged to the canal, since water velocities in the canal are insufficient to keep these material suspended. At the head of the canal, this situation has over time created a sediment mound that is exposed at low tide. Moreover, historical pollutant loadings residing in the canal sediments, combined with current pollutant loading, lack of

inflow, and the canal's narrow configuration with a water exchange dependent on limited tidal flushing, significantly impairs the water quality of the canal. To improve these conditions within the canal, a flushing tunnel was constructed that connected the head of the canal to Buttermilk Channel on the East River. A propeller in the tunnel induces flow from Buttermilk Channel to the canal. This tunnel started operating in 1911, was shut down in the 1960's and was reactivated in 1999.

The Gowanus Canal is identified on New York State's Draft 2008 Section 303(d) list of impaired waters (DEC 2008). The 303(d) list identifies waters that do not support designated uses. This list requires development of a Total Maximum Daily Load (TMDL) for pollutants or other restoration strategies to reduce the input of the specific pollutant(s) that restrict water body uses and to restore and protect such uses. The Gowanus Canal requires TMDL development for DO levels and DO demand that have originated from CSO and urban and stormwater sources. Although the Final 2008 Section 303 (d) list has the Gowanus Canal as requiring TMDL measures, DEC has deferred the development of separate TMDLs for CSO-impacted waterbodies, including the canal, due to a 2005 CSO Consent Order signed by DEC and the City of New York (DEC 2008).

The 2005 Consent Order directs the City to develop and implement watershed and facility plans to address CSO discharges and bring waters into compliance with the CWA (DEP 2007a). In September 2007, DEP submitted the *Gowanus Canal Waterbody/Watershed Facility Plan (Draft)* to DEC for review and approval. As of July 2008, DEC's approval of DEP's draft plan is pending. The purpose of the watershed plan is to take a first step in the development of a Long Term Control Plan for the canal for the purposes of attaining water quality standards. Among the objectives are to improve dissolved oxygen concentrations, eliminate odors, and greatly reduce floatables, with the overall objective of meeting the designated water quality standards for the canal which are SD, with a designated use for fishing, and fish survival and to also support a possible upgrade of the canal to secondary contact recreation. The source of the odors is largely a CSO sediment mound at the head of the canal that becomes exposed at low tide (north of Sackett Street) and low levels of dissolved oxygen on the canal.

The Gowanus Canal Waterbody/Watershed Facility Plan (Draft) includes a number of measures to achieve water quality standards for the canal: rehabilitation of the Gowanus Canal Flushing Tunnel to increase its average capacity by 40 percent to 215 million gallons per day (MGD); reconstruction of the Gowanus Pump Station to reduce the annual volume of CSO discharges by 34 percent with a 90 percent reduction in CSO discharges at RH-035 (e.g., a reduction in CSO from 111.3 mg annual total discharge to 3.4 mg); implementation of floatables controls at 2 CSO locations; and dredging the upper 750 feet of the Gowanus Canal to eliminate exposed sediment mounds. Several of these measures, including the rehabilitation of the Flushing tunnel and pumping station upgrade were identified in prior DEP facility plans; preliminary designs commenced in 2004. With these measures in place, DO levels in the canal are expected to meet state standards for Use Class SD waters. For floatables, the plan would complement the City-Wide Comprehensive CSO Floatables Plan, by providing additional floatables controls at two major CSOs representing 78 percent of the CSO discharges. The elements of the plan would be implemented by December 2013 (DEP 2007a), two years after the proposed project's build year. With the proposed improvements in place it is expected that the Gowanus Canal will meet its SD standards over the entire length of the canal (see also the discussion below under the "Future Without the Proposed Project").

STORMWATER

OVERVIEW

Stormwater runoff is generated by rainwater that collects on the surfaces of land or built structures. The volume of runoff generated by these surfaces varies depending upon the type of land cover, which can be pervious (soil or landscaped surfaces that allow more percolation to the ground below, generating less runoff) or impervious (surfaces such as roads and buildings that impede percolation and generate greater runoff). For example, runoff from a suburban yard will percolate into the ground with less runoff to a local street. The runoff coefficient from this type of land surface is typically about 0.20 (20 percent runoff). In contrast, a building roof has no percolation and, therefore, has a runoff coefficient of 1.00 (100 percent runoff). Paved areas (e.g., streets and sidewalks) primarily generate runoff, with some percolation to the ground below (a runoff coefficient of 0.85).

CURRENT RUNOFF PATTERNS (PROJECT SITE)

Most of the project site is currently covered with impervious surfaces, of which roughly 32 percent is collected by roof drains and conveyed to the combined sewer system (see Figure 13-2). The remainder of the project site ponds on the ground surface and then the majority drains via overland flow to the Gowanus Canal. The existing project site features 1.64 acres of impervious roof area, of which 1.09 acres currently drains to the Bond Street combined sewer, and 0.55 acres drains to the land surface and subsequently into the Gowanus Canal. In addition, the project site currently has another 1.53 acres of impervious surfaces, of which 0.79 acres are streets and 0.55 acres are sidewalks, and the remaining 0.18 acres are other paved areas such as driveways and parking lots. The remaining 1.53 acres are non-paved areas such as gravel, dirt parking surfaces, and areas vegetated by invasive plants. Therefore, as a result of the site topography which slopes to the east, with the exception of the roof area that drains to the combined sewer, all runoff generated on the site and streets is discharged to the Gowanus Canal.

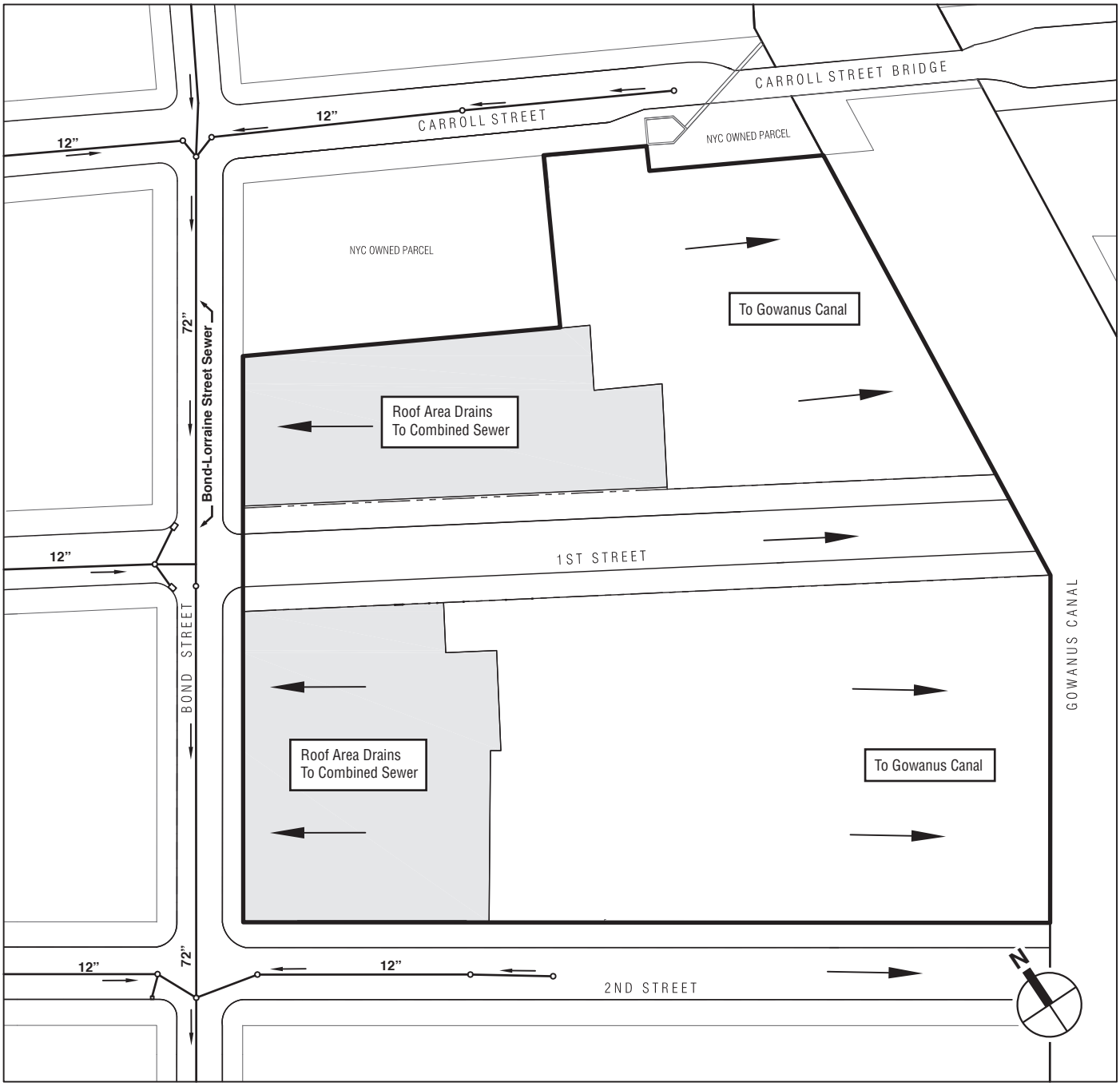
The current stormwater flows at the project site were estimated based on DEP Design Guidelines which refer to the Rational Formula for calculating runoff, which is:

$$Q = C \times I \times A$$

where,

Q is runoff in cfs,
C is the runoff coefficient (1.0 for roof surfaces),
I is the rainfall intensity (5.95 inches per hour; based on 6 minute time of concentration for the 5-year storm), and
A is the area in acres (1.09 acres that currently drains to the combined sewer).

Based on these inputs, approximately 6.48 cfs (using DEP design storm of 5.95 in/hr) is comprised of roof runoff from existing buildings on the project site that currently drain to the combined sewer (see Figure 13-3).



Project Site Boundary

12" *Existing Combined Sewer/ Diameter in Inches*

Existing Manhole

Existing Catch Basin

Direction of Sewer Flow

Direction of Existing Stormwater Drainage Flow

Existing Stormwater Drainage Area to Combined Sewer in Bond Street

Existing Stormwater Flow Pattern
(Approximately One-Third of Project Site Area Drains to Combined Sewer)

363-365 BOND STREET

Figure 13-3

FLOODPLAINS

REGULATIONS

The City of New York has flood plain maps that have been prepared by the Federal Emergency Management Agency (FEMA) and the City has implemented regulations that locally implement flood protection measures. Thus, the City's Building Code contains required flood protection for all construction in flood hazard areas. Any new development in the coastal zone is subject to zoning and other applicable controls on building construction, height, and bulk in order to minimize the potential for damage caused by flooding and erosion. This includes, as applicable, development procedures that meet FEMA's floodplain regulations (44 CFR 60.3), which includes the following:

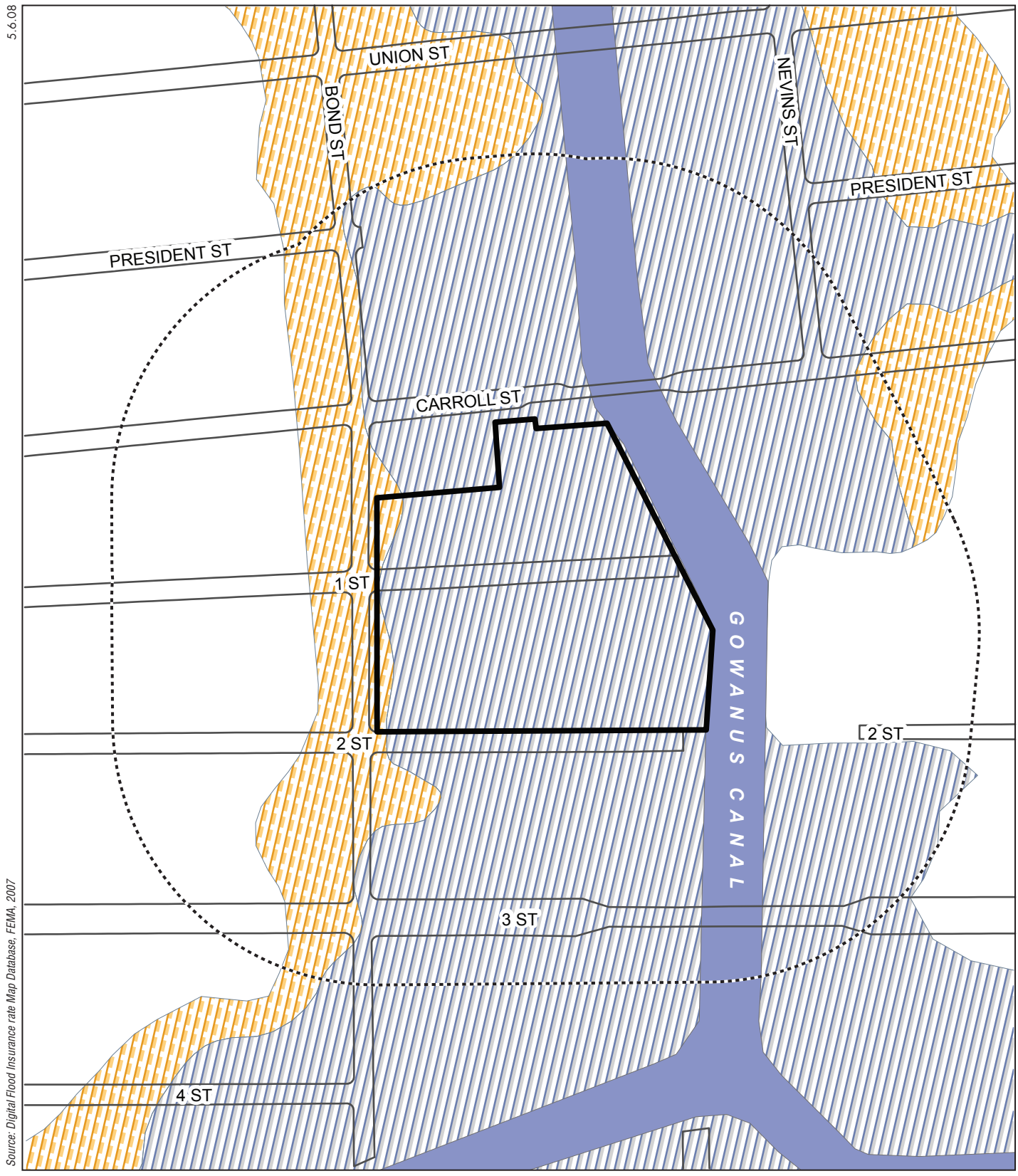
> If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, (ii) be constructed with materials resistant to flood damage, (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

FLOODPLAINS ON THE PROJECT SITE

The project site is located approximately 10 feet above mean sea level. The property is relatively flat but slopes downwards about 5 feet in a southeasterly direction towards the Gowanus Canal. Figure 13-4a presents the 100-year floodplain (area with a 1 percent chance of flooding each year) and 500-year floodplain (area with a 0.2 percent chance of flooding each year) boundaries at the project site and Figure 13-4b presents the floodplain for the canal as a whole and the Gowanus Bay area.

New York City is affected by local street flooding (e.g., flooding of upland streets due to short-term, high-intensity rain events in areas with poor drainage), fluvial flooding (e.g., rivers and streams overflowing their banks), and coastal flooding (e.g., long and short tidal rises and wave surges that affect the shores of the Atlantic Ocean, bays such as Upper New York Bay and Gowanus Bay, and tidally influenced rivers, streams and inlets [FEMA 2007]). The Gowanus Canal waterfront is affected in two of these events: local street flooding and coastal flooding due to rising tides (without wave action).

The FEMA mapped floodplain across the project site is affected by coastal tidal flooding, which is influenced by astronomic tide and meteorological forces (e.g., northeasters and hurricanes [FEMA 2007]). As shown in Figures 13-4a and 13-4b, much of the project site is within the 100-year floodplain (and a small portion of the western boundary of the project site is within the 500-year floodplain). The project site is part of the larger tidal floodplain along the Gowanus Canal which floods in tidal conditions and when waters in the canal rise as a result of tidal increases in Gowanus Bay (and New York Harbor). The portion of the Gowanus Canal 100-year flood zone north of the Hamilton Avenue Bridge encompasses about 893,000 cubic yards tidal floodplain.



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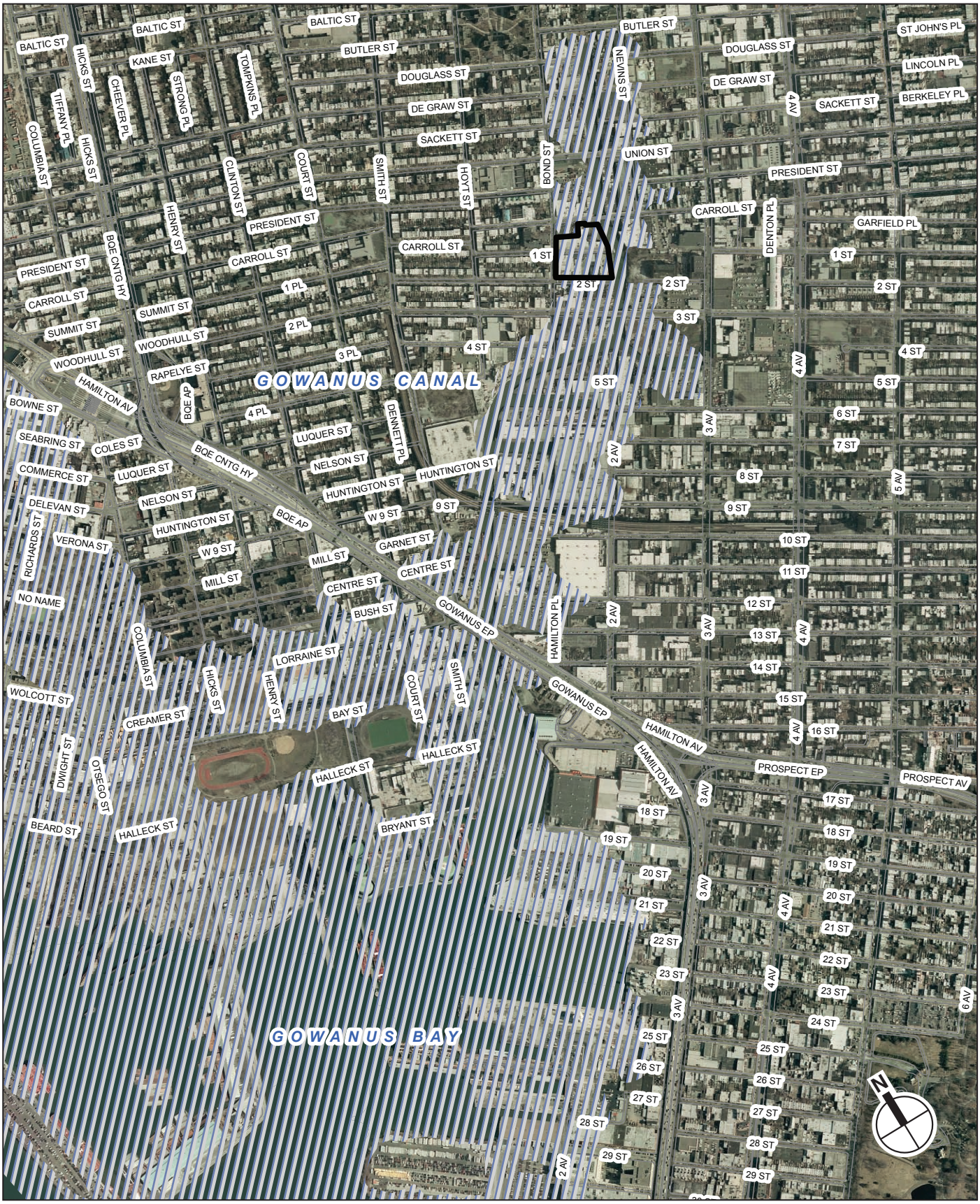
FEMA Flood Hazard Areas

Figure 13-4a



Project Sites

1% Annual Chance of Flooding (100-Year Flood Zone)

FEMA Flood Hazard Areas

Figure 13-4b

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D. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, it is assumed that the existing limited use of the project site would continue. As stated above, the infrastructure demands from these operations are minor. In addition, no significant changes in the flows to the Red Hook WPCP are expected by 2011.

As stated above, the Gowanus Canal is identified on New York State's Draft 2008 Section 303(d) list of impaired waters (DEC 2008). To address this issue, the Gowanus Canal Waterbody/Watershed Facility Plan (Draft) includes the following measures proposed to be completed in 2013:

- *Rehabilitation of the Gowanus Canal Flushing Tunnel*—This rehabilitation will increase the tunnel's average capacity from 154 mgd to 215 mgd, enhancing circulation and introducing water from the Upper Harbor of New York Bay to the head of the Gowanus Canal.
- *Reconstruction of the Gowanus Pump Station*—This reconstruction would result in the expansion of the capacity of the Gowanus Pump Station through the installation of four new pumps. An element of this measure would also include the replacement of the force main that currently runs along the inside of the Flushing Tunnel. Because the current force main is not operational, flow is being diverted to the Bond-Lorraine Sewer. The new force main would pump flow directly to the Columbia Street Interceptor, and eventually to the Red Hook WPCP (flow would no longer be re-routed to the Bond-Lorraine Sewer, thereby relieving some of the capacity of the sewer and reducing the potential for CSO discharges into the canal). The reconstruction of the Pump Station and replacement of the force main is projected to reduce the annual volume of CSO discharges to the canal by 34 percent;
- *Floatables Controls*—This measure would involve the implementation of floatables controls at two CSO locations. Period skimming would also be implemented.
- *Dredging*—Dredging the upper 750 feet of the Gowanus Canal will eliminate exposed sediment mounds.

With these measures in place, DO criteria are projected to meet state standards for Use Class SD waters 100 percent of the time. Furthermore, upgrades to the Gowanus Canal Flushing Tunnel would increase flushing rates by approximately 40 percent. For floatables, the plan would complement the City-Wide Comprehensive CSO Floatables Plan, by providing additional floatables controls at two major CSOs representing 78 percent of the CSO discharges. The elements of the plan would be implemented by December 2013 (DEP 2007a), two years after the proposed project build year. [1] With these measures in place, there would be an improvement to water quality that could support a secondary contact recreation standard (DEP 2007a, page ES-1).

The above described DEP capital project is expected to be completed in 2013. Table 13-3 below presents the net benefits of these proposed improvements. As shown in the table, with the implementation of the Gowanus Canal Waterbody/Watershed Facility Plan (Draft), the volume and number of CSO events occurring at the RH-035 and RH-031 outfalls would be considerably reduced. RH-035 would experience a decrease in annual CSO volume of approximately 108 mg, with 63 less CSO events a year. The CSO volume at RH-031 would be reduced by approximately 25 mg annually, and the number of CSO events at that outfall would decrease by approximately 16. RH-034, at the head of the canal, would also experience a decrease of about 21 CSO events. A modeling analysis of future No Build conditions relative to local infrastructure conditions in both 2011 and 2013 is provided in Appendix C, "Infrastructure and Water Quality Modeling."

[1] Dredging is contingent on the issuance of permits by DEC.

Table 13-3
Annual CSO Discharge (mg) to Gowanus Canal and Adjacent Waterbodies With Proposed Improvement Project

CSO Outfall	Baseline Volume (mg)	Baseline No. of Events	Volume with Gowanus Plan (mg)	No. of Events with Gowanus Plan	Change in Volume with Gowanus Plan (mg)	Change in No. of Events with Gowanus Plan
RH-034	121.1	56	127.0	35	5.8	-21
RH-033	0.2	14	0.2	14	0.0	0
RH-038	0.9	18	1.0	15	0.1	-3
RH-037	0.5	16	0.5	16	0.0	0
RH-036	1.6	21	1.6	20	0.0	-1
OH-005	0.7	5	0.7	5	0.0	0
OH-007	69.4	47	69.4	47	0.0	0
RH-035	111.3	75	3.4	12	-108.0	-63
RH-031	35.3	33	10.6	17	-24.7	-16
OH-006	12.6	33	12.6	33	0.0	0
OH-024	23.4	35	23.5	35	0.1	0
Total	**377**		**250**		**-127**	

Sources: Gowanus Canal Waterbody/Watershed Facility Plan (Draft), DEP, September 2007

E. PROBABLE IMPACTS OF THE PROPOSED PROJECT

WATER SUPPLY

In the future with the proposed project rezoning, it is estimated that there would be a project potable water demand of approximately 114,032 gallons per day (gpd). This demand is based on a residential rate of 112 gpd per person, and a commercial and community facility rate of 0.17 gpd per square foot (see Table 13-4). This is a negligible demand for the City's water services and mains. Water mains already existing in all adjacent streets are available for direct connection to the proposed project and projected development. The proposed project would also comply with all water conservation measures as mandated by local law.

Table 13-4
Projected Water Consumption

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential	1,006 (persons)	NA	112 gpd/ person	112,672
Commercial	NA	2000	0.17 gpd/sf	680
Community Facility	NA	2000	0.17 gpd/sf	680
TOTAL	**NA**	**NA**	**NA**	**114,032**

Sources: Rates from *CEQR Technical Manual, 2001.*

While this new demand represents an increase from the future without the proposed project condition, the incremental demand for water is not expected to place enough of a load on the water supply system to necessitate any upgrades to the existing supply system. In addition, local water pressure is not expected to be significantly affected. As set forth in the *CEQR Technical Manual,* the changes in demand are unlikely to affect the water overall consumption rate and

water pressure and would therefore not result in any significant adverse impacts on the water supply.

Moreover, project-specific calculations developed by the applicant have disclosed that with the use of low flow fixtures the actual water demand rate would be much less than that projected under the *CEQR Technical Manual*. As shown below in Table 13-5, with the use of low-flow fixtures (e.g., low-flow toilets, shower heads, lavatory and kitchen faucets, and low water consumption dish washers and washing machines), the proposed project's water demand would be approximately 56,200 gpd (derived from manufacturer's data), about half of the water demand rates used in this conservative impact analysis using CEQR rates.

Table 13-5
Projected Water Consumption: Project-Specific Calculation

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential	1,006 (persons)	NA	54.51 gpd/ person	54,837
Retail*	NA	2000	0.17 gpd/sf	680
Community Facility*	NA	2000	0.17 gpd/sf	680
TOTAL	NA	NA	NA	**56,197**

Notes:
* Rates from *CEQR Technical Manual, 2001.*
Residential rates developed by Ettinger Engineering Associates for project units based on low-flow fixtures.

SANITARY SEWAGE

DRY WEATHER FLOWS

As with most urban projects, the rates of generated sanitary sewage are generally equivalent to consumed water. Based on this assumption, the proposed project and projected development would discharge about 114,032 gpd or 0.18 cfs of sanitary flow to the Red Hook WPCP (see Table 13-4). This is the equivalent of about 0.4 percent of the current sewage handled by the WPCP. In addition, since the existing flows to the Red Hook WPCP are approximately half of the capacity, and no significant changes in these conditions are expected by 2011, the proposed project would not exacerbate the treatment efficiencies of the plant or cause the plant to not properly treat wastewater prior to discharge to the East River.

In addition, as stated above, project-specific calculations developed by the applicant have disclosed that with the use of low flow fixtures the actual rate of sanitary wastewater generation would be about half of that projected using this conservative impact based on CEQR rates.

STORMWATER

STORMWATER FLOWS WITH THE PROPOSED PROJECT

To protect water quality and reduce stormwater flow contribution to the combined sewer system, new storm sewers would be constructed beneath 1st and 2nd Streets to serve the stormwater needs of the project site and adjacent streets. With the proposed project, no stormwater from the project site would be discharged to the combined sewer system (see Figure 13-5). In addition, some existing paved surfaces and structures would be replaced with landscaped open space and

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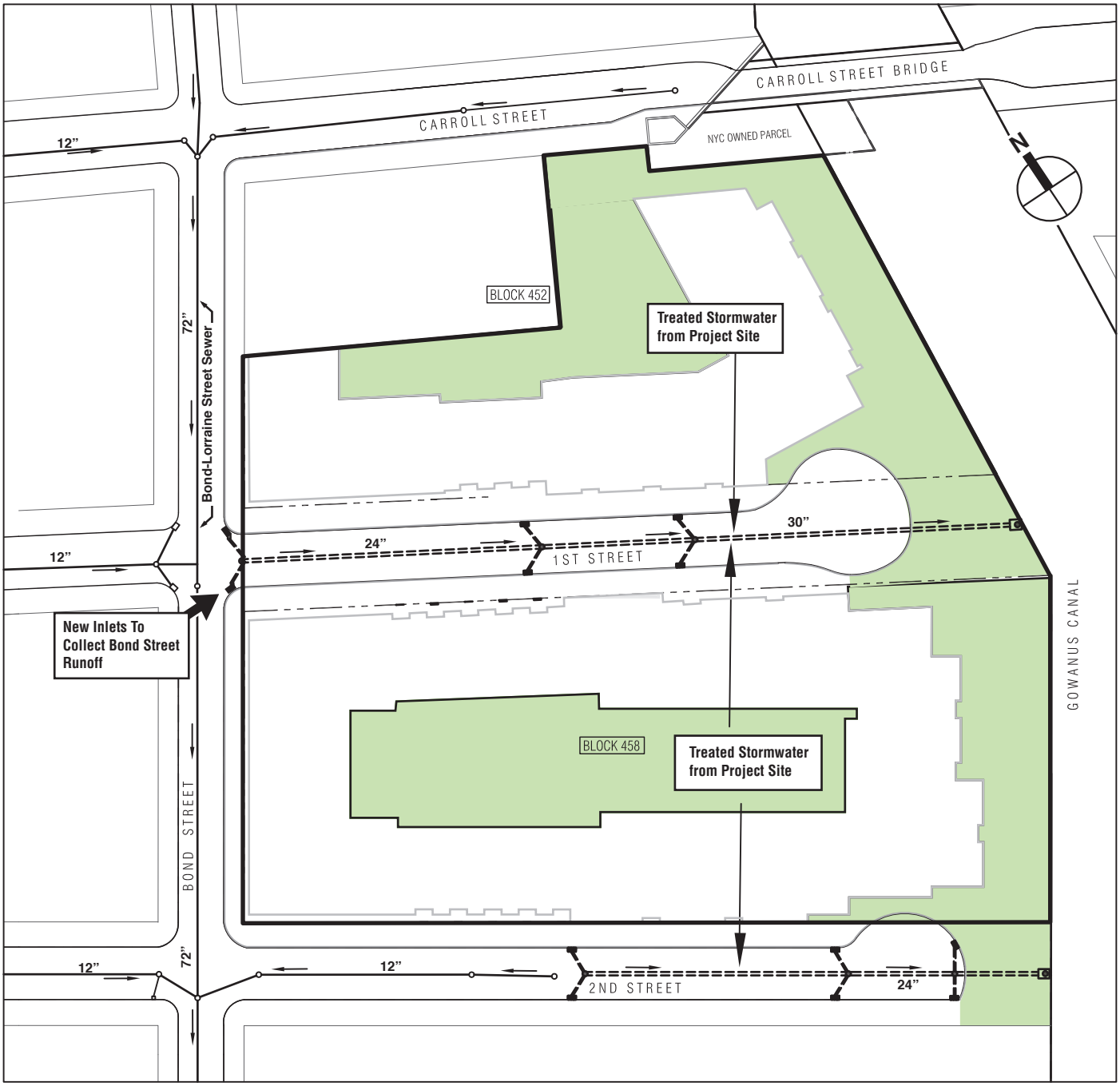

NOTE: FIGURE FOR ILLUSTRATIVE PURPOSES ONLY.

NOT TO SCALE

- *Project Site Boundary*
- 12" *Existing Combined Sewer/ Diameter in Inches*
- *Existing Manhole*
- *Existing Catch Basin*
- 24" *Proposed Storm Sewer/ Diameter in Inches*
- *New Storm Building Lateral Connection*
- *Waterfront Open Space or Landscaped Area*
- *Proposed Manhole*
- *Proposed Catch Basin*
- *Direction of Sewer Flow*
- *Direction of Proposed Stormwater Drainage Flow*

Proposed Stormwater Flow Pattern
(No Proposed Storm Sewer Connections to Combined Sewer)

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Figure 13-5

a landscaped waterfront area that would allow for infiltration and water quality treatment. The degree of infiltration would be dependent on site-specific subsurface conditions such as soil type and permeability. Table 13-6 provides a characterization of the project site with the proposed project in comparison to existing conditions.

Table 13-6
Project Site Characteristics

Area Type[1]	Existing Site Area (acres)	Proposed Site Area (acres)
Roof area to combined sewer	1.09	0.00
Roof area draining to the canal	0.55	1.93
Sidewalks	0.55	0.47
Streets	0.79	0.78
Other paved areas[2]	0.19	0.40
Non-paved areas[3]	1.53	1.12

Notes:
[1]Except as noted above, all areas drain directly to the Gowanus Canal via overland flow or storm sewers.
[2]For existing conditions, includes driveways and parking areas; for proposed condition, includes paved walking paths.
[3]For existing conditions, includes gravel, dirt, vegetated areas; for proposed condition, includes landscaped areas and planters.

STORMWATER TREATMENT

The proposed storm sewers on both 1st and 2nd Streets would convey stormwater directly into the Gowanus Canal through two new outfalls (one at the end of 1st Street and one at the end of 2nd Street). As stated above, both new outfalls would require a DEC and ACOE permit. Stormwater pollutant loads from the project site would be reduced in the proposed project condition due to the conversion of industrial uses and existing paved surfaces to residential uses and proposed landscaped areas, the latter of which would also reduce the amount of total runoff from the project site. Based on DEC's Reducing the Impacts of Stormwater Runoff from New Development Guidelines, this would result a reduction of approximately 21 percent of the existing biochemical oxygen demand (BOD), 44 percent of the existing total phosphorus, 47 percent of the existing total nitrogen, and 38 percent of total suspended solids (TSS) into the Gowanus Canal, prior to the discharge into the canal.

In addition, stormwater from the project site would also undergo treatment through the use of best management practices (BMPs) that would further reduce these suspended solid pollutant loads. As part of the design of the proposed project, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared, in accordance with the DEC SPDES General Permit for Storm Water Discharges from Construction Activity (GP-0-08-001). DEP will also review the SWPPP measures for consistency with DEP requirements. The SWPPP would include BMPs (as discussed below) to be implemented on-site during and after construction to assist in erosion and sediment control and stormwater treatment, that would achieve sufficient performance of the DEC water quality requirements for stormwater discharge to the Gowanus Canal.

Hydrodynamic devices, which separate oils, grease, solids, particulates, and other pollutants from the stormwater would be installed to treat stormwater from both project blocks. These devices would be located on-site prior to discharge to the storm sewer and the Gowanus Canal, and would be sized accordingly to meet the DEC standards for water quality based on the

SPDES General Permit for Stormwater Discharges from Construction Activity requirements. A diversion chamber or flow splitter located within the hydrodynamic device would treat the required water quality volume and bypass larger flows, consistent with DEC requirements.

Another BMP that would be utilized would be infiltration in the waterfront landscaped areas, which would reduce stormwater runoff volumes and peak flows, improve water quality, and promote groundwater recharge. Infiltration practices temporarily store stormwater and enable slow percolation into the underlying soil, physically filtering runoff in the process and enabling soil particles to absorb and biodegrade pollutants. In addition a planted roof system would be in place in both interior courtyard areas on Blocks 452 and 458. With this planted roof system, stormwater would infiltrate through soils and/or the underlying gravel layer which would be effective at reducing runoff volume, filtering metals, sediments, nutrients, bacteria, organics, oxygen demanding substances. There would also be evapotranspiration through plant uptake.

Stormwater runoff on both First Street and Second Street sidewalks would also be partially treated by means of infiltration and filtering through the proposed vegetative strips on both sides of the street. Due to limitations on the types of BMPs that can be installed within the City public right-of-way, stormwater runoff collected in the roadways cannot be treated with the hydrodynamic devices, but would be treated on both First Street and Second Street by Type II Catch Basins with 4-feet deep sumps and hoods. The sumps allow solids to settle out from the stormwater, and the hoods prevent floatables from entering the storm sewer.

While the proposed project would result in a reduction in stomwater pollutant loadings through BMPs and the change in land use as described above, the water quality modeling summarized below conservatively assumed no change in stormwater runoff pollutant concentrations in the analysis of future water quality conditions in the canal.

COMBINED SEWER OVERFLOWS (CSO) AND WATER QUALITY ANALYSIS

CHANGES IN COMBINED FLOW WITH THE PROPOSED PROJECT

Sanitary flow from the proposed project would be conveyed to Bond Street combined sewers which is a 72-inch diameter combined sewer that flows south in Bond Street, then west in Lorraine Street to the interceptor sewer beneath Columbia Street and ultimately to the Red Hook WPCP.

The full-flow design capacity of the existing 72-inch diameter combined sewer in Bond Street fronting the site is approximately 141 cfs. In the existing condition, a very low sanitary flow from on-site users is discharged to the combined sewer system from the project site. With the proposed project, based on the sanitary flow calculations derived from the *CEQR Technical Manual*, approximately 0.18 cfs would discharge to the combined sewer system, accounting for approximately 0.13 percent (or thirteen-hundredths of one percent) of this sewer's estimated capacity.

To redirect current stormwater runoff contribution away from the combined sewer system, two new storm sewers would be constructed for the proposed project. The new storm sewers in 1st Street and 2nd Street would collect and treat stormwater and then outlet into the Gowanus Canal. With these sewer improvements, approximately one-third of the site's current stormwater runoff would be removed from the combined sewer system and no stormwater runoff from the project site would be discharged to the combined sewer system.

As discussed above, approximately 6.48 cfs (using the current DEP design storm of 5.95 in/hr) is roof runoff from existing buildings that currently drains to the combined sewer in Bond Street. With the proposed project, this 6.48 cfs would be re-directed from the combined sewer system to the proposed separate storm system, in effect eliminating storm flows from the site to the combined sewer system. Under the design storm, this would result in a net flow reduction of 6.30 cfs which more than offsets the increase of 0.18 cfs of daily average sanitary flow (see Table 13-7). Though the increased sanitary flows would be relatively constant, the reduced stormwater inflows would occur only during wet weather and would vary depending upon the amount of runoff. Since more runoff is generated during larger storms, the greatest benefit would occur during the largest storms, with lesser benefits occurring during smaller storms. Whether the project represents a net burden or a net benefit to sewer capacity and CSOs depends both on the amount of additional sanitary flow and the size of the storms that are experienced.

Table 13-7
Comparison of Existing and Proposed Flows to the Combined Sewer System Rainfall Intensity of 5.95 in/hr (5-year storm)

	Existing Conditions	No Build Conditions	Build Conditions	Net change
Sanitary Flow to Combined Sewers (cfs)	0.00	0.00	0.18	+0.18
Stormwater Flow to Combined Sewer (cfs)	6.48	6.48	0.00	-6.48
Total Flow to Combined Sewer System (cfs)	6.48	6.48	0.18	-6.30

Notes: Net Reduction of Total Flow to Combined Sewer System (5-yr storm) = 6.30 cfs (based on DEP design storm intensity of 5.95 in/hr)
Sources: AKRF, April 2008

CSO ANALYSIS

A modeling analysis was performed to assess the potential impacts of the proposed project on the local infrastructure systems. The analysis assessed conditions within the Red Hook WPCP service area that would be potentially affected by the proposed project, with a focus on the CSO system that drains to the Gowanus Canal. The modeling examined potential impacts from the proposed project with respect to CSOs under two conditions; using CEQR-based sanitary flow rates, and using project-specific sanitary flow rates. Both of these conditions were analyzed for the year 2011 (the Build condition) and for informative purposes, 2013 (the year in which DEP proposes to complete significant infrastructure improvements at the headwaters of the Gowanus Canal including upgrading the systems at the Gowanus Pump Station and force main and the Gowanus flushing tunnel) The detailed results of the modeling are provided in Appendix C, "Infrastructure and Water Quality Modeling."

The modeling disclosed that in 2011, using the CEQR-specified per-capita sanitary sewage rates, the proposed project would result in a limited annual increase in the volume of CSO discharged to the canal. The number of annual CSO events in the canal does not increase relative to the 2011 No Build condition (73 events), although the total annual CSO volume discharged to the canal does increase by 0.8 MG/yr (0.2 percent of the total CSO discharge to the canal). Virtually all of the increase occurs at outfall RH-035, with the remainder at outfall RH-031.

Using project-specific sanitary flow rates (which incorporates proposed design features such as low-flow fixtures), the proposed project would result in a slight reduction in CSOs to the Gowanus Canal compared with the 2011 No Build Condition (less than 0.1 MG/yr). Virtually all of this difference would be realized at two CSO outfalls: RH-035 (a relief point from the Bond Street sewer located just downstream of the project area) and RH-031 (the next-downstream relief point along the Bond Street sewer). The number of CSO events at RH-031 is projected to decrease from 25 per year to 24 per year with the proposed project. The number of events at RH-035 would remain the same.

It is anticipated that the effects of the proposed project on CSO discharges and water quality would be difficult to detect since the calculated impacts are small, particularly compared to the ranges of discharged flows and concentrations that are currently experienced in the canal. The project is expected to marginally reduce CSO discharges and pollutant loads to the canal during larger storm events, but to marginally increase discharges and loads during smaller events. The overall effect would depend on the size and intensity of the individual storm events that occur. Given an annual rainfall pattern associated with a typical year, with average CSO hydraulics, the analyses conducted indicated that CSO volumes would increase by only about 0.2 percent from the existing level during the interim period prior to the completion of the Gowanus Facilities Upgrade project. However, accounting for water conservation measures that would be implemented as part of the project, the project would be expected to slightly reduce CSO discharges to the canal. Regardless of the method used to estimate the project dry-weather sanitary sewage contributions, the modeling analysis indicated that the proposed project would slightly reduce CSO volumes to the Canal upon completion of the Gowanus Facilities Upgrade project relative to the No Build condition.

WATER QUALITY ANALYSIS

As described in greater detail in Appendix C and summarized in Chapter 11, "Natural Resources," the proposed project would not result in significant adverse impacts on the water quality of the Gowanus Canal under any of the analyzed scenarios. This includes no adverse impacts on key water quality parameters, such as concentrations of dissolved oxygen, and pathogens.

PROPOSED PROJECT RELATED CSO AND WATER QUALITY MODELING CONCLUSIONS

Based on the modeling, the following conclusions can be made relative to the potential impacts of the proposed project on local infrastructure (see Appendix C):

- The proposed project would not result in any increase in the number of annual CSO events that are projected to occur in the canal in 2011 (73 total events).
- The proposed project would not result in any increase in the number of CSO events that are projected to occur in the canal in 2013 with the proposed Gowanus Pump Station improvements in place (33 total events).
- In 2011, assuming the *CEQR Technical Manual* sanitary flow rate calculations for the proposed project, there would be a very limited projected increase in CSO volume to the canal (over the 2011 No Build condition) of approximately 0.8 MG/yr (or 0.2 percent of the total CSO discharge to the canal).

- In 2011, assuming the project-specific sanitary flow rates (which incorporates actual design features such as low-flow fixtures), there is a limited projected decrease in CSO volume to the canal over the course of the year, of approximately 100,000 gallons annually.
- In 2013 (with the proposed Gowanus Pump Station and Gowanus Flushing Tunnel upgrades in place), assuming the *CEQR Technical Manual* sanitary flow rate calculations for the proposed project, the proposed project would result in a projected decrease in CSO volumes of 0.1 MG discharged to the canal over the course of the year.
- In 2013 (with the Gowanus Pump Station and Gowanus Flushing Tunnel upgrades in place), assuming the project-specific sanitary flow rates, there would be a reduction in CSO volumes of 0.1 MG discharged to the canal over the course of the year.
- In no scenario would the proposed project result in any water quality impacts on the Gowanus Canal for principal water quality parameters such as dissolved oxygen and pathogens (see Appendix C and Chapter 10, 'Natural Resources").

In addition, the proposed storm sewer improvements would be designed and constructed in accordance with DEP guidelines and requirements for private sewer construction to redirect stormwater runoff away from the combined sewer system. Per DEC requirements, the stormwater flow would be treated for removal of pollutants such as floatables and sediments.

Thus, the proposed project would have, as described above, no significant adverse impact on CSO flow, the number of CSO events or the duration of CSO events in the downstream combined sewer system. In addition, with the conversion of the site's land use and treatment of the proposed project's stormwater runoff, a reduction in pollutant loadings from the project site to the Gowanus Canal would occur (see the discussion above). Lastly, shortly after completion of the proposed project, the City's proposed improvements of the DEP Gowanus Pump Station, which include reconstruction of the force main, would substantially reduce CSO events in the canal, and improvements to the flushing tunnel further improve flushing and water quality in the Gowanus Canal.

FLOODPLAINS

As noted above, the project site is located within the 100-year floodplain. Consistent with this policy, all buildings on the project site would comply with both FEMA and New York City Building Code requirements regulating construction within flood hazard areas. This includes a first floor elevation of the proposed buildings approximately one foot above the flood elevation.

In order to ensure that project structures are not impacted by flooding, the elevation of the project site would be raised, including 1st Street and the proposed esplanade. In addition, to reduce the potential for flood damage or impacts on residential structures, the lowest occupied floor elevation would be constructed approximately one foot above the 100-year base flood elevation (BFE)[1] which complies the New York City Building Code (Appendix G) and FEMA requirements. The site grade would then slope to match existing street grades along Carroll, Bond, and 2nd Streets. In accordance with coastal zone construction guidelines, all residential units of the two buildings would be constructed above the 100-year elevation and the parking, retail, and community facility would be primarily above the 100-year elevation.

[1] ~7.5 feet above Brooklyn Borough Datum (10 feet National Geodetic Vertical Datum of 1929).

With the proposed fill material to raise the site base grade, this would add less than 0.9 percent to the volume of the 100-year floodplain within the Gowanus Canal for the reach north of Hamilton Avenue. Moreover, in tidal flood conditions the flooding source would be due to water coming into the canal from Gowanus Bay and New York Harbor and is therefore subject to a much larger source of tidal flood waters, elevated by astronomic and meteorological forces (e.g., northeasters and hurricanes [FEMA 2007]), of which the project site's floodplain is an insignificant part (see Figure 13-4b). The additional fill material at the site to raise building and street elevation is calculated to be about 8,200 cubic yards, or 0.9 percent of the total flood capacity volume of the Gowanus Canal reach of the coastal floodplain including only that portion north of the Hamilton Avenue Bridge. Thus, raising the elevation of the project site above the 100-year flood elevation would not exacerbate coastal flooding impacts off-site (i.e. in the vicinity of the project site). See also Appendix D, "Groundwater and Flooding Analysis." ✷