A. INTRODUCTION

This chapter assesses the potential impacts on terrestrial and aquatic natural resources[1], floodplains, groundwater, and earthquake potential from the Proposed Actions. A portion of the Project Area (7 acres) is within the Hudson River between the bulkhead and pierhead line (see Figures 1-1 and 1-2 in Chapter 1, "Project Description").

This chapter:

- Describes aquatic resources of the Hudson River near the Project Area, including water quality and aquatic organisms (plankton, macroinvertebrates, fish, and threatened or endangered species), and the current condition of the floodplain, groundwater, earthquake potential, and natural resources, such as wetlands and terrestrial plants, wildlife, and threatened or endangered species, within the vicinity of the Project Area;
- Describes the regulatory programs that protect floodplains, wildlife, threatened or endangered species, aquatic resources, or other natural resources that may apply to the Proposed Actions;
- Describes special habitat areas within the vicinity of the Project Area, such as a Significant Coastal Fish and Wildlife Habitat identified by the New York State Department of State (NYSDOS); and
- Assesses floodplains, groundwater, earthquake potential, water quality, and aquatic and terrestrial natural resources in the future with and without the Proposed Actions.

The Academic Mixed-Use Development plan would be implemented over several decades and would result in the removal of some existing buildings, construction of slurry walls around some or all of each block of the Academic Mixed-Use Area north of West 125th Street and south of 133rd Street between Broadway and Twelfth Avenue, above- and below-grade construction of certain facilities, upgrades and/or relocation of underground utilities (sewer and water mains, as well as electric, gas, telephone lines, and fiber optic cables), construction of separate storm sewers serving a portion of the Academic Mixed-Use Area discharging to an existing combined sewer overflow (CSO) outfall at the western terminus of St. Clair Place (as described in Chapter

[1] CEQR defines "natural resources" as plant and animal species and any area capable of providing habitat for plant and animal species or capable of functioning to support ecological systems and maintain the City's environmental balance (*CEQR Technical Manual*, City of New York, 2001).

14, "Infrastructure")[1], disturbance and repaving of streets, and creation of the new, privately owned, publicly accessible open space areas (see Chapter 21, "Construction," for more details).

As part of the Proposed Actions, new separate stormwater sewer lines are proposed for West 130th, West 131st, and West 132nd Streets, between Broadway and Twelfth Avenue. This separate stormwater system would be fully operational by 2030. Although it is likely that the stormwater line under West 130th Street would be installed before 2015, a conservative analysis would assume that the installation of all of the stormwater sewer lines would occur after 2015. Therefore, for the 2015 future with the Proposed Actions, two scenarios were analyzed: the Proposed Actions with a partial stormwater system in place in 2015, and the Proposed Actions with no separate stormwater system in place in 2015. As mentioned earlier, the 2030 analysis accounts for a fully operational separate stormwater system. As presented in Chapter 14, the new separate stormwater system would be designed to divert stormwater from the combined sewer system at a flow rate of up to 42 million gallons per day ([mgd] equivalent to 65 cubic feet per second [CFS]). This is an instantaneous flow rate that is not likely to last for a day. By 2030, over the course of a year, the proposed storm sewer system is expected to divert approximately 9.9 million gallons of stormwater and reduce the annual CSO[2] volume at the regulator servicing the blocks between West 129th and West 133rd Streets by 1.6 million gallons per year (mgy). If the portion of the new storm sewer system on West 130th Street is operational in 2015, over the course of a year, this portion of the proposed storm sewer system is expected to divert approximately 3.2 million gallons of stormwater and reduce the annual CSO volume (at the regulator servicing the southern portion of the block between West 130th and West 131st Streets, and the northern portion of the block between West 129th and West 130th Streets) by 0.6 million gallons. The analysis assesses the potential impacts on the floodplain and natural resources associated with the development of the Academic Mixed-Use Area, which could include potential impacts on water quality and aquatic biota from increased discharges to the Hudson River from the North River Water Pollution Control Plant (WPCP) and CSOs to the Hudson River and Harlem River due to increased sanitary base flow. The Proposed Actions

[1] As part of a proposed amended drainage plan (see Chapter 14, "Infrastructure," for details), a separate storm sewer system has been proposed for the blocks between West 130th Street and West 133rd Street between Broadway and Twelfth Avenue, to be completed by 2030. A portion of this separate storm sewer system may be installed and operating on West 130th Street in 2015. The analysis in the DEIS assumed that stormwater collected by this system would be discharged to a newly constructed outfall at the Western terminus of West 125th Street. Since the issuance of the DEIS, further studies have been conducted to determine the feasibility of connecting the stormwater system to an already existing CSO outfall located at the western terminus of St. Clair Place, to avoid the need for construction through the West Harlem Waterfront Park. These studies (submitted to and approved by DEP) determined that the connection to the existing CSO would be feasible, and the FEIS has been revised to reflect this change. The proposed stormwater system would be connected downstream of the regulator for the existing combined sewer, discharging directly into the Hudson River. Therefore, since the same volume of stormwater would be discharched from the same streets in the Project Area, and the only change would be the location of the discharge point into the Hudson River, the results of the analysis in the DEIS have not changed as a result of this revision.

[2] Combined sewer overflow is the discharge of combined sanitary wastewater and stormwater into streams and rivers through CSO outfalls when the Water Pollution Control Plant's capacity is exceeded during heavy storms.

would result in the removal and replacement of street trees, and the creation of new open space areas with landscaping. Dual fuel-fired central energy plants and smaller package boiler systems have been proposed at various locations to provide heating and cooling to the new buildings in the Academic Mixed-Use Area (see Chapter 19, "Air Quality"). As discussed in Chapter 16, "Energy," Columbia University has stated that it is committed to incorporating energy and environmental design elements into the proposed development and would construct buildings that would minimize energy consumption and maximize energy performance.

Within the other portions of the Project Area (Subdistricts B, C, and the Other Areas), the Proposed Actions may result in the development of new uses and uses with greater densities, such as active ground-floor uses, office, and/or residential development.

PRINCIPAL CONCLUSIONS

The Proposed Actions would not result in significant adverse impacts on the floodplain, groundwater, or terrestrial natural resources in the vicinity of the Project Area, or to water quality and aquatic biota of the Lower Hudson River Estuary in 2015 or 2030. The Academic Mixed-Use Area (Subdistrict A), the Other Area east of Broadway, and Subdistrict C are not within the 100-year floodplain. Therefore, development in these portions of the Project Area in 2015 and 2030 would not affect flooding within and adjacent to the Project Area. A portion of Subdistrict B near the Hudson River is within the 100-year floodplain. Within Subdistrict B, the floodplain is currently covered by impervious surfaces. The projected stimulation of retail and office redevelopment in Subdistrict B resulting from the Proposed Actions would not be expected to result in a reduction in imperviousness within this portion of the floodplain.[1] Therefore, redevelopment of this area would not change the floodplain's ability to contain flood waters, or exacerbate flooding conditions within or adjacent to the Project Area. The construction and operation of the new buildings within the Academic Mixed-Use Area by 2030 would not result in significant adverse impacts on groundwater resources. Construction of the buildings would result in the removal or capping of contaminated soils and historic fill, minimizing the potential for adverse impacts on groundwater quality. Although the construction of the slurry walls would modify groundwater flow pattern in the immediate vicinity of the walls, groundwater would be expected to flow around the slurry walls and then continue toward the Hudson River.

Construction within the Academic Mixed-Use Area in 2015 and 2030 may result in the removal of some street trees. These trees would be removed and replaced in accordance with permits issued by the New York City Department of Parks and Recreation (DPR). Similarly, any removal of street trees resulting from redevelopment activities within other portions of the Project Area (Subdistricts B, C, and the Other Areas) would also require permits from DPR and replacement of trees. Additionally, the proposed privately owned, publicly accessible open space within the Academic Mixed-Use Area would be designed to allow landscaping. This would

[1] CPC is contemplating certain modifications to Subdistrict B. The proposed modifications would rezone Subdistrict B to a modified M1-2 light manufacturing district to support light manufacturing and retail uses. It is anticipated that this modification would not result in any projected development sites in Subdistrict B. The proposed modifications are more fully described in Chapter 29, "Modifications to the Proposed Actions." Chapter 29 also analyzes the potential environmental impacts that could result from the proposed modifications.

result in increased vegetation resources within the Academic Mixed-Use Area and the amount of potential habitat available to birds and other wildlife. The maximum building heights allowed for the new buildings proposed to be completed by 2030 would be similar to the heights of surrounding buildings and would not be expected to result in a significant increase in the loss of migratory birds due to building collisions.

The central energy plants and smaller package boiler systems proposed at various locations to provide heating and cooling to the new buildings in the Academic Mixed-Use Area would not result in discharges to the Hudson River and would not affect aquatic resources. As presented in Chapter 19, air emissions from the proposed central energy plants and package boilers would not result in significant adverse air quality impacts. Therefore, potential air emissions from the proposed energy plants and package boiler systems would not be expected to result in significant adverse impacts on terrestrial or aquatic natural resources.

The development of Columbia's facilities in the Academic Mixed-Use Area would not have an adverse impact on the environment due to the earthquake potential of the New York City metropolitan region.

During Phase 1 construction activities, stormwater generated within the Project Area would be discharged to the municipal combined sewer system and would only be discharged directly to the Hudson River during CSOs. During Phase 2 construction activities (2015 and 2030), some stormwater generated within the Project Area would be discharged to the municipal combined sewer system and would only be discharged directly to the Hudson River during CSOs, and some stormwater would be directed toward the existing CSO outfall at the western terminus of St. Clair Place. Implementation of erosion and sediment control measures, and stormwater management measures during construction as part of the Stormwater Pollution Prevention Plan (SWPPP), would minimize potential impacts on the municipal combined sewer system and on the Hudson River associated with stormwater runoff. The construction of slurry walls would minimize dewatering[1] during construction of below-ground project elements. However, should construction dewatering activities be required, the recovered groundwater would be treated, as necessary, prior to discharge to the combined sewer system. Therefore, no adverse impacts on surface water quality of the Hudson River would be expected to occur during the construction of the Proposed Actions in 2015 and 2030.

The increase in the volume of sewage treated by the North River WPCP in 2015 and 2030 would not be expected to adversely affect the WPCP's ability to meet the effluent limitations of the North River WPCP's State Pollutant Discharge Elimination System (SPDES) permit, or adversely affect water quality of the Hudson River in the vicinity of the North River WPCP even after consideration of projected flow increases from other proposed projects within the North River WPCP drainage area. Appendix E.1, "Water Quality Modeling," provides a detailed assessment of potential impacts on water quality of the Hudson and Harlem Rivers from the Proposed Actions.

In 2015, with no partial separate stormwater system, the number of CSO events would increase by one, and CSO volume would increase by approximately 0.3 mgy when compared with the 2015 future without the Proposed Actions condition. The increase in mass loadings of pollutants

[1] Dewatering is the removal of rainwater or groundwater from within an excavated area during construction.

during CSO events would be extremely small. The water quality in the Hudson and Harlem Rivers would be essentially identical to those projected for 2015 future without the Proposed Actions. These increases would not be expected to result in significant adverse impacts on water quality or aquatic biota of the Hudson and Harlem Rivers, even after consideration of the New York City Department of Environmental Protection (DEP) projections of future sewage flows within the North River WPCP service area that were developed on the basis of the New York City Department of City Planning (DCP) population projections for 2015 and 2030[1]. Therefore, the projected increase in sewage volume in 2015 due to the Proposed Actions would not be expected to result in significant adverse impacts on water quality or aquatic biota of the Hudson and Harlem Rivers.

In 2015 with a partial separate stormwater system in place, the number of CSO events would remain unchanged, and CSO volume would decrease by approximately 0.6 mgy when compared with the 2015 future without the Proposed Actions conditions. The decrease in CSO volume would be a result of the partial separate stormwater system, which would divert stormwater from the combined sewer system. The mass loadings of pollutants during CSO events would decrease slightly, and the water quality in the Hudson and Harlem Rivers would not be adversely affected due to the Proposed Actions. Pollutant loading to the Hudson River from the possible operation of the new storm sewer on West 130th Street and subsequent discharge from the CSO outfall at St. Clair Place by 2015 would not be expected to result in significant adverse impacts on water quality or aquatic biota, or result in adverse impacts on the aquatic habitat enhancement measures implemented as part of the West Harlem Waterfront park project.

In 2030, the proposed separate stormwater system would be fully operational. The separate stormwater system with the Proposed Actions would result in a decrease of CSO volume of 1.6 mgy and therefore a decrease in associated pollutant loadings. The CSO volume would decrease by approximately 0.4 percent. The number of CSO events would remain unchanged. Pollutant loading to the Hudson River from the operation of the new storm sewer and subsequent discharge from the CSO outfall at St. Clair Place would not be expected to result in significant adverse impacts on water quality or aquatic biota, or result in adverse impacts on the aquatic habitat enhancement measures implemented as part of the West Harlem Waterfront park project. The new storm sewers would be expected to include measures to contain floatables (e.g., standard DEP catchbasin with sump and hood), and to trap sediment and oil (e.g. catchbasins with hydrodynamic separators). The hydrodynamic separators would be voluntary measures, or measures used as part of the SWPPP prepared for the project. Therefore, the Proposed Actions would not adversely impact water quality, sediment quality, or aquatic biota of the Lower Hudson River Estuary in 2015 and 2030.

The Proposed Actions would not adversely impact water or sediment quality in 2015 or 2030 when the facilities are constructed and operating in the Academic Mixed-Use Area and redevelopment has occurred in the remaining portions of the Project Area. Therefore, no adverse impacts would occur to the New York State- and federally-listed endangered shortnose sturgeon identified as present in the Hudson River in the vicinity of the Project Area. Similarly, the Proposed Actions would not be expected to result in adverse impacts on the Lower Hudson

[1] New York City Department of City Planning. December 2006. New York City Population Projections by Age/Sex & Borough 2000-2030. Department of City Planning, 22 Reade Street, New York, NY 10007-1216, nyc.gov/planning.

Reach Significant Coastal Fish and Wildlife Habitat. The active New York State-listed endangered peregrine falcon nest is far enough away from the Project Area (0.4 miles, or 0.6 kilometers) that it would not be adversely affected by the Proposed Actions in 2015 or 2030. Coordination with DEC's New York Natural Heritage Program (NYNHP) has been conducted regarding the peregrine falcon nest, and additional coordination would be conducted prior to the anticipated start of construction.

B. METHODOLOGY

This section presents the methodology used to characterize existing natural resources within the Project Area under existing and future conditions, and to assess potential impacts on these resources from the Proposed Actions. For terrestrial resources, floodplains, groundwater, and earthquake potential, the study area was restricted to the Project Area and the area immediately adjacent to it because of the highly developed nature of the surrounding land uses. An exception was made for the identification of threatened or endangered species, which were evaluated for a distance of at least 0.5 miles from the Project Area. The study area for water quality and aquatic biota included the lower Hudson River, focusing on that portion of the river with the potential to receive CSO discharges originating from the Project Area within the North River WPCP drainage area, and effluent from the WPCP located north of the Project Area. The analysis of potential impacts on natural resources from the Proposed Actions considered the potential effects for analysis years 2015 and 2030.

EXISTING AND FUTURE CONDITIONS

Existing conditions for aquatic natural resources of the Hudson River in the vicinity of the Project Area, terrestrial and groundwater natural resources, and earthquake potential within the Academic Mixed-Use Area and the remaining portions of the Project Area (Subdistricts B, C, and the Other Areas) were ascertained from:

- Existing information identified in literature and obtained from governmental and nongovernmental agencies, including the DEP Harbor Water Quality Survey (DEP 2005); DEP effluent data for the North River WPCP; U.S. Environmental Protection Agency National Sediment Quality Survey Database, 1980-1999 (EPA 2001); New York/New Jersey Harbor Estuary Program; EPA Regional Environmental Monitoring and Assessment Program (R-EMAP); and U.S. Army Corps of Engineers (USACE) studies conducted as part of the New York and New Jersey Harbor Navigation Project;
- Observations made during site visits and the results of groundwater sampling conducted as part of the Phase II investigation for hazardous materials in the Academic Mixed-Use Area; and
- Responses to requests for information on rare, threatened, or endangered species within the vicinity of the Project Area submitted to the U.S. Fish and Wildlife Service (USFWS) (New York office), National Marine Fisheries Service (NMFS), and the NYNHP. NYNHP, a joint venture of the New York State Department of Environmental Conservation (DEC) and The Nature Conservancy (TNC) since 1985, maintains an ongoing, systematic, scientific inventory on rare plants and animals native to New York State. DEC maintains the NYNHP files. The NYNHP database is updated continuously to incorporate new records and changes in the status of rare plants or animals. In addition to the State program, the USFWS maintains information for federally listed threatened or endangered freshwater and terrestrial

plants and animals, and NMFS for federally listed threatened or endangered marine organisms.

The future conditions without the Proposed Actions for the analysis years 2015 and 2030 were assessed by:

- Considering existing natural resources within the Project Area and assessing potential effects on these resources from proposed development in the vicinity of the Project Area in 2015, and DEP flow projections for the North River WPCP drainage area as described below.
  - A list of proposed projects that have been announced, are in an approval process, or are being constructed, and proposals for rezoning in the vicinity of the Project Area, as discussed in Chapter 2, "Procedural and Analytical Framework" (see Table 2-1 and Figure 2-1), as well as the recommendations made in the New York City Economic Development Corporation (EDC)'s 2002 West Harlem Master Plan. The projects considered in the natural resources assessment include: West Harlem Waterfront park, expected to be completed in 2008; renovations to the existing Studebaker Building on West 131st Street by Columbia; collaboration between Columbia University and the City of New York on the creation of a new public secondary school for science, math, and engineering to be located within the Project Area on the east side of Broadway between West 131st and West 132nd Streets; development of administrative space for Columbia University above the new public secondary school; use of the existing former Warren Nash Service Station building by Columbia University for administrative space; and redevelopment/renovation of two sites for new commercial or residential uses (the northwest corner of West 133rd Street and Twelfth Avenue, and the west side of Twelfth Avenue and West 135th Street).
  - DEP projections of future sewage flows within the North River WPCP developed on the basis of DCP population projections for 2015 and 2030. The DCP population projections considered the Hudson Yards Rezoning and Redevelopment Program project (Hudson Yards project) and the Columbia Manhattanville project.
- Considering potential effects of proposed or ongoing improvements in the vicinity of the Project Area on water quality and natural resources.
- Considering the future without the Proposed Actions in the Project Area in 2030 to be a continuation of the 2015 future without the Proposed Actions conditions.

ASSESSMENT OF IMPACTS ON WATER QUALITY AND NATURAL RESOURCES

Potential impacts on water quality and natural resources from the Proposed Actions were assessed for the analysis years 2015 and 2030 using an approach that considered the following:

- The existing water quality and natural resources within and in the vicinity of the Project Area.
- Potential effects from the discharge of stormwater to the combined sewer system during project construction.
- Results of water quality modeling conducted by HydroQual to assess the potential effects on the municipal combined sewer system and North River WPCP from the discharge of stormwater and sewage during operation of the development generated by the Proposed Actions. (Appendix E.1 presents a detailed discussion of the methods employed and results

of the modeling.) The analysis evaluated potential impacts on the North River WPCP and Hudson River from increased sewage flow from the Proposed Actions and DEP projections of future sewage flows within the WPCP's drainage area developed on the basis of DCP population projections. The projected water quality conditions in the 2015 and 2030 future with the Proposed Actions due to discharges to the North River WPCP are conservative because Columbia University's Manhattanville project was considered in the DCP population projections for 2015 and 2030 that were used by DEP to project future flows to the WPCP. This resulted in the projected sewage flows resulting from the Proposed Actions in 2015 and 2030 being counted twice. The analysis also evaluated potential impacts on the Hudson and Harlem Rivers due to potential changes in CSOs from the increased sewage flow from the Proposed Actions and DEP projections of future sewage flows within the North River WPCP's drainage area. For the 2015 analysis, two scenarios were examined: the Proposed Actions with a partial stormwater system in place on West 130th Street, and the Proposed Actions with no separate stormwater system in place. For the 2015 condition in which a partial stormwater system would be operational by 2015, the analysis took into account the approximately 3.2 million gallons of stormwater that would be diverted annually from the combined sewer system. For the 2030 condition, in which the entire proposed separate stormwater system would be operational, the analysis took into account the 9.9 million gallons of stormwater that would be diverted annually from the combined sewer system. The modeling included:

- InfoWorks hydraulic model was used to determine runoff flows, water surface elevations, and flows within sewers. Sewer conditions were evaluated for CSO overflows and to develop pollutant loadings for modeling water quality in the Hudson and Harlem Rivers. The results of the model simulations were used to estimate the annual overflow volumes and pollutant loadings for the CSOs in the North River WPCP drainage area for the 2015 and 2030 future with and without the Proposed Actions conditions.
- Use of the System-Wide Eutrophication Model (SWEM) to assess potential impacts on water quality (i.e., incremental change) of the Lower Hudson River Estuary and Harlem River from additional sewage flow to the North River WPCP and from CSOs within the North River WPCP drainage. SWEM is a three-dimensional, time-variable, coupled hydrodynamic/eutrophication model of the New York/New Jersey Harbor–New York Bight system. Wastewater flows and pollutant loadings for selected parameters (total suspended solids, BOD5, total nitrogen, total phosphorus, total coliform bacteria, zinc, lead, and copper) from the North River WPCP for fiscal year 2005 were used to establish the baseline loadings from the plant. Pollutant loadings were estimated on the basis of a monthly average concentration of the pollutant as reported by DEP in the North River WPCP effluent for 2005. The projected pollutant loadings for selected parameters from CSOs in 2015 and 2030 were based on DEP-reported pollutant concentrations in the influent to the North River WPCP for 2005, and the historical concentrations of these same pollutants in stormwater. Simulations for all parameters used a standardized rainfall condition, which is the rainfall reported for Central Park in 1988. This is the rainfall year chosen as the base year for DEP's Use and Standards Attainment and the Long Term CSO Control Plan projects for all of New York City. It has been used as the base year for the Long Island Sound total maximum daily loads (TMDLs) and is being used as the base year for New York Harbor nutrient and pathogen TMDLs. In addition, the New Jersey Department of Environmental Protection (NJDEP)

requires communities in New Jersey to use 1988 rainfall data to develop their Phase II Long Term CSO Control Plans.

- Selection of water quality parameters to be evaluated—dissolved oxygen (DO), total suspended solids (TSS), total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform[1].
- In order to provide for a conservative analysis, total nitrogen, total phosphorus, total suspended solids, copper, lead, and zinc were considered to be non-reactive substances, and this assumed that their concentrations within the water column would not be reduced by normal chemical, physical, and biological interactions. The responses for these conservative substances and coliforms were calculated using the pathogen model (PATH), which is a model based on SWEM hydrodynamics, but which has the capability to include coliform kinetics and trace conservative material. Since the conservative substances and coliform bacteria react linearly (i.e., responses are directly proportional to the input pollutant loads), the analysis was performed by inputting a unit load, calculating the receiving water response, and then proportioning the responses based on the projected incremental loads and flows for each scenario. The incremental responses for each scenario were then compared with existing water quality data.
- Comparison of projected water quality parameter concentrations to applicable water quality standards for Use Class I waters.

- Potential change in terrestrial habitat that would occur as a result of the Proposed Actions.

C. REGULATORY CONTEXT

Stormwater discharges and activities within the New York State coastal zone and the floodplain require compliance with federal and State legislation and regulatory programs, and federal executive orders that pertain to activities in coastal areas, surface waters, floodplains, and the protection of species of special concern. The regulations that may apply to the Proposed Actions are described below.

[1] Although levels of dissolved mercury in the Hudson River exceed DEC guidance values, mercury was not selected as a parameter to be evaluated in the water quality modeling. This was because the existing North River WPCP effluent discharges are well below the SPDES permit limit. The Proposed Actions would not be expected to result in a significant change to the mercury levels being discharged into the combined sewer system. The proposed uses to be developed within the Academic Mixed-Use Area, and within the other portions of the Project Area (Subdistricts B, C, and the Other Areas), would be consistent with the range of uses currently found within the North River WPCP drainage area and would not be expected to affect the ability of the WPCP to meet the current mercury SPDES permit limit. As discussed in Chapter 14, "Infrastructure," Columbia University's continued policy prohibiting the discharge of liquid chemical or radiological waste into the public sewer system would further minimize potential discharges of mercury to the combined sewer system and the potential of increased mercury discharges from the North River WPCP.

FEDERAL

Clean Water Act (33 USC §§ 1251 to 1387)

The objective of the Clean Water Act (CWA), also known as the Federal Water Pollution Control Act ("the Act"), is to restore and maintain the chemical, physical, and biological integrity of U.S. waters. It regulates point sources of water pollution, such as discharges of municipal sewage and industrial wastewater, and the discharge of dredged or fill material, into navigable waters and other waters of the United States. It also regulates non-point source pollution, such as runoff from streets, agricultural fields, construction sites, and mining operations, that enters waterbodies from other than the end of a pipe.

Section 404 of the Act requires authorization from the Secretary of the Army, acting through USACE, for the permanent or temporary discharge of dredged or fill material into navigable waters and other waters of the United States. Waters of the United States is defined in 33 Code of Federal Regulations (CFR) 328.3 and includes wetlands, mudflats, and sandflats that meet the specified requirements in addition to streams and rivers that meet the specified requirements. Activities authorized under Section 404 must comply with Section 401 of the Act.

Under Section 401 of the Act, any applicant for a federal permit or license for an activity that may result in a discharge to navigable waters must provide to the federal agency issuing a permit a certificate, either from the state where the discharge would occur or from an interstate water pollution control agency, that the discharge would comply with Sections 301, 302, 303, 306, 307, and 316 (b) of the CWA. Applicants for discharges to navigable waters in New York must obtain a Water Quality Certification from DEC.

Coastal Zone Management Act of 1972 (16 USC §§ 1451 to 1465)

The Coastal Zone Management Act of 1972 established a voluntary participation program to encourage coastal states to develop programs to manage development within the state's designated coastal areas to reduce conflicts between coastal development and protection of resources within the coastal area. Federal permits issued in New York must be accompanied by a Coastal Zone Consistency Determination that evaluates consistency with New York's federally approved coastal zone management program.

Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through USACE, for the construction of any structure in or over any navigable water of the United States, the excavation from or deposition of material in these waters, or any obstruction or alteration in navigable water of the United States. The purpose of this Act is to protect navigation and navigable channels. Any structures placed in navigable waters such as pilings, piers, or bridge abutments up to the mean high water line would be regulated pursuant to this Act. USACE must evaluate the probable impacts, including cumulative impacts of the proposed activity on the public interest (benefits of the proposed activity vs. potential detriments).

Executive Order 11988 (Floodplain Management)

Executive Order 11988 states that "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities."

Endangered Species Act of 1973 (16 USC §§ 1531 to 1544)

The Endangered Species Act of 1973 recognized that endangered species of wildlife and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. The Act prohibits the importation, exportation, taking, possession, and other activities involving illegally taken species covered under the Act, and interstate or foreign commercial activities. The Act also provides for the protection of critical habitats on which endangered or threatened species depend for survival.

NEW YORK STATE

State Pollutant Discharge Elimination System (New York Environmental Conservation Law Article 3, Title 3; Article 15; Article 17, Titles 3, 5, 7, and 8; Article 21; Article 70, Title 1; Article 71, Title 19; Implementing Regulations 6 NYCRR Articles 2 and 3)

Title 8 of Article 17, New York State Environmental Conservation Law (ECL), Water Pollution Control, authorized the creation of the SPDES to regulate discharges to the State's waters. Activities requiring a SPDES permit include discharges from pipe (point source) that discharges wastewater into the State's surface water or groundwater, including the intake and discharge of water for cooling purposes; constructing or operating a disposal system (sewage treatment plant); discharge of stormwater; and construction activities that disturb one or more acres.

Protection of Waters, Article 15, Title 5, Environmental Conservation Law (ECL), Implementing Regulations 6 NYCRR Part 608

DEC is responsible for administering Protection of Waters regulations to prevent undesirable activities on surface waters (rivers, streams, lakes, and ponds). The Protection of Waters Permit Program regulates five different categories of activities: disturbance of the stream bed or banks of a protected stream or other watercourse; construction, reconstruction, or repair of dams and other impoundment structures; construction, reconstruction, or expansion of docking and mooring facilities; excavation or placement of fill in navigable waters and their adjacent and contiguous wetlands; and Water Quality Certification for placing fill or other activities that result in a discharge to waters of the United States in accordance with Section 401 of the CWA.

Tidal Wetlands Act, Article 25, ECL, Implementing Regulations 6 NYCRR Part 661

Tidal wetlands regulations apply anywhere tidal inundation occurs on a daily, monthly, or intermittent basis. They are found along much of the saltwater shore, bays, inlets, canals, and estuaries of Long Island, New York City, and Westchester County, and the tidal waters of the Hudson River up to the salt line. DEC is responsible for administering the tidal wetlands regulatory program (6 NYCRRR Part 661) and mapping the locations of New York State's regulated tidal wetlands. The tidal wetlands are identified by category based on the types of vegetation and the presence of tide. Each category has restrictions on activities allowed in and adjacent to (up to 300 feet inland from wetland boundary, or up to 150 feet inland within the City) wetlands falling under that category. A permit is required for almost any activity that will alter wetlands or the adjacent areas. Wetlands within the project area are described below in "Existing Conditions."

Waterfront Revitalization of Coastal Areas and Inland Waterways Act (Sections 910-921, Executive Law, Implementing Regulations 6 NYCRR Part 600 et seq.)

Under the Waterfront Revitalization of Coastal Areas and Inland Waterways Act, NYSDOS is responsible for administering the Coastal Management Program (CMP). The Act also authorizes

the State to encourage local governments to adopt Waterfront Revitalization Programs (WRP) that incorporate the state's policies. New York City has a WRP administered by DCP.

The New York CMP has specific policies with respect to fish and wildlife. Policy 7 specifies that Significant Coastal Fish and Wildlife Habitats be protected, preserved and—where practical—restored, so as to maintain their viability as habitats. DEC is responsible for evaluating the significance of coastal habitats and evaluating their relative habitat values. NYSDOS designates and maps the Significant Coastal Fish and Wildlife Habitat areas. Neither land/water uses nor development activities may be undertaken that destroy the designated habitat through direct or indirect means. These uses or activities may not significantly impair the viability of the habitat by reducing vital resources beyond the tolerance range of important species of fish or wildlife that rely on the habitat, such as physical parameters (circulation, flushing rates, turbidity, or depth); biological parameters (community structure or predator/prey relationships); and chemical parameters (dissolved oxygen, carbon dioxide, nutrients, salinity and pollutants).

Floodplain Management Criteria for State Projects (6 NYCRR 502)

Under 6 NYCRR 502, all New York State agencies are to ensure that the use of State lands and the siting, construction, administration, and disposition of State-owned and State-financed projects involving any change to improved or unimproved real estate are conducted in ways that will minimize flood hazards and losses. Projects are to consider alternative sites on which the project could be located outside the 100-year floodplain. Projects to be located within the floodplain are to be designed and constructed consistent with the need to minimize flood damage within the 100-year floodplain and include adequate drainage to reduce exposure to flood hazards. All public utilities and facilities associated with the project are to be located and constructed to minimize or eliminate flood damage. The regulations specify that for nonresidential structures, the lowest floor should be elevated or flood-proofed to not less than one foot above the base flood level so that below this elevation the structure, together with associated utility and sanitary facilities, is watertight, with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. No project may be undertaken unless the cumulative effect of the proposed project and existing developments would not cause material flood damage to the existing developments. In cities with a designated floodway, no portion of the project may be placed within the adopted regulatory floodway to result in any increases in flood levels. No regulatory floodway is located in the vicinity of the Project Area.

Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern (ECL, Sections 11-0535[1]-[2], 11-0536[2], [4], Implementing Regulations 6 NYCRR Part 182)

The Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern Regulations prohibit the taking, import, transport, possession, or selling of any endangered or threatened species of fish or wildlife, or any hide, or other part of these species that are listed in 6 NYCRR §182.6.

D. EXISTING CONDITIONS

FLOODPLAINS AND WETLANDS

Figure 11-1 presents the 100-year (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 within the

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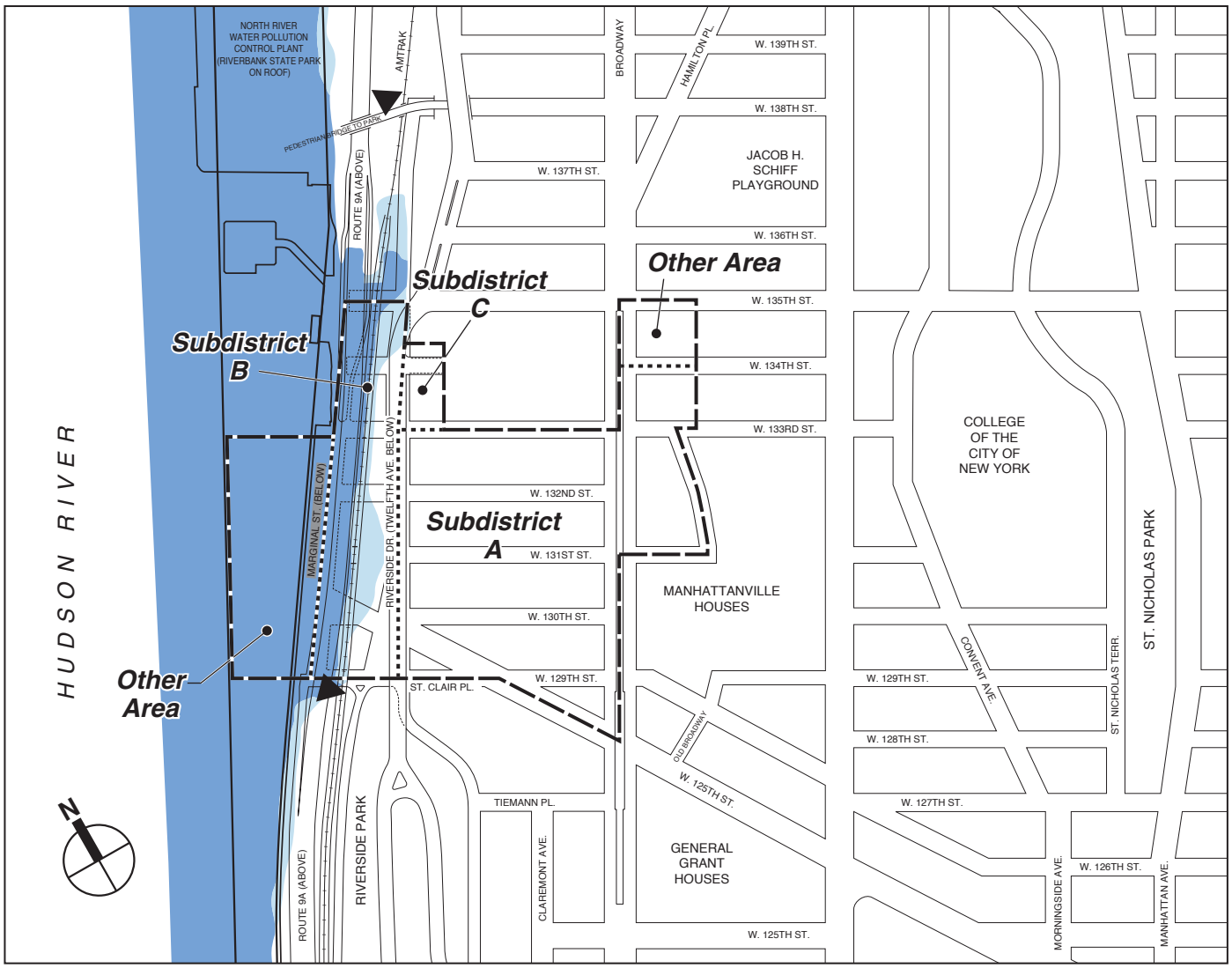


Project and Rezoning Area Boundary

Subdistrict Boundary

500-Year Flood Boundary

100-Year Flood Boundary

ZONE B

ZONE A1

ZONE A5

100-Year Flood Boundary

500-Year Flood Boundary

ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — ERM 7

C Areas of minimal flooding. (No shading)

Zone D Boundary

River Mile — •M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

MANHATTANVILLE IN WEST HARLEM REZONING AND ACADEMIC MIXED-USE DEVELOPMENT

Figure 11-1

100-Year Floodplain

Project Area. The 100-year floodplain does not extend into the Academic Mixed-Use Area (Subdistrict A), Subdistrict C, or the Other Area east of Broadway. The 100-year floodplain does extend into the two westernmost subdistricts closest to the Hudson River, Subdistrict B and the Other Area west of Marginal Street. All of the Other Area west of Marginal Street and a portion of Subdistrict B west of the Amtrak Empire rail line have been mapped as 100-year floodplain.

The portion of the Other Area west of Marginal Street along the Hudson River shoreline is the only portion of the Project Area containing tidal wetlands as mapped by the DEC (see Figure 11-2) and the USFWS National Wetland Inventory (NWI) maps (see Figure 11-3). The shoreline within this subdistrict is bulkheaded and provides limited potential for tidal marsh plants or submerged aquatic vegetation. The USFWS NWI map classifies the waters adjacent to this portion of the Project Area as estuarine subtidal wetlands with unconsolidated bottom. Subtidal estuarine wetlands are continuously submerged areas with low energy and variable salinity, influenced and often enclosed by land. Unconsolidated bottoms have at least 25 percent cover of particles smaller than 6 or 7 cm, and less than 30 percent vegetative cover. DEC has designated this portion of the Hudson River as containing littoral zone wetlands (shallow waters 6 feet or less in depth). There are no nontidal wetlands within the Project Area.

GROUNDWATER

Groundwater within the Project Area is encountered at depths ranging from approximately 6 to 26 feet below surface grade. Groundwater flow is generally westward toward the Hudson River. As described in Chapter 12, "Hazardous Materials," volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals were detected in groundwater samples collected within the Academic Mixed-Use Area. While some VOC concentrations were above DEC Class GA standards (drinking water standards), most were at low levels. SVOC concentrations were found to exceed Class GA standards in some samples. Most of the SVOC exceedances were for polycyclic aromatic hydrocarbons (PAHs). The majority of the total and dissolved metals concentrations in the groundwater samples were below the Class GA standards. However, some samples exceeded total metals standards for barium, chromium, iron, lead, magnesium, manganese, and sodium. Some samples exceeded Class GA standards for dissolved metals (barium, iron, magnesium, manganese, and sodium). Elevated metals levels are typical of groundwater quality encountered in industrial areas of New York City and are not necessarily due to contamination from past operations. No pesticides or polychlorinated biphenyls (PCBs) were detected in groundwater samples collected within the Academic Mixed-Use Area.

Concentrations of metals, organic compounds, and other contaminants detected in groundwater samples collected within the Academic Mixed-Use Area are likely associated with urban fill placed within the Project Area rather than specific past or current uses. Because groundwater is not a source of potable water in Manhattan, exceedance of the DEC Class GA Ambient Water Quality Standards (which assume long-term use as a source of drinking water), as provided in DEC's Technical and Operational Guidance Series (TOGS) 1.1.1, does not generally indicate a concern. Potable water in Manhattan is provided by New York City's public water supply, which comprises a system of upstate reservoirs.

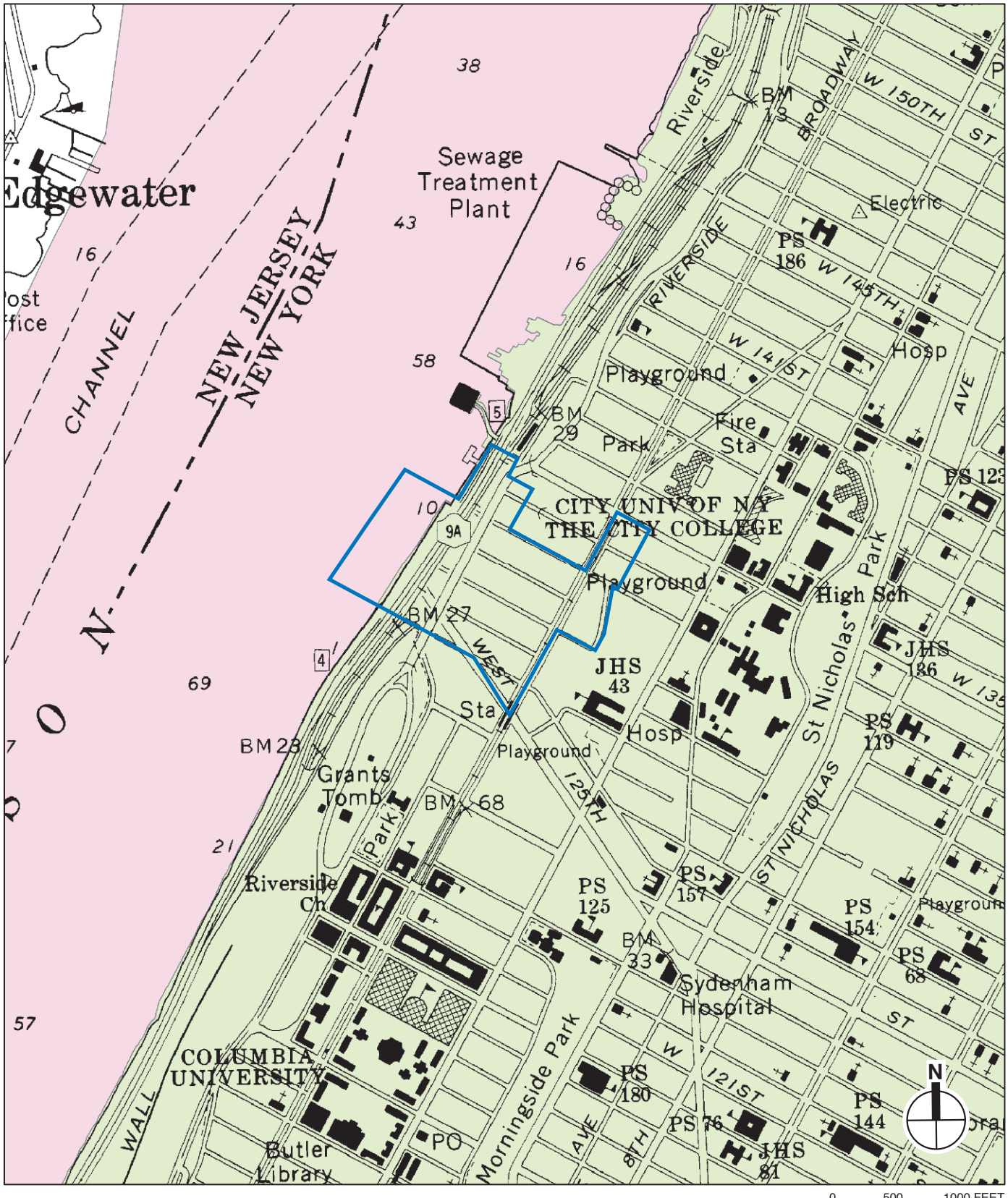
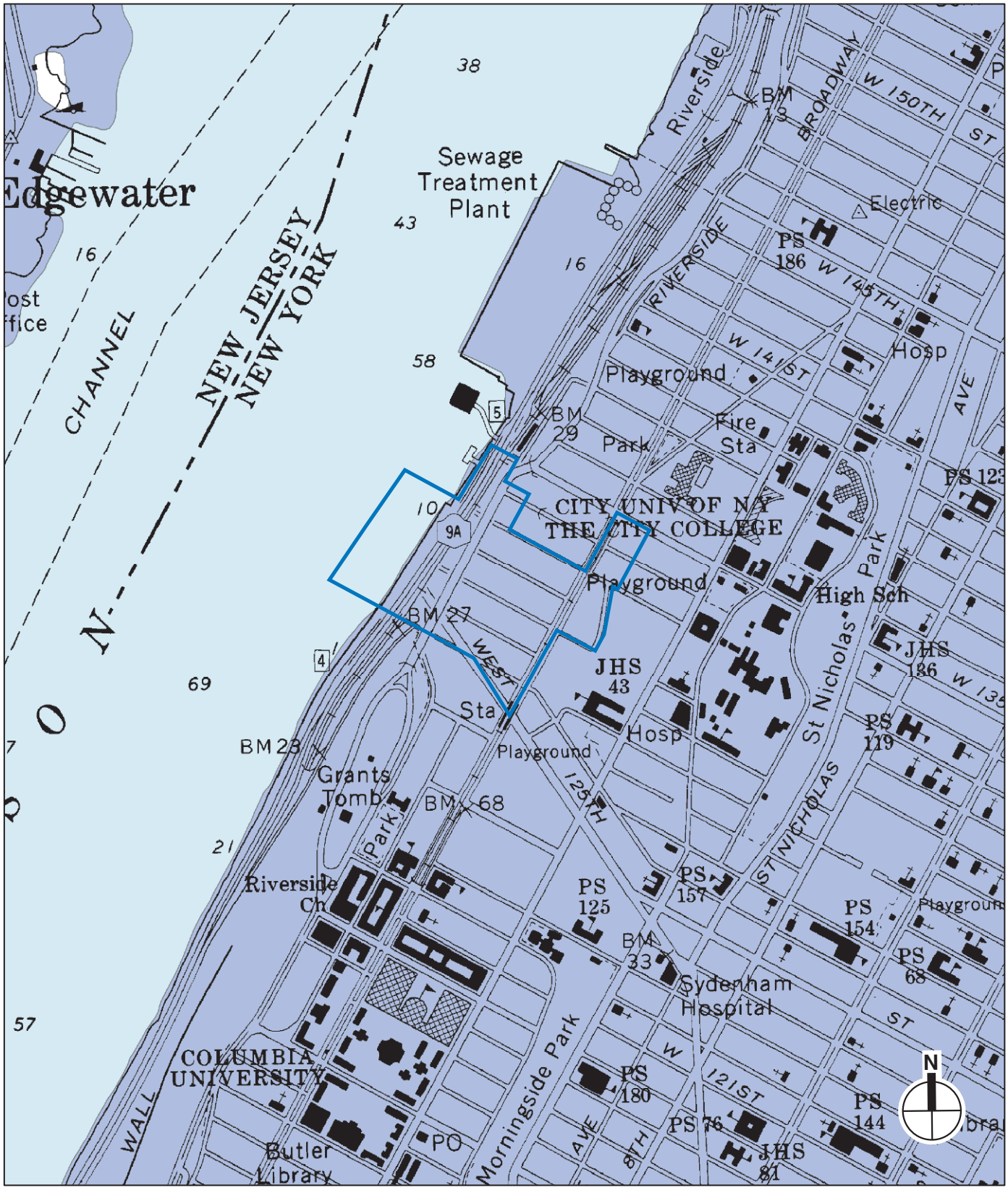


Figure 11-2
DEC Tidal Wetlands



MANHATTANVILLE IN WEST HARLEM REZONING AND ACADEMIC MIXED-USE DEVELOPMENT

Figure 11-3
NWI Wetlands

EARTHQUAKE POTENTIAL

New York City lies within the southern end of the Manhattan Prong geologic province, a northeast-trending sequence of metamorphosed [1]crystalline rocks. The Hartland Schist and Manhattan Schist bedrock units[2] underlie the Project Area (Merguerian 2005). Depth to bedrock within the portion of the Project Area bounded by Broadway, Twelfth Avenue, West 125th Street, and West 133rd Street, appears to be close to the existing grade for the portions of the blocks near Broadway at the eastern portion of the Mixed-Use Area, and deeper (more than 165 feet below existing grade) toward the center and western portion of the blocks between Broadway and Twelfth Avenue.

The crystalline bedrock that underlies New York City is cut by numerous brittle faults[3] that are either north–northeast trending (older Mesozoic age), or north–northwest trending (younger) strike-slip faults of the Manahattanville fault system (Merguerian 2002). These sets of brittle faults cut two ductile thrust faults (Cameron's Line and St. Nicholas thrust) that cross through Manhattan. At least six of these north–northwest trending brittle faults cut diagonally through Manhattan. The 125th Street (Manhattanville) fault appears to underlie the Project Area. This fault lies within a broad U-shaped valley that extends from 125th Street on the west side to 94th to 96th Streets on the east side before crossing the East River to the subsurface of Long Island City (Merguerian 1996). Other faults cutting through Manhattan include the 14th Street fault (lower Manhattan), the Harlem River fault (approximately parallels the Manhattan shoreline of the river before cutting diagonally across the northern portion of Manhattan), and the Dyckman Street fault and another fault cutting across the northern tip of Manhattan. North of Manhattan, the Mosholu Parkway (Van Cortlandt Park) fault crosses through the Bronx.

Brittle fault zones, such as the 125th Street fault under the Project Area, generally comprise a fault core where most of the displacement occurs; a damage zone characterized by minor faults, fractures, veins and fracture networks; and the undeformed or host rock (Caine et al. 1996, and Brosh and Kurz 2005). Construction excavation within New York City indicate that there are abundant faults that are not mapped, with fault zone widths ranging in scale from inches to fault core-damage zones on the 100 foot scale (Snee 2004). The New York City Water Tunnel Number 3 cuts through the 125th Street fault beneath Amsterdam Avenue. The zone of highly fractured rock at this location was about 131 feet wide (Merguerian 1996). Brittle fault zones can pose

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[1] The original mineralogy, texture, or composition of a rock has undergone changes due to the effects of pressure, temperature, or the gain or loss of chemical components.

[2] The Hartland Schist comprises metamorphosed deep-oceanic shale, interstratified greywacke, and volcanic rocks formed offshore adjacent to North America during Late Protoerozoic to Early Paleozoic time. The Manhattan Schist comprises very massive rusty- to maroon-weathering, medium- to coarse-textured biotite-muscovite-plagioclase-quartz-garnet-kyanite-sillimanite gneiss and schist, without layering. The Manhattan Schist is a major ridge former in northern Manhattan (Merguerian 2005).

[3] A fault is a fracture or fracture system that has experienced movement along opposite sides of the fracture. When they occur in the upper or "brittle" crust they result in cracking or fracturing of material along the fault—brittle fault. When faults occur in the middle to lower portion of the earth's crust the deformation process is under higher temperatures and pressure resulting in intracrystalline plastic mechanisms that do not change the material integrity of the rock—ductile faults (Chester et al. 2004, and Riedmüler et al. 2001).

geotechnical problems for deep excavation or tunneling activities because of their heterogeneous structure, potentially unstable conditions, and potential for allowing movement of groundwater (Riedmüller et al. 2001, and Snee 2004).

Earthquake is a term used to describe both sudden slip on a fault and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. Earthquake risk is the probable building damage and number of people expected to be hurt if an earthquake occurs. Earthquake or seismic hazard is anything associated with an earthquake that may affect the normal activities of people. New York State is generally considered to have a moderate level of seismicity[1] and seismic hazard. Within New York, the highest levels of seismicity occur in the northern Adirondacks, the New York City metropolitan area, and western New York State. Seismic building codes have been developed for the State and New York City to reduce the earthquake or seismic risk (Jacob 1993). New York City, along with Long Island, the Hudson Valley, east central New York, and most of the counties along Lake Erie and Lake Ontario were mapped as Seismic Zone C (intermediate seismic hazard, seismic zone factor [effective peak acceleration on rock/stiff soil of 0.15g]) in the seismic zoning map prepared for the State of New York in 1993 developed as part of the New York State Building Code. Title 27, Subchapter 9, Article 5, "Wind Loads and Earthquake Loads of the New York City Building Code," adopted in 1995, addresses building and structure design with respect to seismic ground motions. The New York City Building Code requires that buildings taller than three stories be designed to resist effects of seismic ground motion of 0.15g (i.e., earthquakes up to a magnitude of 5.5 Richter).

Because New York State adopted the International Building Code® (IBC) in 2002, the IBC Seismic hazard maps prepared by the United States Geological Survey (USGS) Earthquake Hazards Program, National Seismic Hazards Mapping Project, now supersede the New York State Seismic Zones. The National Seismic Hazard maps (http://earthquake.usgs.gov) are probabilistic ground motion maps that project peak ground acceleration ([PGA] as a percent of gravity [g]), or ground motion that would be expected to occur for future individual earthquakes within a set time interval, typically 50 years. The National Seismic Hazards Mapping Project also projects 0.2 and 1.0 second Response Spectral Acceleration (Spectral Acceleration) that would be expected to occur for future individual earthquakes within a set time interval. The Spectral Acceleration is approximately what is experienced by a building (http://earthquake.usgs.gov). The seismic hazard map for New York City indicates that the earthquake PGA that has a 10 percent chance of being exceeded in 50 years has a value between 0.05 and 0.06g (i.e., 90 percent of the PGA values during the 50-year period would be expected to be less than those values), suggesting low seismic hazard in the future, and lower than the peak acceleration standard of 0.15 set in the New York City Building Code. The earthquake PGA that has a 2 percent chance of being exceeded in 50 years has a value between 0.20 and 0.22g (i.e., 98 percent of the PGA values would be expected to be less than those values). A PGA of 10g is the approximate threshold above which damage may occur to older (pre-1965) dwellings not designed to resist earthquakes (http://earthquake.usgs.gov).

In 2001, slip along north–northwest-trending brittle faults, described above, resulted in two earthquakes localized in New York City (Merguerian 2002). On January 17, 2001, the epicenter of a small earthquake (magnitude of approximately 2.4 Richter) occurred adjacent to the trace of the

[1] Seismicity refers to the geographic and historical distribution of earthquakes.

125th Street fault near 102nd Street and Park Avenue in Manhattan (Merguerian 2005), at a depth of about 3.1 to 4.3 miles (5 to 7 kilometers [Merguerian undated]). This was the first recorded historic earthquake to strike on land within the New York City metropolitan area. On October 27, 2001, another small earthquake (magnitude of approximately 2.6 Richter) occurred in Manhattan with the epicenter near 55th Street and Eight Avenue (Merguerian 2005), at a depth of about 0.6 miles (Merguerian undated). Previous earthquakes in the vicinity of New York City were larger. These include the October 1985 Ardsley quake along the north–west-trending Dobbs Ferry fault that produced two small tremors (magnitude of approximately 4.0 Richter) and many aftershocks; and the 1884 (magnitude of approximately 5.0 to 5.5 Richter), 1783 (magnitude of approximately 4.9 Richter), and 1737 (magnitude of approximately 5.2 Richter [Merguerian 2005]).

Although New York City is considered to be within a region with low seismic hazard (infrequent damaging earthquakes of magnitude 5.5 Richter or higher), it has a high seismic risk due to the concentration of buildings, the potential for building damage, population size, and high value of real estate and infrastructure (Tantala et al. 2003). The New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) evaluated the risks, potential losses, and mitigation in the New York/New Jersey/Connecticut region due to future earthquakes of magnitudes 5.2 (1884 earthquake), 6, and 7 Richter with an epicenter at the location of the 1884 quake—off shore of Brooklyn in Lower New York Harbor. The assessment of risk took into account soil type (the softer the soil the greater the ground motion), depth to bedrock, expected PGA, types of building structures, estimated losses (i.e., property, infrastructure, injuries, casualties), and availability of public shelters and hospitals (Tantala et al. 2003).

The NYCEM evaluation assessed the potential for ground shaking to occur in Manhattan by mapping the soils and bedrock in each census tract, using existing borehole (Standard Penetration Tests), depth to bedrock records and geological surveys, and the 1997 National Earthquake Hazard Reduction Program (NEHRP) classification scheme. Soil and bedrock characteristics and distribution affect the amount of ground shaking, and subsequent damage from a given earthquake. Softer soils amplify ground shaking, and have the potential to result in more damage than stiffer soils or bedrock. The NEHRP site classes are A—hard rock, B—rock, C—dense soil/soft rock, D—soft soils, and E—special soils. Most of the higher elevations in Manhattan (northern portion and surrounding Central Park) have stiff site conditions, belonging either to Class A or B. Class B areas usually have at least 5 feet of soil over the bedrock. Soft soils, Class D, occur along fault zones in Upper Manhattan (along the 125th Street fault zone), in lower Manhattan, and along the outer portions of Manhattan where landfilling has occurred. Very few areas were designated Class E (Jacobs et al. 2000). On the basis of the NEHRP class mapping by census tract presented in Jacobs et al. (2000), the Project Area is located within the NEHRP Class D. Although bedrock occurs close to the surface of the Project Area near Broadway, the majority of the Project Area appears to be located within soft soils overlying the 125th Street fault zone with a large depth to bedrock (Jacob et al. 2000).

Most of the buildings in Manhattan are unreinforced masonry structures which are the most vulnerable to damage during an earthquake because they are brittle and do not absorb motion as well as more flexible structures (e.g., wood frame or steel). The majority of buildings within the Morningside Heights-Hamilton Heights-Manhattanville area, which includes the Project Area, were masonry structures (1592 out of 1881 buildings). The NYCEM evaluation of potential building damage resulting from the scenario of an earthquake with magnitude 7.0 Richter suggested that on the basis of building type and NEHRP soil classification, approximately 35 percent of the existing structure within the Morningside Heights-Hamilton Heights-Manhattanville area would incur no damage, approximately 27 percent would have slight damage (i.e., minor

cracks), approximately 29 percent would have moderate damage (i.e., larger cracks and some connection failures), approximately 8 percent would have extensive damage (i.e., building would have significant cracks and connection failures necessitating demolition), and approximately 2 percent would have complete damage (i.e., structure is collapsed or in imminent danger of collapse [Tauntala et al. 2003]). These projections of potential building damage may actually underestimate the potential damage for the Project Area because with the exception of the Project Area, which is situated on soil with an NEHRP classification of D, most of the remaining portion of the Morningside Heights-Hamilton Heights-Manhattanville area is underlain by more stable soils designated B or C.

TERRESTRIAL RESOURCES

The majority of the land surface within the Project Area is covered with impervious surfaces (buildings, streets, and parking areas), and there is little vegetation to provide habitat for wildlife. There are few terrestrial resources within the Project Area other than occasional street trees along some sidewalk areas. Outside the Project Area, landscaped areas (trees and grass) are situated to the northeast within the Jacob H. Schiff Playground, to the east within the Manhattanville Houses area, and to the southwest and northwest within Riverside Park.

Examples of birds found within landscaped areas and successional woodlands within the New York City metropolitan region that have the potential to breed in the vegetated open space areas within the vicinity of the Project Area based on N.Y. State Breeding Bird Atlas project records for Block 5851A (1980 to 1985 and 2000 to 2004), and Block 5852C (1980 to 1985 [DEC 2004]) include pigeon (*Columba livia)*, mourning dove (*Zenaida macroura*), chimney swift (*Chaetura pelagica)*, barn swallow (*Hirundo rustica)*, blue jay (*Cyanocitta cristata)*, American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottos)*, downy woodpecker (*Picoides pubescens)*, northern flicker (*Colaptes auratus)*, eastern kingbird (*Tyrannus tyrannus)*, black-capped chickadee (*Poecile atricapillus)*, tufted titmouse (*Baeolophus bicolor)*, house wren (*Troglodytes aedon)*, song sparrow (*Melospiza melodia)*, northern cardinal (*Cardinalis cardinalis)*, red-winged blackbird (*Agelaius phoeniceus)*, gray catbird (*Dumetella carolinensis)*, American crow (*Corvus brachyrhynchos)*, European starling (*Sturnus vulgaris)*, common grackle (*Quiscalus quiscula)*, house finch (*Carpodacus mexicanus)*, and house sparrow (*Passer domesticus)*. Peregrine falcon (*Falco peregrinus*), listed by DEC as endangered in New York, is reported to breed within the vicinity of the Project Area. Other wildlife with the potential to occur within the Project Area includes gray squirrel (*Sciurus carolinensis*), mice, and other small rodents.

AQUATIC RESOURCES

The Project Area is located along the Manhattan shoreline of the Hudson River, within the Lower Hudson River Estuary, which comprises the study area for the assessment of aquatic resources. The Lower Hudson River Estuary is part of the New York/New Jersey Harbor Estuary, which also includes upper and lower New York Harbor, Arthur Kill, Kill Van Kull, East River, Raritan Bay, and Jamaica Bay. The Hudson River is the largest single freshwater input to this coastal plain estuary. The Hudson River Estuary extends approximately 150 miles upriver from the Battery to the Federal Dam at Troy, New York. The river gradient within the estuary is very low, rising only 5 feet, and is tidally influenced throughout this extent (Moran and Limburg 1986).

Salt water and tides dominate the flows and physical characteristics of the Lower Hudson River Estuary. The estuary receives salt water from Upper New York Harbor during the flood (rising)

phase of a tidal cycle, discharging less saline water to the Upper Harbor during the ebb (falling) phase (Moran and Limburg 1986). The estuary is partially stratified: More saline waters are generally found toward the bottom, and fresher waters toward the surface. However, under low freshwater flow conditions, the fresh and saline waters are generally well-mixed (Busby and Darmer 1970).

WATER QUALITY

Title 6 of the New York Code of Rules and Regulations (NYCRR) Part 703 includes surface water standards for each use class of New York surface waters. The lower Hudson River is Use Classification I saline surface waters. Best usages for Use Class I waters are secondary contact recreation and fishing. Water quality should be suitable for fish propagation and survival. Water quality standards for fecal and total coliform, DO, and pH for Use Class I waters are as follows (there are no New York State standards for chlorophyll *a* or water clarity):

- Fecal coliform—Monthly geometric mean less than or equal to 2,000 colonies/100 milliliters (mL) from five or more samples.
- Total coliform—The monthly geometric mean from a minimum of five examinations shall not exceed 10,000 colonies/100 mL.
- DO—Never less than 4 milligrams per liter (mg/L).
- pH—The normal range shall not be extended by more than 0.1 of a pH unit.

The City of New York has monitored New York Harbor water quality with an annual survey (Harbor Survey) for over 90 years. DEP evaluates surface water quality of four designated regions: Inner Harbor Area, Upper East River-Western Long Island Sound, Lower New York Bay-Raritan Bay, and Jamaica Bay. The Project Area is located along the eastern shore of the lower Hudson River, which is within the Inner Harbor Area. The Inner Harbor Region includes the lower Hudson River to the Harlem River, the East River to the Battery, the Kill Van Kull and Arthur Kill, and the Upper New York Harbor south to the Narrows (DEP 2003).

Major improvements to water quality of the Lower Hudson River Estuary, indicated by lower fecal coliform bacteria concentrations and higher dissolved oxygen concentrations, occurred in the mid- to late-1980s. These improvements were primarily due to regional decreases in municipal and industrial discharges that occurred through the construction and upgrading of WPCPs (DEP 1998 and 2003). While water quality continued to improve until the early 1990s, since that time improvements have been relatively small (DEP 2004).

Recent survey data (1999 through 2003) from the Harbor Survey station closest to the Project Area, off of West 125th Street, indicate that the water quality in this part of the lower Hudson River is good and generally meets the dissolved oxygen, fecal coliform, total coliform, and other water quality standards for Class I saline surface waters (DEC 2004) (see Table 11-1).

Temporary increases in fecal coliform concentrations may occur during wet weather due to increased fecal coliform loadings following a rain event. During the period from 1999 to 2003, fecal coliform exceeded the standard (2,000 cells/100 mL) only one time. Also during that period, DO concentrations in bottom waters rarely fell below the 4 mg/L standard for Class I waters (2 of 83 measurements) and never fell below the standard in top waters. Secchi transparency measurements taken in the area indicate that water quality in this area is often (32 of 86 measurements) impaired by reduced water transparency (e.g., Secchi transparencies of less than 3 feet).

Table 11-1
DEP Water Quality Data for the West 125th Street Sampling Station (1999–2003)

Parameter—[Class I Standard]	Top Waters			Bottom Waters		
	Low	High	Avg	Low	High	Avg
Fecal coliform (colonies per 100 mL)—[Monthly geometric mean less than or equal to 2,000 colonies/100 milliliters (mL) from five or more samples]	1	4,240*	193	1	116	41
Dissolved oxygen (mg/L)—[Never less than 4 mg/L]	4.6	13.7	7.9	2.4	12.3	6.4
Secchi transparency (ft)—[No Standard]	1	5	3.0	NA	NA	NA
Chlorophyll *a* (µg/L)—[No Standard]	0.12	47.3	5.1	NM	NM	NM
Salinity (parts per thousand)-[No Standard]	0.9	23.1	12.6	2.2	27.9	20.8
Temperature (°C)—[No Standard]	1.0	26.6	17.6	1.9	25.7	17.3

Notes:

NM = not measured, NA = not applicable.

* = Measurement was unusually high, about three times the next highest measurement of 1340 colonies per 100 mL. All other measurements were less than 1000 colonies per 100 mL.

Source: DEP 2004.

SEDIMENT QUALITY

Typical of urban watersheds, New York Harbor Estuary sediments are contaminated from a history of industrial uses in the area. Contaminants found throughout the New York Harbor Estuary include pesticides, such as chlordane and DDT; metals, such as mercury, cadmium, lead, and copper; PCBs; and various PAHs (Rohmann and Lilienthal 1987). Adams et al. (1998) found the mean sediment contaminant concentration for 50 of 59 chemicals measured in sediment samples from the New York/New Jersey Harbor Estuary to be statistically higher than other coastal areas on the East Coast. Newark Bay ranked as the most degraded area on the basis of sediment chemistry, toxicity, and benthic community, followed by the Upper Harbor, Jamaica Bay, Lower Harbor, Western Long Island Sound, and the New York Bight Apex (Adams et al. 1998). While the sediments of the New York Harbor Estuary are contaminated, the levels of most sediment contaminants (e.g., dioxin, DDT, and mercury) have decreased over the past 30 years (Steinberg et al. 2002). Between 1993 and 1998, the percentage of sediment sampling locations with benthic macroinvertebrate communities considered impacted, or of degraded quality, decreased throughout the New York/New Jersey Harbor Estuary. Within the Upper Harbor, the percentage of benthic communities considered impacted decreased significantly from 75 percent in 1993 to 48 percent in 1998 (Steinberg et al. 2004).

AQUATIC BIOTA

The New York/New Jersey Harbor Estuary, including the lower Hudson River, supports a diverse and productive aquatic community of over 100 species of finfish, more than 100

invertebrate species, and a variety of phytoplankton and zooplankton. The aquatic biota found in the Harbor Estuary are briefly described below, focusing on the lower Hudson River, which is located in the vicinity of the Project Area.

Phytoplankton are microscopic plants whose movements within the system are largely governed by prevailing tides and currents. Light penetration, turbidity, and nutrient concentrations are important factors in determining phytoplankton productivity and biomass. Diatoms, such as *Skeletonema costatum* and *Thalassiosira* spp., generally dominate the phytoplankton community, with lesser contributions from dinoflagellates and green algae (Brosnan and O'Shea 1995). While nutrient concentrations in most areas of New York Harbor are very high, low light penetration has often precluded the occurrence of phytoplankton blooms. Limited light penetration also restricts the distribution of submerged aquatic vegetation (SAV) in the Harbor. Benthic macroalgae, large multicellular algae that are important primary producers in the aquatic environment, include sea lettuce, green fleece, and brown algae (*Fucus* spp.). They occur on rocks, jetties, pilings, and sandy or muddy bottoms (Hurley 1990).

Zooplankton are an integral component of aquatic food webs; they are primary grazers on phytoplankton and detritus material, and are themselves used by organisms of higher trophic levels as food. The higher level consumers of zooplankton typically include forage fish, such as bay anchovy, as well as commercially and recreationally important species, such as striped bass and white perch during their early life stages. Crustacean taxa (copepods *Acartia tonsa*, *Acartia hudsonica*, *Eurytemora affinis,* and *Temora longicornis)* dominate the zooplankton community, with the dominant species changing in certain seasons (Stepien et al. 1981, Lonsdale and Cosper 1994, Perlmutter 1971, Lauer 1971, Hazen and Sawyer 1983).

The major groups of benthic invertebrates collected in the estuary include aquatic earthworms (oligochaetes), segmented worms (polychaetes), snails (gastropods), bivalves, barnacles, cumaceans, amphipods, isopods, crabs, and shrimp (EEA 1988, EA Engineering Science and Technology 1990, and PBS&J 1998).

New York City is located at the convergence of several major river systems, all of which connect to the New York Bight portion of the Atlantic Ocean. This convergence has resulted in a mixture of habitats in the Harbor Estuary and lower Hudson River that supports marine fish, estuarine fish, anadromous fish (which migrate up rivers from the sea to breed in freshwater), and catadromous fish (which live in freshwater but migrate to marine waters to breed).

According to Woodhead (1990), populations of numerically dominant fish within the Harbor Estuary (hogchoker, tomcod, winter flounder, white perch, and striped bass) remain relatively stable from year to year. Studies at Pier 76 south of the Project Area during the winter from 1982 to 1983, 1988, and 1992 reported that the same four species of fish (striped bass, white perch, winter flounder, and Atlantic tomcod) comprised about 88 to 90 percent of the fishes collected (EEA 1988; Stoecker et al. 1992). Although there are differences in abundance of fish among years and seasons, field investigations conducted by Able et al. (1995) in the lower Hudson River (Piers 40 and 76) in 1993 and 1994 found that the composition and distribution of fish were similar to those reported in previous studies, such as Beebe and Savidge (1988). Nine species comprised nearly 95 percent of the total number of fish collected, with juvenile striped bass the most abundant, followed by Atlantic tomcod, American eel, seaboard goby, cunner, northern pipefish, naked goby, winter flounder, and tautog (Able et al. 1995).

THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

Requests for information on rare, threatened, or endangered species within the immediate vicinity of the Project Area were submitted to USFWS, NMFS, and DEC NYNHP. Appendix E.2 contains the responses received from DEC, USFWS, and NMFS. The NMFS indicates that the endangered shortnose sturgeon (*Acipenser brevirostrum*) may occur in the Hudson River within the vicinity of the Project Area as a transient (Rusanowsky 2004). No threatened or endangered species, or species of special concern under the authority of the USFWS, were identified in the vicinity of the Project Area (Stilwell 2004). The NYNHP reports two species as occurring within the vicinity of the Project Area: the New York State- and federally-listed endangered shortnose sturgeon and the New York State-listed endangered peregrine falcon (*Falco peregrinus*) (Ketcham 2004).

The shortnose sturgeon is an anadromous bottom-feeding fish that can be found throughout the Hudson River system. These fish spawn, develop, and overwinter well upriver of the Project Area, and prefer colder, deeper waters for all life stages. Individuals are only expected to use the lower Hudson River when traveling to or from the upriver spawning, nursery, and overwintering areas. The Hudson River below the Tappan Zee is not considered optimal shortnose sturgeon habitat (Bain 2004).

The Hudson River shortnose sturgeon population was recently estimated to contain approximately 61,000 fish (Peterson and Bain 2002). These studies show that the population has increased approximately 450 percent since the 1970s. Size and body condition of the fish caught in these studies indicate the population is primarily healthy, long-lived adults. Although larvae can be found in brackish areas of the river, the juveniles (fish ranging from 2 to 8 years old) are predominately confined to freshwater reaches above the downstream saline area. The primary summer habitat for shortnose sturgeon in the middle section of the Hudson River Estuary (far upriver of the Project Area) is the deep river channel (13 to 42 meters deep, 43 to 138 feet). The river channel downstream of this middle estuary area is 18 to 48 meters deep (59 to 157 feet) (Peterson and Bain 2002).

Out of the more than 1,000 trawls taken in the Westway study in both the Hudson and East Rivers, only one shortnose sturgeon was collected. This individual was collected in a deep water habitat near the Peekskill-Haverstraw section of the Hudson River. Long-term Hudson River monitoring data, collected by the New York utilities and others since the 1970s, have also indicated that shortnose sturgeon inhabit deep-water habitats and occur in greatest abundance north of the Tappan Zee. Hoff et al. (1988 in Bain 1997) reported most captures of adult shortnose sturgeon during river monitoring of fish distributions by the Hudson River electric utilities from 1969 to 1980 occurred between river kilometers (km) 38 to 122 (from near the New York–New Jersey border up to near Poughkeepsie). Distribution of egg, embryo, and larva is similarly upriver of the Project Area. EEA (1988) and EA (1990) did not collect any shortnose sturgeon during multi-year sampling of interpier and underpier habitats in the lower Hudson River. No sturgeon were found in interpier areas of the Hudson River Park sampled between June 2002 and March 2004 (Meixler et al. 2003, Cornell University 2004).

Peregrine falcons nest on ledges and small shallow caves on high cliff walls, man-made platforms, or in urban areas on bridges and tall buildings. In the New York City area, courtship occurs in February and March, with egg laying in April and May. Peregrine falcons typically return to the same nest every year. A nesting site is located within about 2,000 feet (0.4 miles, or 0.6 kilometers) of the Project Area. This nesting site has been active since 1989 and hatched four chicks in 2004 (Loucks 2004). Coordination with DEC's NYNHP has been conducted regarding

the peregrine falcon nest, and additional coordination would be conducted prior to the anticipated start of construction.

SIGNIFICANT COASTAL FISH AND WILDLIFE HABITAT

NYSDOS has designated 15 Significant Coastal Fish and Wildlife Habitats within New York City, one of which—the Lower Hudson Reach—is within the vicinity of the Project Area. The Lower Hudson Reach is the portion of the Hudson River starting from Battery Park at the southern tip of Manhattan and extending north to Yonkers in the vicinity of Glenwood. This area runs for 19 miles and includes deep water, shallows, piers, and interpier basins. The Lower Hudson Reach was designated a Significant Coastal Fish and Wildlife Habitat because it provides an important wintering habitat for young-of-the-year, yearling, and older striped bass. Significant numbers of other fish species and waterfowl also use the Lower Hudson Reach (NYSDOS 1992). USFWS (1997) has also designated the Lower Hudson River Estuary (from the Battery at the southern tip of Manhattan up to Stony Point at river mile 41) as a Significant Habitat Complex because it is a regionally significant nursery and wintering habitat for a number of anadromous, estuarine, and marine fish species, including striped bass, and is a migratory and feeding area for birds and fish that feed on the abundant fish and benthic invertebrate resources found in this portion of the estuary.

E. 2015 FUTURE WITHOUT THE PROPOSED ACTIONS

FLOODPLAINS AND WETLANDS

The West Harlem Waterfront park is the only project being evaluated in the future without the Proposed Actions that is within the 100-year floodplain. Located in the Other Area west of Marginal Street, this park is being created from a City-owned parking lot between St. Clair Place and West 133rd Street. It is expected to be completed in 2008. This planned open space underwent separate environmental review and permitting and is being undertaken independent of the Proposed Actions. This open space will include landscaped walking and biking paths, a recreation pier, an ecological platform, several passive recreation areas that include lawns and sitting areas, links to the Manhattan Waterfront Greenway, construction of two new piers to allow docking for recreational excursions and ferry boats, and a small multi-purpose building. It is assumed that these open space elements will be constructed with appropriate stormwater management measures and in accordance with the permitting conditions issued for the project by USACE and DEC. Because the park is being constructed in an area already covered by impervious surface, the development of this open space area is not expected to exacerbate flooding conditions in the floodplain or increase flooding in surrounding areas. The potential for adverse impacts on wetlands within the West Harlem Waterfront park has been evaluated through the environmental review and permitting process, and mitigation measures have been developed to minimize adverse impacts on tidal wetlands.

GROUNDWATER

The projects that could be developed in the Project Area in the future without the Proposed Actions by 2015 (described above in “Methodology”) are not expected to result in a change in the existing groundwater quality or discharge to the Hudson River.

EARTHQUAKE POTENTIAL

The projects that could be developed in the Project Area in the future without the Proposed Actions by 2015 would be designed in accordance with the New York City Building Code to reduce earthquake or seismic risk. Therefore, these projects would not result in an increased earthquake hazard to residents of New York City.

TERRESTRIAL RESOURCES

The future without the Proposed Actions in the Project Area is anticipated to be a continuation of existing conditions with the exception of the West Harlem Waterfront park, renovations to the existing Studebaker Building, development of a new public secondary school and administrative space for Columbia University, use of the existing former Warren Nash Service Station building by Columbia University, and redevelopment/renovation of the two sites for commercial use at Twelfth Avenue and West 133rd Street and the corner of Twelfth Avenue and West 135th Street.

Vegetation planted in the landscaped passive recreation areas of the West Harlem Waterfront park, described in the previous section, would have the potential to provide limited wildlife habitat to wildlife species that tolerate urban conditions. Examples may include birds listed as breeding within the vicinity of the Project Area as described above in "Existing Conditions," such as mourning dove, American robin, pigeon, sparrow, and chimney swift, as well as small mammals, such as squirrels, mice, and other rodents.

As described in Chapter 2, outside the Project Area, Columbia will develop the property in its control south of West 125th Street in accordance with current zoning regulations. The low-rise portion of 560 Riverside Drive along West 125th Street may be renovated to provide a building entrance in this location. Columbia also proposes to develop an academic building at the southwest corner of Broadway and West 125th Street. These projects would not be expected to affect terrestrial resources.

AQUATIC RESOURCES

OTHER PROJECTS WITHIN THE PROJECT AREA

With respect to aquatic resources, the West Harlem Waterfront park would not be expected to result in significant adverse impacts on water quality or aquatic resources. A separate environmental review and permitting of the West Harlem Waterfront park has been completed, and those reviews concluded that the project will not result in significant adverse impacts on water quality or aquatic resources. Aquatic habitat enhancement measures, such as the placement of reefballs within the Hudson River at the project site, will enhance the diversity of fish habitat available within this portion of the Hudson River and minimize the potential for adverse impacts on aquatic resources. Therefore, aquatic resources present within the Project Area in 2015 in the future without the Proposed Actions, after the West Harlem Waterfront park is completed and operational, would be expected to be similar to that described above in "Existing Conditions."

OTHER PROJECTS OUTSIDE THE PROJECT AREA

There are several proposed and ongoing projects aimed at improving water quality and aquatic resources in the New York/New Jersey Harbor Estuary that have the potential to result in water quality and aquatic habitat improvements in the lower Hudson River, the study area for the assessment of potential effects to aquatic resources. These projects are independent of the

Proposed Actions. Improvements that would result from these projects, described below, would occur without the Proposed Actions and are expected to continue through the construction and operation of the Proposed Actions in 2015 and 2030. In addition to these water quality and habitat improvement projects, other proposed projects, such as the proposed Hudson Yards project in West Midtown Manhattan, have the potential to affect water quality and aquatic resources, as discussed below.

New York/New Jersey HEP Projects

Several of the future water quality improvement efforts in the Lower Hudson River Estuary will be coordinated by the New York/New Jersey Harbor Estuary Program (HEP). The Final Comprehensive Conservation and Management Plan (CCMP [NY/NJ HEP 1996]) for the HEP included a number of goals to improve water quality and aquatic resources in the area. The CCMP outlines objectives for the management of toxic contamination, dredged material, pathogenic contamination, floatable debris, nutrients and organic enrichment, and rainfall-induced discharges. The HEP Habitat Workgroup has developed watershed-based priorities for identifying acquisition, protection, and restoration sites for the preservation and enhancement of tidal wetlands that will provide improved habitat for fish and macroinvertebrates as well as the birds, mammals, and reptiles that depend on these habitats. No NY/NJ HEP Acquisition and Restoration Sites have been identified within the Project Area. NY/NJ HEP Acquisition and Restoration Sites closest to the Project Area include Inwood Hill Park, Fort Tryon Park, and Fort Washington Park on the northern end of Manhattan. NY/NJ HEP actions taken with respect to these sites would occur with or without the Proposed Actions.

The Contamination Assessment and Reduction Project (CARP), sponsored by the Port Authority of New York and New Jersey (PANYNJ), is a component of HEP focused on understanding the fate and transport of contaminants discharged to the estuary, and using this information to develop measures that may be necessary to reduce sediment contamination. The principal chemicals of concern include dioxins/furans, PCBs, PAHs, metals (mercury, cadmium, and lead), and pesticides (dieldrin and chlordane). Continued research and monitoring programs are anticipated to play a role in the development of future management strategies for Harbor sediments (NY/NJ HEP undated, USACE 1999).

State and Regional Projects

The Hudson-Raritan Estuary Ecosystem Restoration Project is a cooperative project being led by USACE that was funded by a U.S. House of Representatives Resolution on April 15, 1999. PANYNJ is a co-sponsor of this project. Other agencies involved in this project include EPA, USFWS, National Oceanic and Atmospheric Administration (NOAA), National Resource Conservation Service, NJDEP, New Jersey Department of Transportation (Office of Maritime Resources), DEC, NYSDOS, DEP, DPR, and New Jersey Meadowlands Commission. The focus of the study is to identify the actions needed to restore the Hudson-Raritan Estuary and develop a plan for their implementation. The study area for the program includes all the waters of New York and New Jersey Harbor and the tidally influenced portions of all rivers and streams that empty into the Harbor and ecologically influence the Harbor. The program will identify measures and plans to restore natural areas within the estuary and enhance their ecological value, and address habitat fragmentation, and past restoration and mitigation efforts that were piecemeal in nature. Thirteen initial representative restoration sites in New York and New Jersey have been targeted as the first sites for inclusion as potential restoration projects for feasibility level analysis. It is anticipated that expedited restoration of these representative restoration sites

will provide substantial immediate value to the ecosystem. None of these sites occurs in the vicinity of the Project Area. Therefore, actions taken by the Hudson-Raritan Estuary Ecosystem Restoration Project with respect to these sites would occur with or without the Proposed Actions.

The New York sites include:

- Alley Pond Park, bordering western Long Island Sound;
- Old Place Creek, a tributary to the Arthur Kill;
- Newtown Creek, a tributary to the lower East River;
- Brookville Creek, a tributary to Jamaica Bay;
- Dreier Offerman Park, bordering Coney Island Creek near the Narrows;
- Sherman Creek, a tributary to the Harlem River;
- Pelham Lagoon and Turtle Cove, a tributary to western Long Island Sound; and
- Tallapoosa, a tributary to western Long Island Sound.

In addition to the 13 representative sites, three spin-off sites have been identified. These are restoration sites being evaluated in parallel to the representative sites. They include the Lower Passaic River and Hackensack Meadowlands in New Jersey, and Gowanus Canal in New York, a tributary to the Upper New York Bay.

The Comprehensive Port Improvement Plan (CPIP), sponsored by PANYNJ, is a multi-agency plan for implementing economic development and environment improvement decisions for PANYNJ. Among the priority objectives for the plan are the identification and protection of significant habitats, the investigation of innovative best management practices for reduction of non-point sources of water pollutants, and the incorporation of green technologies in port improvement projects.

DEC and NJDEP, in coordination with the Interstate Environmental Commission (IEC), will continue to develop TMDLs and to identify priority waterbodies in bi-annual 305(b) reports to EPA. TMDLs, once implemented, will reduce the daily inputs of various contaminants in an effort to improve water quality. New York State provided $255 million to implement wastewater improvements, nonpoint source abatement, and aquatic habitat restoration projects in 1998. The State intends to continue water quality improvement projects in the Harbor for the foreseeable future.

DEP Projects

EPA's National CSO Strategy of 1989 requires states to eliminate dry weather overflows of sewers, meet federal and State water quality standards for wastewater discharges, and minimize impacts on water quality, plant and animal life, and human health. CSOs are the largest single source of pollutants and pathogens to the New York Harbor. DEP has taken several steps in recent years to mitigate discharges from CSOs, which, in combination with improvements that have been made to WPCPs, and the ongoing Comprehensive City-Wide Floatables Abatement Plan, are expected to result in future improvement in coliform, dissolved oxygen, and floatables levels in the New York Harbor area. The Multi-Year Intended Use Plan of the New York City Municipal Water Financing Authority has identified several CSO improvement and abatement projects, which will be completed by 2010. As required by EPA's CSO Control Policy, DEP initiated the development of the Long Term Control Plan (LTCP) Project in 2004. The LTCP Project will integrate CSO Facility Planning Projects and the Comprehensive City-Wide Floatables Abatement Plan,

incorporate ongoing Use and Standards Attainment Program (USA) Project work, and will develop Waterbody/Watershed Facility Plan Reports and the LTCP for each waterbody area, including the Hudson River. The LTCP Project monitors and assures compliance with applicable Administrative Consent Orders between DEC and New York City for the CSO Abatement Program. Additionally, DEP plans to increase identification and control of pollutants of concern, including mercury, PCBs, and solvents.

Other Projects

Other proposed projects located outside the Project Area, but within the drainage area serviced by the North River WPCP, have the potential to affect aquatic resources of the Hudson River in the vicinity of the Project Area in 2015 without the Proposed Actions. Such projects would include those that would result in development of new uses and uses with greater densities. These projects have the potential to result in greater water volume needs and sewage discharges to the combined sewer system than current uses, and have the potential to result in increased sewage discharge to the Hudson River from CSOs, which may affect water quality in the Hudson River. Projects that have been proposed or land use changes that have the potential to occur within the North River WPCP drainage area were included in the assessment of future conditions without the Proposed Actions in 2015 are as follows:

- The proposed No. 7 Subway Extension—Hudson Yards project, located about 5 miles (8 kilometers) to the south of the Project Area on the western shoreline of Manhattan. The New York City Planning Commission (CPC) and the Metropolitan Transportation Authority (MTA) propose to promote the transit-oriented redevelopment of the Hudson Yards area (generally bounded by West 43rd Street on the north, Hudson River Park on the west, West 28th and West 30th Streets on the south, and Seventh and Eighth Avenues on the east) through: zoning and related land use actions that would allow more intensive commercial and residential development; a new midblock boulevard between Tenth and Eleventh Avenues, and significant new open spaces; the extension of the No. 7 subway line from Times Square to a new terminus at Eleventh Avenue and West 34th Street; and expansion of the Jacob K. Javits Convention Center and construction of a new Convention Center hotel. The development of a new multi-use facility is no longer expected to occur in the future. MTA and CPC evaluated the potential environmental impacts from the Hudson Yards project in a separate Generic Environmental Impact Statement (GEIS [MTA and CPC 2004]).
- DEP projections of future sewage flows within the North River WPCP drainage for 2015 and 2030.

Appendix E.1 presents a detailed discussion of water quality modeling conducted to assess potential impacts on water quality and aquatic resources in 2015 and 2030 in the future with and without the Proposed Actions. In 2015, the components of the proposed Hudson Yards project expected to be completed and operating include the No. 7 subway extension, convention center expansion, and moderate levels of commercial and residential development. The projected increase in sewage flow to the North River WPCP from to the Hudson Yards project would be approximately 1.1 mgd[1]. DCP considered the Hudson Yards project and the Columbia

[1] The FEIS water quality modeling is conservative, because the population projections developed by DCP that were used as a basis for DEP dry weather flow projections already account for the increased populations from Columbia Manhattanville project.

Manhattanville project in the population projections for 2015 that were used by DEP to develop projections of future sanitary sewage flows for the North River WPCP. The DEP projected average dry weather (sanitary flow) daily flow to the North River WPCP in 2015 developed on the basis of DCP population projections within the North River WPCP drainage is 125 mgd. The projected average daily flow, which includes sanitary and wet weather flow, to the North River WPCP in 2015 is 133.0 mgd. This includes DEP's estimate of 8 mgd[1] of wet weather flow to the North River WPCP.

As determined by modeling analysis and presented in Appendix E.1, the projected increase in average daily flow in 2015 without the Proposed Actions would not affect compliance of the North River WPCP effluent with the SPDES permit limits. Changes to water quality parameters (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform) within the vicinity of the North River WPCP would be minimal, and the water quality within the Hudson River would continue to meet the Use Class I water quality standards, although the minimum bottom water DO concentration may occasionally drop below the 4 mg/L water quality standard and exceed the DEC guidance value for mercury for the DEP Harbor Survey monitoring station of West 155th Street, near the North River WPCP, as it does currently under the existing condition.

The evaluation of water quality of the Hudson and Harlem Rivers from CSOs in the 2015 future without the Proposed Actions was based on the projected pollutant loadings per CSO event and projected CSO volumes for 2015. As presented in Chapter 14, the regulator receiving sanitary sewage and stormwater from the Project Area overflows about 27 times per year and discharges about 73.6 mgy of combined sewage into the Hudson River. In 2015 future without the Proposed Actions the number of CSO events is not expected to increase above 27 per year. The projected additional CSO volumes discharged to the Hudson and Harlem Rivers in 2015 without the Proposed Actions were estimated at approximately 1.3 mgy. Therefore, the volume of CSO is expected to increase to 74.9 mgy from existing conditions. The volume increase is due to the projected background growth in population and sanitary sewage within the regulator's service area. Projected incremental changes to water quality parameters (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform) within the Hudson and Harlem Rivers due to projected loadings from CSOs would be minimal. Both the Hudson and Harlem Rivers would continue meet the standards established for Class I waters.

F. 2015 FUTURE WITH THE PROPOSED ACTIONS

FLOODPLAINS AND WETLANDS

The Academic Mixed-Use Area (Subdistrict A), Subdistrict C, and the Other Area east of Broadway are not within the 100-year floodplain. Therefore, development in these portions of the Project Area that would be completed by 2015 would not affect the floodplain.

Subdistrict B along the Hudson River is within a portion of the 100-year floodplain, primarily west of the Amtrak Empire rail line. This portion of the Project Area is already covered with impervious surface. Therefore, development within Subdistrict B facilitated by the Proposed

[1] New York City Department of Environmental Protection (DEP), Bureau of Wastewater Treatment, Process Engineering Section Operating Data Fiscal Year 2005, November 2005.

Actions[1] would not increase the amount of impervious surfaces within this portion of the Project Area. The Proposed Actions would not adversely affect the floodplain's ability to contain flood waters or exacerbate flooding conditions within the Project Area or its immediate vicinity. As a result, there would be no significant impacts from development activities in the floodplain resulting from the Proposed Actions. In addition, as outlined in Appendix K.5 (memoranda prepared by Golder Associates, Inc. and Mueser Rutledge Consulting Engineers), after establishing design groundwater and flood levels for the Proposed Actions, these design water levels will be incorporated into the project's foundation designs. With these measures, no significant adverse impacts from flooding are expected on the Proposed Actions' below-grade facility.

The only portion of the Project Area containing wetlands, the Other Area west of Marginal Street along the Hudson River, will be developed for the West Harlem Waterfront park (see "2015 Future Without the Proposed Actions," above), which has undergone separate environmental review and permitting. The only element of the Proposed Actions with the potential to affect tidal wetlands (littoral zone) in this portion of the Project Area is the connection to the existing outfall to discharge stormwater if the portion of the proposed new storm sewer system on West 130th Street is operational in 2015. These activities would not be expected to result in significant adverse impacts on wetland resources. The connection to the existing outfall would require a new SPDES permit from DEC for stormwater discharge into the Hudson River.

GROUNDWATER

Development expected by 2015 in the Academic Mixed-Use Area, including approximately 22,355 square feet (sf) of publicly accessible open space, is not expected to result in significant adverse impacts on groundwater resources or flow patterns. Construction of the buildings would result in the removal or capping of contaminated soils and historic fill, minimizing the potential for adverse impacts on groundwater quality. Although construction of a small portion of the slurry walls that may be developed by 2015 would have the potential to modify groundwater flow pattern in the immediate vicinity of the wall, groundwater discharge to the Hudson River would not be adversely affected. Groundwater would be expected to flow around the slurry wall and then continue toward the Hudson River.

EARTHQUAKE POTENTIAL

In accordance with the New York City Building Code, the buildings and other structures constructed by 2015 as part of the Academic Mixed-Use Development must be designed to resist the effects of seismic ground motions with a peak acceleration of 0.15g, taking into account the site geology (i.e., bedrock type, depth to bedrock, soil type, etc.) characterized through on-site geotechnical borings. Where competent rock is not exposed, piles would be driven for the building foundations. Excavation below the ground surface for the development of the slurry walls and building foundations within the Academic Mixed-Use Area would range from less

[1] As described earlier, CPC is contemplating certain modifications to Subdistrict B that would not result in any projected development sites in Subdistrict B. The proposed modifications are more fully described in Chapter 29, "Modifications to the Proposed Actions."

than 50 feet to approximately 120 feet or more. The presence of the 125th Street Fault zone within the Project Area will be further assessed during the detailed geotechnical evaluations performed prior to the design of the buildings to establish site-specific seismic design parameters (see Appendix K.5).

The construction and operation of the Academic Mixed-Use Development would not be expected to result in an increased earthquake hazard to residents of New York City or result in adverse impacts on the environment. Through the removal of existing buildings, many of which are unreinforced masonry structures that are susceptible to damage from seismic events, and construction of new structures that are in compliance with and may potentially exceed the New York City Building Code's seismic design requirements, the Proposed Actions would be expected to result in a decreased earthquake hazard within the Project Area.

TERRESTRIAL RESOURCES

Construction of the Academic Mixed-Use Development in 2015 could have the potential to result in the removal of some existing street trees. These trees would be removed and replaced in accordance with permits issued by DPR. However, the approximately 22,355 sf of publicly accessible open space would be designed to allow landscaping, which would result in increased vegetation resources within the Academic Mixed-Use Area and the amount of potential habitat available to birds and other wildlife. Species expected to use these areas would be similar to those discussed above in "Existing Conditions." The maximum heights allowed for the five buildings that would be constructed in the Academic Mixed-Use Area in 2015 would range from 120 feet (160 feet with mechanical) to 190 feet (230 feet with mechanical [see Figure 1-8]). These building heights would not exceed those of surrounding buildings (230 to 325 feet [see Figures 1-14 and 1-15]), and would not be expected to result in an increased loss of migratory birds due to building collisions.

As presented in Chapter 19, air emissions from the proposed central energy plants and package boilers proposed at various locations to provide heating and cooling to the new buildings in the Academic Mixed-Use Area in 2015 would not result in violations of National Ambient Air Quality Standards (NAAQS) or increases in concentrations above EPA-defined significant impact levels. Additionally, emissions of fine particulate matter would not result in significant adverse air quality impacts. Therefore, potential air emissions from the proposed energy plants and package boiler systems would not be expected to result in significant adverse impacts on terrestrial resources.

Redevelopment is expected to have been completed in the remaining Subdistricts (B, C, and the Other Areas) by 2015. As with the Academic Mixed-Use Area, construction activities have the potential to result in the loss of some street trees, which would be replaced in accordance with DPR requirements. Any landscaping associated with redevelopment activities would also have the potential to increase wildlife habitat.

AQUATIC RESOURCES

Construction activities in the Academic Mixed-Use Area and any construction resulting from the Proposed Actions in Subdistricts B, C, and the Other Areas have the potential to temporarily affect water quality of the Hudson River where stormwater is discharged. During Phase 1 construction activities, stormwater generated within the Project Area would be discharged to the municipal combined sewer system and would only be discharged directly to the Hudson River during CSOs. During Phase 2 construction activities (2015 and 2030), some stormwater

generated within the Project Area would be discharged to the municipal combined sewer system (only discharged directly to the Hudson River during CSOs), and some stormwater would be directed toward the existing CSO outfall at the western terminus of St. Clair Place. Construction specifications for facilities in the Academic Mixed-Use Development, as well as those facilitated by the Proposed Actions in remaining portions of the Project Area, would include erosion and sediment control measures as part of a SWPPP and would minimize potential impacts on the municipal combined sewer system and the Hudson River associated with stormwater runoff. The construction of slurry walls prior to conducting excavation and construction for below-grade structures would minimize the need for dewatering. Any groundwater recovered during construction of below-ground facilities would be treated, as necessary, before being discharged to the combined sewer system. Therefore, no significant adverse impacts on surface water quality of the Hudson River would be expected to occur during the construction of the Proposed Actions.

Appendix E.1 presents a detailed discussion of water quality modeling conducted to assess potential impacts on water quality and aquatic resources in 2015 and 2030 from the discharge of stormwater and sanitary sewage to the municipal combined sewer system. As described above, in 2015 without the Proposed Actions, the projected average daily flow (sanitary and wet weather) to the North River WPCP is 133.0 mgd. With the Proposed Actions, the components of the reasonable worst-case development scenario expected to be completed and operating within the Academic Mixed-Use Area in 2015 (described in Chapter 2) would result in an additional discharge of approximately 0.20 mgd to the municipal combined sewer system. This would bring the projected average daily flow to the North River WPCP to 133.2 mgd. The total estimated sanitary sewage discharge from the Proposed Actions in 2015 would represent only about 0.12 percent of the North River WPCP's permitted daily flow limit of 170 mgd.

As presented in Appendix E.1, the small additional increase to sanitary sewage flow from the Proposed Actions, when added to the DEP projections of future sanitary sewage flows developed from DCP population projections, would not adversely impact the North River WPCP. The projected concentrations for average daily flow, five-day carbonaceous biological oxygen demand ($CBOD_5$), $CBOD_5$ removal, TSS, percent suspended solids removal and fecal coliform counts would be well within the SPDES permit limits authorized for the plant. The increased effluent discharge from the North River WPCP in the 2015 future with the Proposed Actions would result in minimal or no projected changes to the Hudson River water quality parameters evaluated (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform). The projected concentrations of these parameters would be well within the standards set for Class I waters.

The small projected increase in sanitary sewage volume in 2015 due to the Proposed Actions, combined with the increases evaluated under 2015 future without the Proposed Actions conditions, would not be expected to result in an adverse impact to Hudson River or Harlem River water quality due to CSOs. The Proposed Actions would not result in a significant increase in the projected annual loadings of TSS, $CBOD_5$, total nitrogen, total phosphorus, total fecal coliform, zinc, lead, or copper. Loadings were estimated from concentrations of these same parameters measured in the sanitary sewage entering the North River WPCP for 2005 combined with concentrations of the same parameters in stormwater runoff estimated from historical concentrations (HydroQual 1991).

2015 WITH PARTIAL STORMWATER SYSTEM

As presented in Appendix E.1, if the proposed separate storm sewer within West 130th Street was operational in 2015, the projected increase in sanitary flow in 2015 future with the Proposed Actions would result in a decrease in CSO volume when compared with the 2015 future without the Proposed Actions. The separate storm sewer on West 130th Street would receive stormwater runoff from a 3.9-acre area (encompassing the southern portion of the block to the north of West 130th Street, and the northern portion of the block to the south of West 130th Street). The proposed storm sewer would divert approximately 3.2 million gallons annually from the combined sewer system. The volume of CSO would decrease from the 2015 future without the Proposed Actions by an amount smaller than the volume of stormwater diverted to the new stormwater system, approximately 0.6 mgy. The factors contributing to this smaller reduction in annual CSO volume are as presented below.

- Not all of the stormwater currently discharged to the combined sewer system from the 3.9-acre area is discharged to the Hudson or Harlem Rivers through CSOs. This is because individual regulators can generally divert between 1.5 and 2 times the peak design dry weather flow into the interceptor system. It is only when the flow exceeds this amount that flow is diverted into a CSO outfall. Additionally, the interceptor sewer system in the North River WPCP has the capacity to hold a significant amount of sanitary waste and stormwater runoff and convey this flow to the WPCP.
- Even though the inflow from a small portion of the drainage area is reduced, the regulator receiving the stormwater runoff from the 3.9-acre area is also influenced by other factors (e.g., water level in the interceptor sewers, peak inflow to the regulator with and without the Proposed Actions, etc.) that affect the reduction in CSOs in that regulator.

The frequency of CSO events is not expected to change, remaining at 27 per year. The resulting incremental increase in pollutant loadings (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform) to the Hudson River from those projected for the 2015 future without the Proposed Actions conditions would be minimal. As demonstrated by modeling analysis, these minimal increases would result in water quality conditions that are essentially the same as the 2015 future without the Proposed Actions conditions, and would not result in water quality conditions that fail to meet Class I standards. The exception may be the continuation of occasional bottom water DO concentrations below the 4.0 mg/L standard that occur at the Harbor Survey station near the North River WPCP.

If operational in 2015, stormwater collected by the new storm sewer on West 130th Street would be discharged through an existing CSO outfall at the western terminus of St. Clair Place. As presented in Appendix E.1, the estimated annual pollutant loads (i.e., total nitrogen, total phosphorous, total suspended solids, copper, lead, and zinc) from the operation of this portion of the new storm sewer system in 2015 are expected to be small, and would not be expected to result in significant adverse impacts on water quality or aquatic biota, or result in adverse impacts on the aquatic habitat enhancement measures implemented as part of the West Harlem Waterfront park project. The new storm sewers would be expected to include measures to contain floatables (e.g., catchbasins with sump and hood), and to trap sediment and oil (e.g. catchbasins with hydrodynamic separators). The connection to the existing outfall would require a new SPDES permit from DEC for stormwater discharge into the Hudson River.

2015 WITHOUT PARTIAL SEPARATE STORMWATER SYSTEM

For the 2015 future with the Proposed Actions and without the partial stormwater system, the number of CSO events would increase by one at NR 43, and the volume of CSO would increase by approximately 0.3 mgy at regulator NR 43 when compared with future conditions in 2015 without the Proposed Actions. The overall increase of CSO in the North River WPCP service area is predicted to be 0.46 mgy greater than without the Proposed Actions, out of a total CSO volume (at all regulators in the North River WPCP service area) of 493.68 mgy. The resulting incremental additional CSO pollutant loadings would be extremely small and would result in projected concentrations of these water quality parameters essentially identical to those projected for the 2015 future without the Proposed Actions. Water quality in the Hudson and Harlem Rivers would continue to meet the Class I water quality standards in the 2015 future with the Proposed Actions without the separate stormwater system except for the absolute minimum DO as a result of the existing conditions being below the standard.

As discussed in Chapter 14, Columbia University's continued policy prohibiting the discharge of liquid chemical or radiological waste into the public sewer system would further minimize potential impacts on surface water and aquatic biota from the operation of the Academic Mixed-Use Development. The central energy plants and smaller package boiler systems proposed at various locations to provide heating and cooling to the new buildings in the Academic Mixed-Use Area would not result in discharges to the Hudson River and would not affect aquatic resources. Potential air emissions from the proposed energy plants and package boiler systems would not be expected to result in significant adverse impacts on aquatic resources. As presented in Chapter 19, air emissions from the proposed central energy plants and package boilers would not result in violations of NAAQS or increases in concentrations above EPA-defined significant impact levels. Additionally, emissions of fine particulate matter would be below the City's current significant impact thresholds. Therefore, the Proposed Actions would not adversely impact water quality or aquatic biota in the Lower Hudson River Estuary in 2015.

THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

If the portion of the proposed new separate storm sewer on West 130th Street is operational in 2015, stormwater collected by this storm sewer would discharge through the existing CSO outfall at the western terminus of St. Clair Place. Discharge of stormwater from the existing CSO outfall in 2015 would not result in any significant adverse impacts on water or sediment quality. Therefore, no adverse impacts would occur to the New York State and federally listed endangered shortnose sturgeon identified as occurring within the Hudson River in the vicinity of the Project Area. According to DEC (Loucks 2004), the active New York State-listed endangered peregrine falcon nest is far enough away from the Project Area (about 2,000 feet) that it would not be adversely affected by the Proposed Actions. Additional coordination with NYNHP would be conducted for the peregrine falcon nest prior to the anticipated start of Phase I construction in 2008.

SIGNIFICANT COASTAL FISH AND WILDLIFE HABITAT

The Proposed Actions would not include any in-water activities and would not result in adverse impacts on water quality or sediment quality. Therefore, adverse impacts would not be expected to occur to the Lower Hudson Reach Significant Coastal Fish and Wildlife Habitat.

G. 2030 FUTURE WITHOUT THE PROPOSED ACTIONS

By 2030, the future without the Proposed Actions in the Project Area is anticipated to be a continuation of the 2015 future without the Proposed Actions conditions. As described in Chapter 2, no specific developments have been identified in the study area for completion by the 2030 analysis year.

FLOODPLAINS AND WETLANDS

The floodplain and wetland resources within the Project Area in the 2030 future without the Proposed Actions would be a continuation of the 2015 future without the Proposed Actions conditions described above in "2015 Future Without the Proposed Actions."

GROUNDWATER

The groundwater resources within the Project Area in the 2030 future without the Proposed Actions would be a continuation of the 2015 future without the Proposed Actions conditions described above in "2015 Future Without the Proposed Actions."

EARTHQUAKE POTENTIAL

All projects that may be developed within the Project Area in 2030 without the Proposed Actions would be designed in accordance with the New York City Building Code to reduce earthquake or seismic risk. Therefore these projects would not result in an increased earthquake hazard to residents of New York City.

TERRESTRIAL RESOURCES

Because no additional projects are projected to occur within the Project Area after 2015, terrestrial resources present within the Project Area in 2030 without the Proposed Actions would be a continuation of those described above in "2015 Future Without the Proposed Actions."

AQUATIC RESOURCES

OTHER PROJECTS WITHIN THE PROJECT AREA

Aquatic resources within the Project Area in 2030 without the Proposed Actions would be a continuation of those described above in "2015 Future Without the Proposed Actions."

OTHER PROJECTS OUTSIDE THE PROJECT AREA

New York/New Jersey HEP, State, Regional, and City Projects

Many of the ongoing projects described above in "2015 Future Without the Proposed Actions" would be expected to continue to 2030, resulting in additional improvements to water quality and aquatic habitat conditions in the Lower Hudson River Estuary. Habitat restoration projects completed by 2030, such as those proposed by the HEP or the Hudson Raritan Estuary Ecosystem Restoration Project, would also result in improved habitat for terrestrial wildlife such as waterfowl and wading birds. Improvements to the New York City WPCPs, completion of DEP's CSO LTCP Project anticipated for 2017, and implementation of measures included in the LTCP by future project developers would also contribute to improved water quality.

Other Projects

As discussed above in "2015 Future Without the Proposed Actions," proposed projects located outside the Project Area, but within the service area serviced of the North River WPCP, would continue to have the potential to affect aquatic resources of the Hudson River in the vicinity of the Project Area in 2030 without the Proposed Actions. Such projects would include those that would result in development of new uses and uses with greater densities and therefore greater water volume needs and sewage discharges to the combined sewer system than current uses. These increased sewer discharges have the potential to result in increased CSOs, which may affect water quality in the Hudson River. Projects that have been proposed or land use changes that have the potential to occur within the North River WPCP drainage area that would result in increased sewage discharge to the combined sewer and were included in the assessment of future conditions without the Proposed Actions in 2030 are as follows.

- The continued development of the proposed Hudson Yards project, described above in "2015 Future Without the Proposed Actions"; and
- Projected increases in sanitary sewage discharge due to projected population increases within the North River WPCP drainage.

Appendix E.1 presents a detailed discussion of water quality modeling conducted to assess potential impacts on water quality and aquatic resources in 2015 and 2030 in the future with and without the Proposed Actions. In 2030, redevelopment within the Hudson Yards area would be completed, with new residential, commercial, and recreation uses served by new subway stations, a midblock park and boulevard system and other open spaces, and a fully expanded convention center. On the basis of DCP population projections within the North River WPCP service area for 2030, DEP projected an average dry weather flow of 132.0 mgd to the North River WPCP. DCP considered the Hudson Yards project and the Columbia Manhattanville project in the 2030 population projections. When the DEP-estimated wet weather contribution of 8 mgd is added to the expected dry weather flow, the projected average daily flow to the North River WPCP would be 140 mgd. The increased sewage flow to the North River WPCP would not cause the plant effluent to be out of compliance with the SPDES permit limits for the plant. Changes to water quality parameters (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform) within the vicinity of the North River WPCP would be minimal. Water quality within the Hudson River would continue to meet the Use Class I water quality standards, although the minimum bottom DO concentration at the Harbor Survey station near the North River WPCP (off West 155th Street) may continue to occasionally be slightly below the 4.0 mg/L water quality standard and exceed the DEC guidance value for mercury, as observed under the existing condition.

As presented in Appendix E.1, using the DEP projections of future sanitary sewage flow developed using DCP population projections, the projected CSO volume would increase by approximately 2.5 mgy in 2030 without the Proposed Actions. This would result in a total CSO volume of 77.4 mgy. The number of CSO events would increase by 2, to 29 events per year. This additional CSO volume and the resulting increase in pollutant loadings to the Hudson and Harlem Rivers would result in changes to water quality parameters (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform). However, these changes would be minimal and would not result in water quality conditions that fail to meet Class I standards, although minimum bottom water DO concentrations may continue to occasionally drop slightly below the standard. Therefore, without the Proposed Actions, water

quality and aquatic biota of the Lower Hudson River Estuary would not be adversely impacted in 2030 by CSOs.

H. 2030 FUTURE WITH THE PROPOSED ACTIONS

FLOODPLAINS AND WETLANDS

The Academic Mixed-Use Area (Subdistrict A) is not within the 100-year floodplain. Therefore, development within this portion of the Project Area by 2030 would not affect the floodplain. The Other Area east of Broadway and Subdistrict C also are not within the 100-year floodplain.

A portion of Subdistrict B is within the 100-year floodplain, primarily west of the Amtrak Empire rail line. However, development of this subdistrict is expected to be completed by 2015. Therefore, conditions within the floodplain would be similar to those described above in "2015 Future with the Proposed Actions." In addition, as outlined in Appendix K.5, after establishing design groundwater and flood levels for the Proposed Actions, these design water levels will be incorporated into the project's foundation designs. With these measures, no significant adverse impacts from flooding are expected on the Proposed Actions' below-grade facility.

The only portion of the Project Area containing wetlands is the Other Area along the Hudson River that will be developed for the West Harlem Waterfront park. As discussed above in "2015 Future Without the Proposed Actions," the West Harlem Waterfront park is not part of the Proposed Actions and is undergoing separate environmental review and permitting.

As part of constructing the new separate stormwater system, stormwater would discharge through a connection to an existing outfall at the western terminus of St. Clair Place. These activities would not be expected to result in significant adverse impacts on wetland resources. The connection to the existing outfall would require a new SPDES permit from DEC for stormwater discharge into the Hudson River.

The construction and operation of the new buildings within the Academic Mixed-Use Area, including the development of an additional approximately 71,610 sf of open space by 2030, for a total of 93,965 sf of open space, would not result in significant adverse impacts on groundwater resources or flow patterns. Construction of the buildings would result in the removal or capping of contaminated soils and historic fill, minimizing the potential for adverse impacts on groundwater quality. Although the construction of the slurry walls around the blocks to be developed by 2030 would modify the groundwater flow pattern in the immediate vicinity of the wall, groundwater discharge to the Hudson River would not be adversely affected. Groundwater would be expected to flow around the slurry walls and then continue toward the Hudson River.

EARTHQUAKE POTENTIAL

In accordance with the New York City Building Code, the buildings and other structures constructed by 2030 as part of the Academic Mixed-Use Development must be designed to resist the effects of seismic ground motions with a peak acceleration of 0.15g, taking into account the site geology (i.e., bedrock type, depth to bedrock, soil type, etc.) characterized through on-site geotechnical borings. Where competent rock is not exposed, piles would be driven for the building foundations. Excavation below the ground surface for the development of the slurry walls and building foundations within the Academic Mixed-Use Area would range from less than 50 feet to approximately 120 feet or more. The presence of the 125th Street Fault zone within the Project Area will be further assessed during geotechnical evaluations performed prior

to the design of the buildings to be completed by 2030, to establish site-specific seismic design parameters (see Appendix K.5).

The construction and operation of the Academic Mixed-Use Development in 2030 would not be expected to result in an increased earthquake hazard to residents of New York City or result in adverse impacts on the environment. Through the removal of existing buildings, many of which are unreinforced masonry structures that are susceptible to damage from seismic events, and construction of new structures that are in compliance with and may potentially exceed the New York City Building Code's seismic design requirements, the Proposed Actions would be expected to result in a decreased earthquake hazard within the Project Area.

TERRESTRIAL RESOURCES

As discussed above in "2015 Future with the Proposed Actions," construction within the Academic Mixed-Use Area in 2030 has the potential to result in the removal of some existing street trees. These trees would be removed and replaced in accordance with permits issued by DPR. Additionally, the proposed privately owned, publicly accessible open space would be designed to allow landscaping. This would result in increased vegetation resources within the Academic Mixed-Use Area and the amount of potential habitat available to birds and other wildlife. Species expected to use these areas would be similar to those discussed above in "Existing Conditions." Approximately 75 percent of nocturnally migrating songbirds do so at altitudes of between 500 and 2,000 feet (152 to 600 meters) above the surface (Kerlinger 1995). The maximum building heights allowed for the new buildings proposed to be completed between 2015 and 2030 would range from 100 feet to 260 feet (320 feet with mechanical [see Figure 1-8]). These building heights would be similar to the heights of surrounding buildings (see Figures 1-14 and 1-15) and would not be expected to result in a significant increase in the loss of migratory birds due to building collisions.

As presented in Chapter 19, air emissions from the proposed central energy plants and package boilers proposed to be completed and operating in 2030 to provide heating and cooling to the new buildings in the Academic Mixed-Use Area would not result in violations of NAAQS or increases in concentrations above EPA-defined significant impact levels. Additionally, emissions of fine particulate matter would be below the City's current significant impact thresholds. Therefore, potential air emissions from the proposed energy plants and package boiler systems in 2030 would not be expected to result in significant adverse impacts on terrestrial resources.

Redevelopment is expected to be completed in the remaining Subdistricts (B, C, and the Other Areas) by 2015. Therefore, terrestrial resources in these subdistricts resulting from the Proposed Actions in 2030 would be a continuation of those described above in "2015 Future with the Proposed Actions."

AQUATIC RESOURCES

Construction of the new buildings and associated relocation of underground utilities within the Academic Mixed-Use Area between 2015 and 2030, and development of an additional 71,610 sf of privately owned, publicly accessible open space, has the potential to temporarily affect water quality of the Hudson River where stormwater is discharged. During Phase 2 construction activities (2015 and 2030), some stormwater generated within the Project Area during construction would be discharged to the municipal combined sewer system within the North River WPCP drainage (only discharged directly to the Hudson River during CSOs), and some

stormwater would be directed toward the existing CSO outfall at the western terminus of St. Clair Place that would receive stormwater from the new storm sewer. Implementation of erosion and sediment control measures, and stormwater management measures during construction as part of the SWPPP would minimize potential impacts on the municipal combined sewer system and to the Hudson River associated with stormwater runoff. The construction of slurry walls would minimize dewatering[1] during construction of below-ground project elements. However, should construction dewatering activities be required, the recovered groundwater would be treated, as necessary, prior to discharge to the combined sewer system. Therefore, no adverse impacts on surface water quality of the Hudson River would be expected to occur during the construction of the Proposed Actions in 2030.

Appendix E.1 presents a detailed discussion of water quality modeling conducted to assess potential impacts on water quality and aquatic resources in 2015 and 2030 from the discharge of stormwater and sanitary sewage to the municipal combined sewer system. Because population increases attributable to the Columbia Manhattanville project are included in the DCP population projections used by DEP to develop projections of future sanitary flows considered in the 2030 future without the Proposed Actions, the analysis of the 2030 future with the Proposed Actions is considered conservative because the Columbia Manhattanville flows are actually incorporated into the water quality modeling twice. (See Appendix E.1 for an explanation of how this flow was incorporated into the modeling.) In 2030, the components of the reasonable worst-case development scenario expected to be completed and operating as a result of the Proposed Actions would result in an increase of approximately 0.95 mgd discharged to the municipal combined sewer system. This estimated discharge represents an increase of 0.81 mgd from the estimated current discharge of 0.14 mgd from within the Project Area. The total estimated sewage discharge from the Proposed Actions in 2030 would represent only about 0.56 percent of the North River WPCP's permitted daily flow limit of 170 mgd.

The projected average daily flow to the North River WPCP in 2030 with the Proposed Actions, when combined with the DEP flow projections, would be about 141.0 mgd. This increased flow to the plant would not affect compliance of the effluent with the SPDES permitting conditions. Changes to water quality parameters (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform) within the vicinity of the North River WPCP resulting from the projected effluent pollutant loads would be small. Hudson River water quality in the vicinity of the North River WPCP would continue to meet the Use Class I water quality standards, except for occasional bottom water DO concentrations below the 4.0 mg/L standard as currently occur at the Harbor Survey station near the North River WPCP.

As presented in Appendix E.1, the projected increase in sanitary flow in 2030 future with the Proposed Actions would result in a decrease in CSO volume when compared with the 2030 future without the Proposed Actions due to the operation of the proposed separate storm sewer. The proposed separate stormwater system would divert approximately 9.9 million gallons annually from the combined sewer system. The volume of CSO would decrease from the 2030 future without the Proposed Actions by an amount smaller than the volume of stormwater

[1] Dewatering is the removal of rainwater or groundwater from within an excavated area during construction.

diverted to the new stormwater system, approximately 1.6 mgy. The factors contributing to this smaller reduction in annual CSO volume are as presented below.

- Not all of the stormwater currently discharged to the combined sewer system from the 12.36-acre area is discharged to the Hudson or Harlem Rivers through CSOs. This is because individual regulators can generally divert between 1.5 and 2 times the peak design dry weather flow into the interceptor system. It is only when the flow exceeds this amount that flow is diverted into a CSO outfall. Additionally, the interceptor sewer system in the North River WPCP has the capacity to hold a significant amount of sanitary waste and stormwater runoff and convey this flow to the WPCP.
- Even though the inflow from a small portion of the drainage area is reduced, the regulator receiving the stormwater runoff from the 12.36-acre area is also influenced by other factors (e.g., water level in the interceptor sewers, peak inflow to the regulator with and without the Proposed Actions, etc.) that affect the reduction in CSOs in that regulator.

The frequency of CSO events is not expected to change, remaining at 29 per year. The resulting incremental increase in pollutant loadings (DO, TSS, total nitrogen, total phosphorus, copper, lead, zinc, and total coliform and total fecal coliform) to the Hudson River from those projected for the 2030 future without the Proposed Actions conditions would be minimal. As demonstrated by modeling analysis, these minimal increases would result in water quality conditions that are essentially the same as the 2030 future without the Proposed Actions conditions, and would not result in water quality conditions that fail to meet Class I standards. The exception may be the continuation of occasional bottom water DO concentrations below the 4.0 mg/L standard that occur at the Harbor Survey station near the North River WPCP.

As discussed previously, stormwater generated within the majority of the Academic Mixed-Use Area (16.75 of 17 acres located south of West 132nd Street) would be diverted to a new storm sewer system within West 130th, West 131st, and West 132nd Streets. The new stormwater system would be developed as part of the proposed amended drainage plan and would divert about 9.9 mgy from the combined sewer system. Stormwater collected by the new storm sewers would be discharged through an existing CSO outfall at the western terminus of St. Clair Place. As presented in Appendix E.1, the estimated annual pollutant loads (i.e., total nitrogen, total phosphorous, total suspended solids, copper, lead, and zinc) from the operation of the new storm sewer system are expected to be small, particularly in comparison with the daily loadings currently discharged, or projected to be discharged from the North River WPCP in 2030 with or without the Proposed Actions, which would not be expected to result in significant adverse impacts on water quality. Additionally, with the exception of zinc, the estimated annual loadings from the stormwater outfall are less than the incremental changes in CSO annual loadings in 2030 with or without the Proposed Actions, which would also not be expected to result in significant adverse impacts on water quality. Therefore, discharge of stormwater through the existing CSO outfall at St. Clair Place would not be expected to result in significant adverse impacts on water quality or aquatic biota, or result in adverse impacts on the aquatic habitat enhancement measures implemented as part of the West Harlem Waterfront park project. The new storm sewers would be expected to include measures to contain floatables (e.g., catchbasins with sump and hood), and to trap sediment and oil (e.g. catchbasins with hydrodynamic separators). The connection to the existing outfall would require a new SPDES permit from DEC for stormwater discharge into the Hudson River.

The central energy plants and smaller package boiler systems proposed to provide heating and cooling to the new buildings in the Academic Mixed-Use Area in 2030 would not result in

discharges to the Hudson River and would not affect aquatic resources. Potential air emissions from the proposed energy plants and package boiler systems would not be expected to result in significant adverse impacts on aquatic resources. As presented in Chapter 19, air emissions from the proposed central energy plants and package boilers would not result in violations of NAAQS or increases in concentrations above EPA-defined significant impact levels. Additionally, emissions of fine particulate matter would be below the City's current significant impact thresholds. As presented in Chapter 14, Columbia University's continued policy prohibiting the discharge of liquid chemical or radiological waste into the public sewer system would further minimize potential impacts on surface water and aquatic biota from the operation of the Academic Mixed-Use Development. Therefore, the Proposed Actions would not adversely impact water quality, sediment quality, or aquatic biota of the Lower Hudson River Estuary in 2030.

THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

Discharge of stormwater from the existing CSO outfall in 2030 would not result in any significant adverse impacts on water or sediment quality. Therefore, no adverse impacts would occur to the New York State and federally listed endangered shortnose sturgeon identified as occurring with the Hudson River in the vicinity of the Project Area. According to DEC (Loucks 2004), the active New York State-listed endangered peregrine falcon nest is far enough away from the Project Area (about 2,000 feet) that it would not be adversely affected by the Proposed Actions. Additional coordination with NYNHP would be conducted for the peregrine falcon nest prior to the anticipated start of Phase I construction in 2008.

SIGNIFICANT COASTAL FISH AND WILDLIFE HABITAT

The Proposed Actions would not include any in-water activities between 2015 and 2030 and would not result in adverse impacts on water quality or sediment quality. Therefore, adverse impacts would not be expected to occur to the Lower Hudson Reach Significant Coastal Fish and Wildlife Habitat.

I. REFERENCES

See Appendix E.3 for the references associated with this chapter. ✷