FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE CROTON WATER TREATMENT PLANT AT THE HARLEM RIVER SITE

7. WATER TREATMENT PLANT AT THE HARLEM RIVER SITE

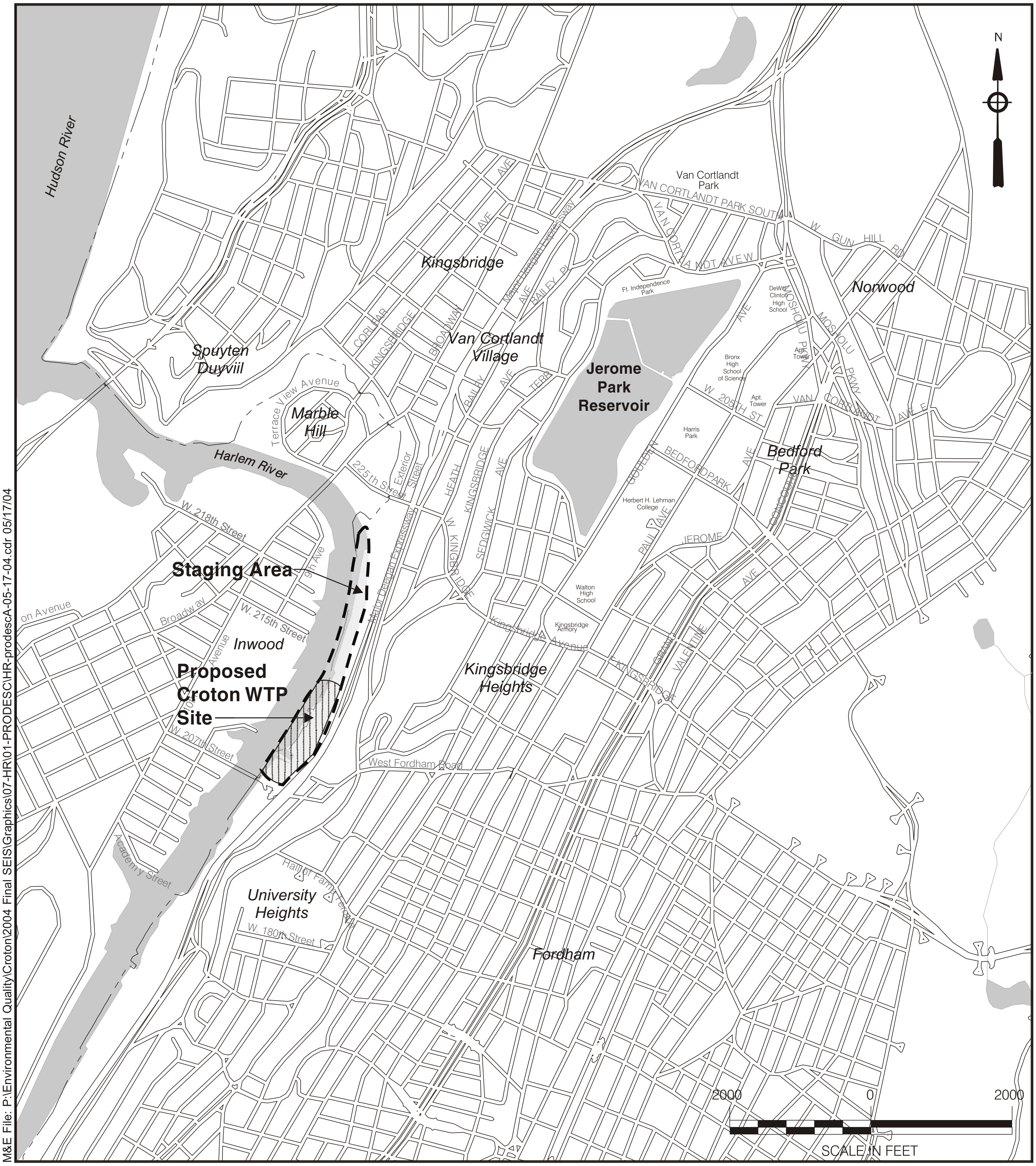
7.1. INTRODUCTION AND PROJECT DESCRIPTION

The New York City Department of Environmental Protection (NYCDEP) proposes to design, construct and place into operation a 290 million-gallon-per-day (mgd) Croton Water Treatment Plant (WTP) to provide filtration and disinfection of the Croton Water System. The project would also include the construction of new raw water and treated water tunnels to connect the proposed plant to the New Croton Aqueduct (NCA), and improvements and rehabilitation of structures related to distribution connections at and near Jerome Park Reservoir. Three sites for the water treatment plant are evaluated in this Draft SEIS: The Eastview Site in the Town of Mount Pleasant, Westchester County; the Mosholu Site in the Bronx, Bronx County; and the Harlem River Site, also in the Bronx, Bronx County. Some alternatives include work at other sites along the NCA, and one alternative includes a possible future connection to the proposed Kensico-City Tunnel. This project description provides details relating to construction and operation of the proposed plant if it were built at the Harlem River Site.

Construction of the proposed Croton WTP at the Harlem River Site would include a new raw water tunnel to convey untreated water from the NCA to the water treatment plant site; a raw water turbine and pressure reducing facility located aboveground that would deliver the raw water to the head of the proposed plant while recovering energy; a treatment building located above ground that would house all the process elements, administrative offices, a conference room, a small process laboratory, maintenance and storage facilities, electrical and heating, ventilation and air conditioning (HVAC) rooms; a treated water pump station; a guard house; and treated water conveyances. A bulkhead in the Harlem River at the existing pierhead and bulkhead line would be built in order to maximize the available land area for the turbine and pressure reducing facility, and the treatment building. The Harlem River Site is less secure than both the Mosholu and Eastview Sites, since it is located adjacent to the Harlem River, Major Deegan Expressway, and the Metro-North railroad. The treated water connection alternatives are described in greater detail in Section 3, Proposed Project and Engineering Alternatives. In addition, construction of the proposed plant would require stabilization of several off-site facilities, including modifications to the facilities in and around Jerome Park Reservoir (Bronx, NY). Work described at these off-site locations is described in Section 8, Off-Site Facilities.

7.1.1. Site Description

The Harlem River Site is located in the Borough of the Bronx, New York. The City of New York proposes to acquire approximately 17.5 acres of land for the proposed project. The site is about 350 ft. wide at its widest and 2,200 feet long. The water treatment plant site is located along the Harlem River near the West Fordham Road/University Heights Bridge with the Metropolitan Transit Authority (MTA) Metro-North Railway Hudson Rail on the east and north (Figure 7.1-1).



Harlem River Site Location

Croton Water Treatment Plant

Figure 7.1-1

The Harlem River Site is identified by property tax Block 3231, Lot 350; Block 3244, Lot 100; Block 3244, Lot 120; Block 3244, Lot 145; Block 3244, Lot 160; Block 3244, Lot 1; Block 3245, Lot 3. Current property owners have been identified as the following: NYC Department of Transportation (NYCDOT); Consolidated Edison Company of New York, Inc. (Con Edison); Storage Post Self-Storage; XCEL Ready-Mix concrete batch plant; and Consolidated Rail Corporation (CSX). An agreement with the property owners and lessees to vacate would have to be negotiated for the proposed project to proceed.

Current zoning of the Harlem River Site consists of M1-1, M2-1, and M3-1 (Manufacturing). Access to the water treatment plant site would be from an existing ramp just east of University Heights Bridge down to Exterior Street, located along the southeastern side of the water treatment plant site.

7.1.1.1. Topography

The Harlem River Site topography consists of a gradually sloping surface toward the Harlem River (western boundary) from the railroad tracks (eastern boundary). The elevations are generally between 13 feet mean sea level (MSL) and 9.5 feet MSL. A small portion of the water treatment plant site has been filled to the bulkhead/pierhead line. An area at the south end of the site contains a 1.3 acres water inlet (cove). This unfilled area has been used for barge landing in the past, and currently contains the remains of an old pier. There are several existing structures and utility lines on this portion of the site, including a combined sewer outfall, two 30-inch natural gas mains and two electrical conduits crossing beneath the River to Manhattan (Figure 7.1-2).

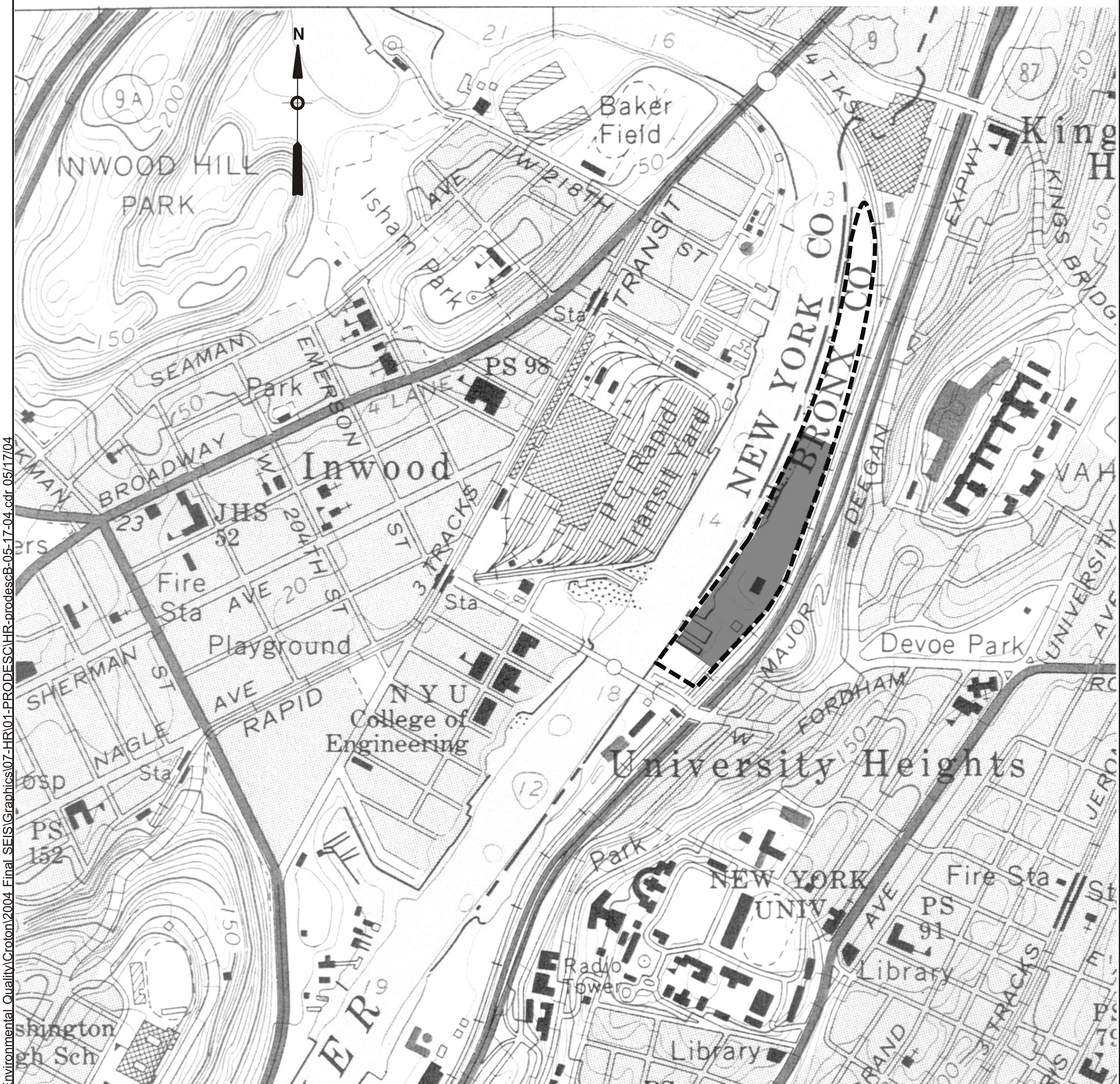
7.1.1.2. Surface Water

The Harlem River bounds the west side of the proposed water treatment plant site. The Harlem River is a tributary of the Hudson River. It is a navigable tidal channel, 8 miles (12.9 km) long, in New York City (the City), separating Manhattan from the Bronx and connecting the Hudson and East Rivers.

The area stormwater flows into the Harlem River, which is also a receptor of the combined sewer overflows from the Wards Island Water Pollution Control Plant Basin. There is no surface water body on the site except for a cove of approximately 1.3 acres (previously used as a barge docking bay) located on the proposed water treatment plant site.

7.1.1.3. General Geology

At the turn of the 20th century, much of the water treatment plant site was beneath the eastern edge of the Harlem River, covered by shallow water and organic mud deposits. Fill was subsequently placed on the river deposits to create land; as a result, the surficial materials at the site consist entirely of fill. In 2002, approximately 100 borings were drilled at the water treatment plant site and in the Harlem River to determine subsurface conditions. The surficial layer of fill was found to be underlain by a sequence of strata that includes, in descending order, organic silts, clays, and peat of the river deposits; post-glacial and glacial alluvial sands; varved sands, silts, and clays; glacial till; weathered or decomposed rock; and bedrock.



Site Topography
Harlem River Site

Figure 7.1-2

The unconsolidated deposits that underlie the fill and the post-glacial alluvial deposits at the water treatment plant site were emplaced during an episode of continental glaciation, which concluded about 10,000 years ago in this area. The bedrock that underlies the unconsolidated deposits is metamorphic rock of Cambrian or Ordovician age. Weathering has caused partial disintegration of the bedrock at and near the rock surface, along faults, and at the contact between different rock types. The drilling program revealed that the decomposed rock layer has a thickness of 100 feet or more beneath eastern parts of the water treatment plant site.

The unconsolidated deposits at the proposed water treatment plant site lie on a surface of bedrock or decomposed bedrock that slopes generally west, toward the Harlem River. The top of bedrock ranges from Elevation –30 feet MSL to below –150 feet MSL. The higher rock elevations were encountered in the northeast section of the water treatment plant site.

Two different bedrock formations, the Fordham Gneiss and the Inwood Marble, underlie the water treatment plant site. Competent bedrock was found along the southeastern side, where the bedrock surface is closest to the surface. The bedrock beneath this part of the water treatment plant site was found to be almost exclusively gneiss. Marble was found interspersed with the gneiss near the east central part of the water treatment plant site; apparently, masses of marble occur within the gneiss near the contact of the two rock types.

A layer of decomposed rock was found to overlie the competent bedrock in almost all of the borings drilled. The decomposed rock is typically less than 40 feet thick in the southeast part of the water treatment plant site and is absent where the bedrock surface is at its highest elevation along the southeastern side of the site.

Competent bedrock was not encountered in the borings drilled beneath the northern part or most of the western side of the site, indicating that the depth to competent rock is greater than the depths (generally about 150 to 200 feet) to which the borings were drilled. The elevation of the competent bedrock surface is more than 180 feet below sea level in these parts of the site. Even though competent bedrock was not encountered, decomposed rock was penetrated in most cases. The decomposed rock was found to be at least 100 feet thick at several locations in the northern part and along the western side of the site.

Just west of the proposed water treatment plant site competent bedrock was encountered in several of a series of borings that were drilled in the Harlem River. The rock encountered in these borings was neither gneiss, marble, nor a mixture of the two rock types, but most likely a weathered layer. The interbedding of the rocks is a common feature along their contact. The great thickness of decomposed rock beneath much of the water treatment plant site is probably a result of the presence of the contact between the two rock types.

7.1.1.4. Seismicity

The NYC Building Code (Code) defines a seismic zone factor, Z, of 0.15 for the City. This factor is the effective zero period of acceleration for the S1 subsurface profile defined in the

Code. In accordance with the Code definitions, the site coefficient was determined to be S3, corresponding to a soil profile with a total depth of overburden exceeding 75 feet and containing more than 20 feet but less than 40 feet of soft to medium clays and/or loose sands and silts. The safety factor S of 1.5 and Normalized Response Spectrum for S3 would be used in the design of the proposed structures.

The Code requires that structures be designed for a design earthquake event having a 10 percent probability of being exceeded in 50 years (an approximate return period of 500 years). Studies of the New York area seismic hazard have determined that the dominant magnitude in a 500-year event is approximately M=5.75.[1]

7.1.1.4.1. Groundwater

Groundwater levels within the water treatment plant site fluctuate with tidal levels of the Harlem River, which generally range between Elevation 2.75 feet Mean High Water and Elevation 1.25 feet Mean Low Water. The water levels measured from the monitoring well range between 0.3 to 0.7 feet higher than the river at high tide.

7.1.2. Water Treatment Plant at the Harlem River Site

The proposed plant at the Harlem River Site would include the water treatment building (housing the treatment processes, administrative offices, and a process laboratory), a raw water tunnel from the NCA, a pump station building, and a treated water tunnel (the treated water tunnel is a combined tunnel, which would split in two later). Separate structures adjacent to the water treatment building would house the electrical facilities.

The proposed plant layout would be designed to minimize space requirements. This design practice involves using appropriate loading rates in the treatment processes, common wall construction with rectangular treatment units and vertically stacking some process components. The structural components would be designed in accordance with state and local codes to accommodate normal and seismic forces. The proposed plant design would incorporate levels of redundancy based on good engineering practices and regulatory requirements. NYCDEP's standard approach to critical equipment redundancy is to provide "n+1+1" equipment units, where "n" is the number of units required for maximum design conditions. These design levels of redundancy, at a minimum, satisfy the requirements of *Recommended Standards for Water Works*, also referred to as the *Ten State Standards,* which is based on n+1. Although these n+1+1 design levels of redundancy are not considered mandatory, they would be used in the process design and by the NYSDOH as a guideline for approval of the proposed project. Therefore, the proposed project would incorporate an "n+1+1" redundancy[2] for the critical equipment design.

The proposed plant would be designed such that the main flow of water through the treatment processes would be by gravity, with pumping needed for treated water to both the High Level

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[1] The term "M" refers to magnitude on the Richter Scale.
[2] n+1+1 means that a process or piece of equipment has two full standby or backup units so that it can be taken out of service for maintenance and a backup unit still remain.

and Low Level services. The average design flow would be 144 mgd with a maximum capacity of 290 mgd. Raw water would travel from the raw water tunnel to a turbine generator/pressure reducing valve (PRV) station that would reduce the water pressure and create power when the turbines are in operation. With the design principle that no single plant component would treat, convey, or power more than 50 percent of the plant design flow, in the event of an unforeseen shutdown or emergency, the main treatment processes would be divided into two separate water treatment trains, Train A and Train B, meaning that if one train went out of service, the other could treat up to 145 mgd.

7.1.2.1. Raw Water[3] Supply

The original Croton System was constructed in the mid 1800's, but only a portion of that system is still in use today. The present Croton System, constructed between 1885 and 1911, normally provides approximately 10 percent of the City's daily water supply and can provide up to 30 percent during drought conditions. The Croton System consists of twelve reservoirs and three controlled lakes on the Croton River, its three branches and three other tributaries (Figure 7.1-3). The water flows from upstream reservoirs through natural streams to downstream reservoirs, terminating at the New Croton Reservoir. With a watershed area of approximately 375 square miles, the system lies almost entirely within the State of New York with a small portion in the State of Connecticut. Situated approximately 45 miles north of the center of Manhattan, the watershed has been subjected to suburban-type development over the years, which has affected the quality of the water source.

A limited amount of water can be transferred from the Croton System to the higher level Delaware System at West Branch Reservoir, and water can also be transferred by gravity from the Catskill System into the NCA through the Croton Lake Gate House[4], in the Town of Yorktown. During outages of the Croton System the Catskill/Delaware System can supply all of the City's water needs.

Water is conveyed from the New Croton Reservoir through the NCA to the Jerome Park Reservoir. The NCA is approximately 31 miles in length with a delivery capacity of approximately 290 mgd. The NCA is located up to 400 feet below ground and is composed of two sections. The northern section is primarily a brick-lined at grade tunnel constructed in rock and originating near the now submerged Old Croton Dam, about three miles upstream of the Cornell Dam, on the New Croton Reservoir, and extending to Gate House No. 1 in Van Cortlandt Park, a distance of about 24 miles. This section is horseshoe-shaped, 13.5 feet high by 13.6 feet wide, and is not pressurized. The invert was constructed at a constant slope of about 0.7 feet per mile. The northern section also includes a short section of a 14.25-foot diameter pressure tunnel near Tarrytown. The southern section is a pressurized brick-lined tunnel extending from Gate House No. 1 to Shaft No. 33 at 135th Street and Convent Avenue in Manhattan, a distance of about seven miles. For the most part, this section is 12.25 feet in diameter. In addition, a branch of the NCA (e.g. New Croton Branch Aqueduct) transmits water from Gate House No. 1 to the Jerome Park Reservoir, a distance of about one mile.

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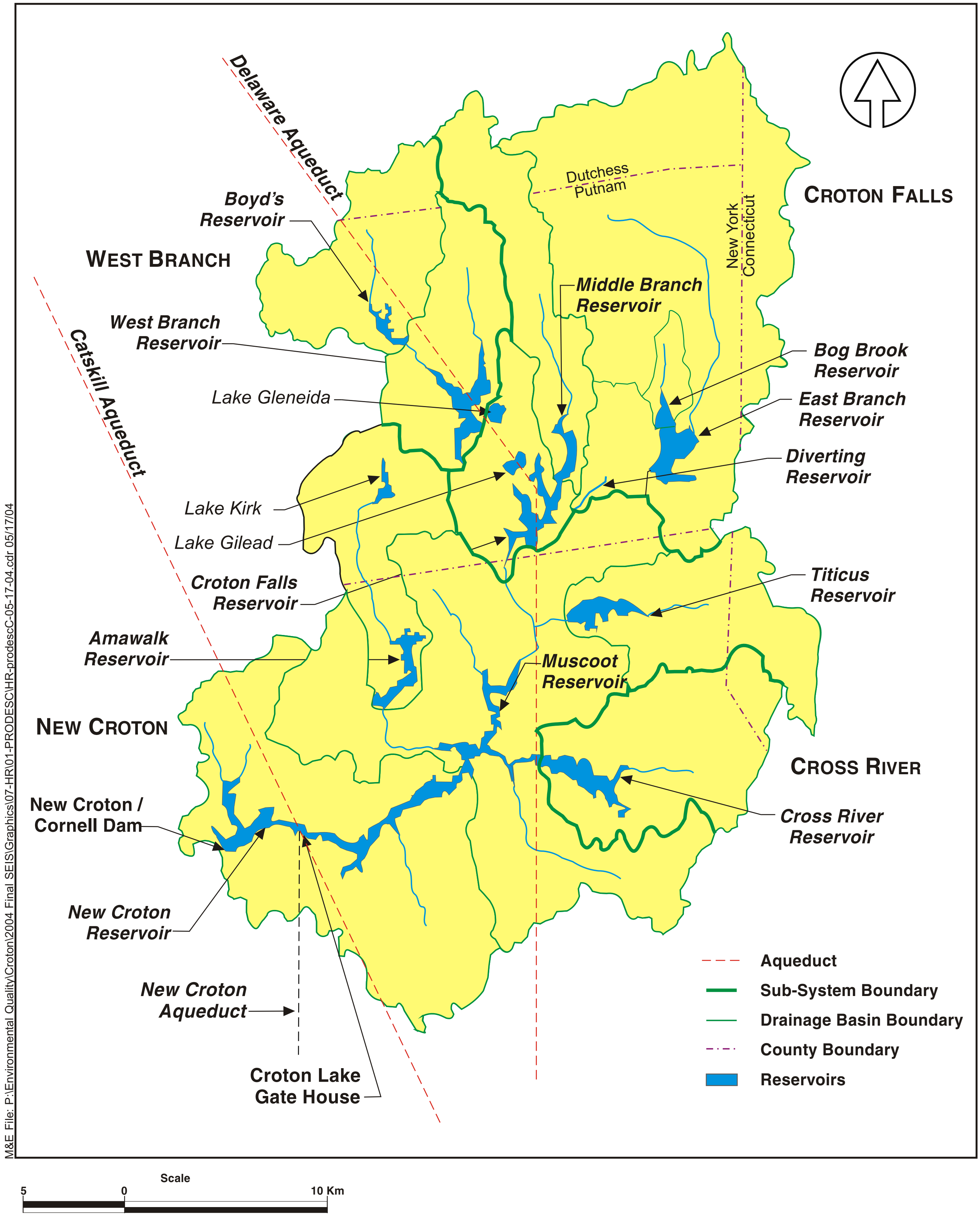
[3] Fresh, unfiltered water.
[4] The Croton Lake Gate House controls the amount of water that enters the northern most entry point to the NCA.



Croton Watershed and Reservoirs

7.1.2.2. Raw Water Conveyance

Similar to current practices, raw water would be conveyed from the New Croton Reservoir controlled by Croton Lake Gate House, in the Town of Yorktown, NY through the NCA. At Gate House No. 1 raw water would be conveyed through the New Croton Branch Aqueduct to the Jerome Park Reservoir (as under current normal conditions). From the Jerome Park Reservoir the raw water would be conveyed to the Harlem River Site through the NCA to a new water tunnel connection. The new tunnel would convey raw water by gravity from the NCA to a turbine station.

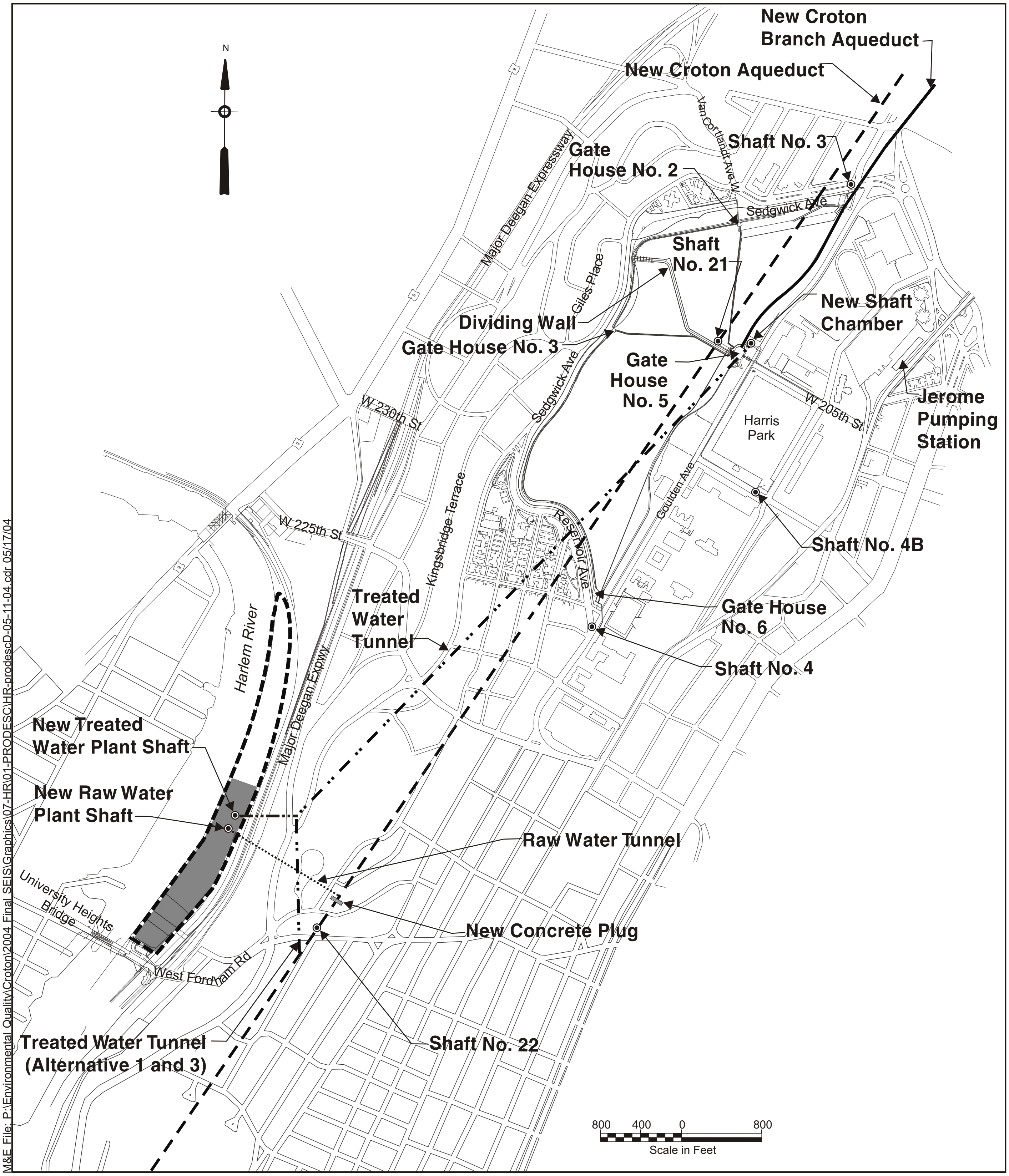
7.1.2.3. Raw Water Tunnel

The new connection to the NCA would be located upstream of NCA Shaft No. 22. From this location a new tunnel would be constructed to connect to the proposed plant. The connection of the new raw water tunnel to the NCA would be perpendicular to the NCA, and would be designed to match the invert elevation of the NCA at this location. Rock dowels and welded wire fabric would be used to support the rock at the point of connection. A tunnel plug, made of cast-in-place concrete, would be installed in the NCA downstream of the raw water connection. The plug would separate and prevent raw water from contaminating treated water flowing to the Manhattan Low Level Service.

The raw water tunnel would be approximately 1,415 feet long. From this connection point, the tunnel would slope down towards the inlet channel of a new raw water shaft that would be constructed at the water treatment plant site. Excavation of the raw water tunnel would be performed by the use of drill-and-blast methods in sections of the tunnel where rock is encountered in the subsurface. The portion of the raw water tunnel crossing beneath the Major Deegan Expressway and Metro-North railroad tracks would be constructed in the soil layer with permeation and jet grouting stabilization. A plan of the proposed raw water tunnel is shown in Figure 7.1-4.

7.1.2.4. Raw Water Turbine Station

From the new tunnel, the raw water would flow, by gravity, through a new raw water shaft. The raw water shaft would transfer the raw water from the tunnel to a turbine generator/pressure reducing valve (PRV) station. The generator/PRV station would reduce the water pressure in the NCA at the inlet of the proposed plant. The PRV station would contain four pressure reducing valves; each valve would be capable of handling 145 mgd. At maximum flow (290 mgd), two PRVs would be in use, with one stand-by and one out-of-service (n+1+1 redundancy). The purpose of the PRVs would be to reduce the pressure of the flow when the turbines are off line. The raw water that passes through the turbines would generate power that could be used within the proposed plant. Approximately 1.3 Megawatts (MW) of power at 144 mgd (average plant flow) and 2.6 MW of power at 290 mgd (maximum plant flow) would be recovered.



Proposed Project General Arrangement Harlem River Site

Figure 7.1-4

7.1.2.4.1. Surge Relief Valve Station

If the turbines were to suddenly shut down, a surge condition would occur in the raw water tunnel just upstream of the turbines and in the NCA. To prevent the surge from flowing upstream, a surge relief valve chamber containing six 24-inch diameter surge relief valves would be constructed adjacent to the raw water shaft at the proposed plant. Two 84-inch diameter raw water pipes, from the raw water shaft, would run through the chamber. Six surge relief valves, sized to discharge up to 72.5 mgd each, would be installed (three per raw water pipe) to relieve the pressure within the system. The surge relief valves would be provided with a total n+1+1 redundancy. The surge flow would be conveyed to a nearby existing combined sewer overflow that drains to the Harlem River.

7.1.2.5. Water Treatment Plant

7.1.2.5.1. Treatment Process Goals

The primary goals of the proposed project are to meet the public water supply and public health needs of the City and to comply with State and Federal drinking water standards and regulations. The NYSDOH and the U.S. Environmental Protection Agency (USEPA) have mandated the filtration and disinfection of the Croton System to comply with standards set forth in subpart 5.1 of Chapter 1, New York State Sanitary Code, and the USEPA Surface Water Treatment Rule; a National Primary Drinking Water Regulation promulgated under the Safe Drinking Water Act of 1974. The key treated water quality objectives considered in evaluating and selecting a treatment process for the Croton System focus on source water quality and current and anticipated water quality regulations. These water quality objectives include:

- **Particulate removal**, to optimize for concerns over *Giardia* cysts[5] and *Cryptosporidium* oocysts[6], making both turbidity[7] and particle removal critical;
- **Aesthetics**, to improve aesthetic parameters such as color, taste and odor, iron and manganese, and visible larvae, due to consumer complaints;
- **Disinfection**, to comply with the disinfectant concentration and contact time (CT) requirements of the Surface Water Treatment Rule (SWTR) and the future Enhanced Surface Water Treatment Rule (ESWTR) to balance against lower trihalomethane (THM) and other disinfection by-product (DBP) standards that have been proposed under the future Disinfectant/Disinfection By-Products Rule (D/DBPR);
- **Disinfection By-Products**, to comply with future standards of 64 ug/l for Total Trihalomethanes and 48 ug/l for the total of five Haloacetic Acids (HAA5) (on a locational running annual average basis at the worst case point in the distribution system).

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[5] A cyst is a small capsule-like sac that encloses certain organisms in their dormant or larval stage.
[6] An oocyst is a thick-walled dormant reproductive stage for some sporozoans.
[7] Turbidity refers to having sediment or foreign particles stirred up or suspended.

TABLE 7.1-1. TREATED WATER QUALITY GOALS

Constituent	Goal
Microbiological	
Giardia cysts	≥99.9% removal and inactivation
Cryptosporidium oocysts	≥99.9% removal and inactivation
Viruses	≥99.99% removal and inactivation
Filtered water turbidity	≤0.10 ntu for 95% of time
Particles (>2 µm)	Steady state operation
Regrowth potential	BDOC[1] not more than raw water levels (seasonally adjusted)
Disinfection By-Products	
Trihalomethanes (total)	64 µg/l (4-quarter RAA[2])
Haloacetic acids (HAA5)	48 µg/l (4-quarter RAA)
Bromate	≤5 µg/l
Inorganics	
Aluminum	≤0.05 mg/l
Corrosion control	Maintain finished water pH of 7.0-7.5
Iron	≤0.10 mg/l
Manganese	≤0.05 mg/l
Other	
Total organic carbon	>35% removal, or <2 mg/l in filtered water
True color	≤5 scu
Tastes and odors	Treat to minimize

(1) Biodegradable Dissolved Organic Carbon (BDOC)
(2) Running Annual Average (RAA)

Treated water quality goals developed for the Croton WTP design are presented in Table 7.1-1. These goals are based on the USEPA regulations proposed or promulgated under the Safe Drinking Water Act, Part 5 of the State Sanitary Code (10NYCRR), and NYCDEP's own water quality goals. In addition to the specific goals listed below, the plant's treated water quality is expected to comply with all other regulated parameters; these other contaminants are generally not present in the Croton raw water at levels above regulated standards.

7.1.2.5.2. Treatment Processes

To satisfy the above-mentioned criteria, the selected treatment process for the proposed plant would be a "stacked" dissolved air flotation/filtration (DAF/Filtration) followed by disinfection (Ultraviolet light (UV) and chlorination). Pre-treatment in support of this process includes mixing/coagulation, flocculation, and chemical adjustment. Post-treatment includes further chemical adjustment and fluoridation. This selection would achieve or exceed treated water quality goals including a 99.9 percent (3-log) removal/inactivation of *Giardia* cysts and 99.9-percent (3-log) removal of *Cryptosporidium* oocysts.

DAF is used to remove particulate matter from the water stream. It is followed by filtration, which further removes particulates to achieve required turbidity levels. Use of DAF in conjunction with filtration would optimize the particulate removal component of the process.

Disinfecting filtered water with ultraviolet light technology would provide further treatment for inactivation of pathogens. At an achievable dose, UV disinfection has been found to effectively prevent the *Cryptosporidium* oocyst from replicating itself and it is therefore shed from a host's digestive tract without causing illness. UV has also been found to render *Giardia lamblia* cysts non-infective, but was deemed inefficient with respect to inactivating viruses. To inactivate many microorganisms (bacteria, viruses, and *Giardia lamblia* cysts), chlorination is effective, but it is not effective for inactivating *Cryptosporidium parvum* oocysts. Based on an Agreement-in-Principle by the USEPA signed in September 2000 and subsequently adopted in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) that was published on August 11, 2003 in the Federal Register (Volume 68, Number 154), UV technology has been approved for use for the deactivation of both *Cryptosporidium* oocysts and *Giardia* cysts, while chlorination is given no credit for *Cryptosporidium* inactivation. Based on its approval by the USEPA for the inactivation of *Cryptosporidium* oocysts and *Giardia* cysts, UV disinfection has been incorporated into the design of the proposed project.

Ancillary systems in the proposed plant would include pre/post-treatment chemical storage and handling; process waste backwash water handling and residual facilities, with necessary support facilities such as electrical, instrumentation; plumbing, and security; and HVAC systems. The treatment process is described in detail for the three water treatment plant sites in Section 3, Proposed Project and Engineering Alternatives.

7.1.2.5.3. Treatment Chemicals

Chemical facilities would be designed in accordance with NYSDOH and New York State Department of Environmental Conservation (NYSDEC) requirements. Regulatory requirements encompass chemical storage capacity, redundant transfer and feed pumps, and secondary containment of chemicals to protect against potential spills. The chemicals and their functions are listed below. Chemical application points, average and maximum dosage, and chemical storage volumes per treatment train (with two treatment trains in the proposed plant) are presented in Table 7.1-2.

- Potassium permanganate[8]: Use for oxidation of iron and/or manganese as needed during reservoir turnover events.
- Sulfuric acid: For pH correction prior to coagulation.
- Coagulant alum (Aluminum sulfate)/PACl (Poly-Aluminum chloride): For coagulation.
- Coagulant Aid Polymer: Coagulant.
- Filter Aid Polymer: Filtration aid.
- Sodium Hypochlorite:
    - Pre-Feed: Used for plant start-up and aids in maintaining an oxide coating on the filter media.
    - Post-Feed: Secondary and virus disinfection.
- Hydrofluorosilicic Acid: To prevent dental decay.
- Sodium Hydroxide: For pH adjustment
- Corrosion Inhibitor (Orthophosphate or Phosphoric Acid): For corrosion control.

Chemical system capacities would be based on the chemical usage data from pilot testing and estimates of required dosages for other chemicals. The storage tank volume would be based on 30-day storage for the design usage, except sodium hypochlorite and potassium permanganate, which would be based on 15-day storage. In order to standardize the design of the chemical systems, tanks would be provided for the larger of the 30-day storage or 5,000 gallons. However, the filter aid polymer and residual polymer would be shipped in totes rather than in tanker trucks.

Transfer pumps and transfer (day) tanks are proposed to reduce space requirements in the bulk storage tank area. Transfer tank volumes would be based on maximum flow and maximum dose conditions with a 24-hour detention time for all chemicals. All chemical storage tanks would be provided with secondary containment with the capacity to hold at least 110 percent of the largest single tank volume in the containment area. Incompatible chemicals would be stored in separate areas. The chemical system would be divided into two sub-systems, each serving one half of the treatment plant.

[8] Potassium Permanganate would be used as needed during turnover events.

TABLE 7.1-2. CHEMICAL SYSTEM DESIGN CRITERIA[1]

Chemical	DOSE (mg/L)		DESIGN USAGE[2]		STORAGE[2]		Application Point
	Average	Maximum	(Lbs/day) of active chemical	(Gal/day) of active chemical	No. of Tanks	Volume per tank (gallon)	
Potassium Permanganate[3]	3.0	3.0	7,256	N/A	15 cycle bins	3,300 lbs	Gate House No. 5
Coagulant[4]					7	9,284	
Aluminum Sulfate; Alum	17	30	10,640	1,998			First-Stage of Rapid Mixers
Poly-aluminum Chloride; PACl	13	17	8,136	2,464			First-Stage of Rapid Mixers
Sulfuric Acid	2.5	6.5	1,565	141	2	5,861	First-Stage of Rapid Mixers
Coagulant Aid (Cationic) Polymer	1.25	1.75	782	179	2	5,861	Second-Stage of Rapid Mixers
Filter Aid Polymer	0.05	0.2	31	8	Tote or Storage Drums		Second-Stage of Flocculation Tank
Sodium Hypochlorite[5]					4	9,700	
Pre-Feed	2.0	3.0	1,262	1,520			Before Filtration
Post-Feed	1.5	2.0	900	1,086			Filtered water discharge from UV chamber
Hydrofluorosilicic Acid	1.0	1.0	601	327	2	5,252	Filtered water discharge from UV chamber
Sodium Hydroxide	5.0	12.5	3,004	468	2	7,800	Filtered water discharge from UV chamber
Corrosion Inhibitor (Orthophosphate or Phosphoric Acid)	1.0	2.0	601	168	2	5,252	Filtered water discharge from UV chamber

TABLE 7.1-2. CHEMICAL SYSTEM DESIGN CRITERIA[1]

Chemical	DOSE (mg/L)		DESIGN USAGE[2]		STORAGE[2]		Application Point
	Average	Maximum	(Lbs/day) of active chemical	(Gal/day) of active chemical	No. of Tanks	Volume per tank (gallon)	

Notes:

(1) Quantities are per treatment train (with two treatment trains in the proposed plant).

(2) Based on Average Dosage and Average Flow (144 mgd).

(3) Potassium permanganate facilities would be at Gate House No. 5 at Jerome Park Reservoir Potassium permanganate facilities would be introduced if the filter media proposed at the water treatment plant were changed from a dual media of sand and anthracite to a dual media of sand and GAC. Anthracite, the currently planned filter medium, can remove metals without oxidation by potassium permanganate; if after operations are underway it is decided to switch filter media to granular activated carbon, potassium permanganate would have to be added occasionally. The flocculation of iron and manganese with potassium permanganate is a slow reaction, and it would be added at Gate House No. 5 to allow time for the reaction to occur before the raw water would reach the water treatment plant. Work to install the potassium permanganate is entirely interior, of short duration, and would not result in a significant impact. It would be delivered in a dry chemical form and therefore gallons per day units are not applicable. Storage is based upon usage of 3,300 lb cycle-bins for maximum flow and dosage. A cycle-bin system would allow ease of storage, transport, and handling of potassium permanganate.

(4) Coagulant storage tanks store either Alum or PACL at one time, depending on which chemical is more desirable to be used as a coagulant.

(5) Sodium hypochlorite tanks store both pre-feed and post-feed sodium hypochlorite.

7.1.2.5.4. Harlem River Site Overview

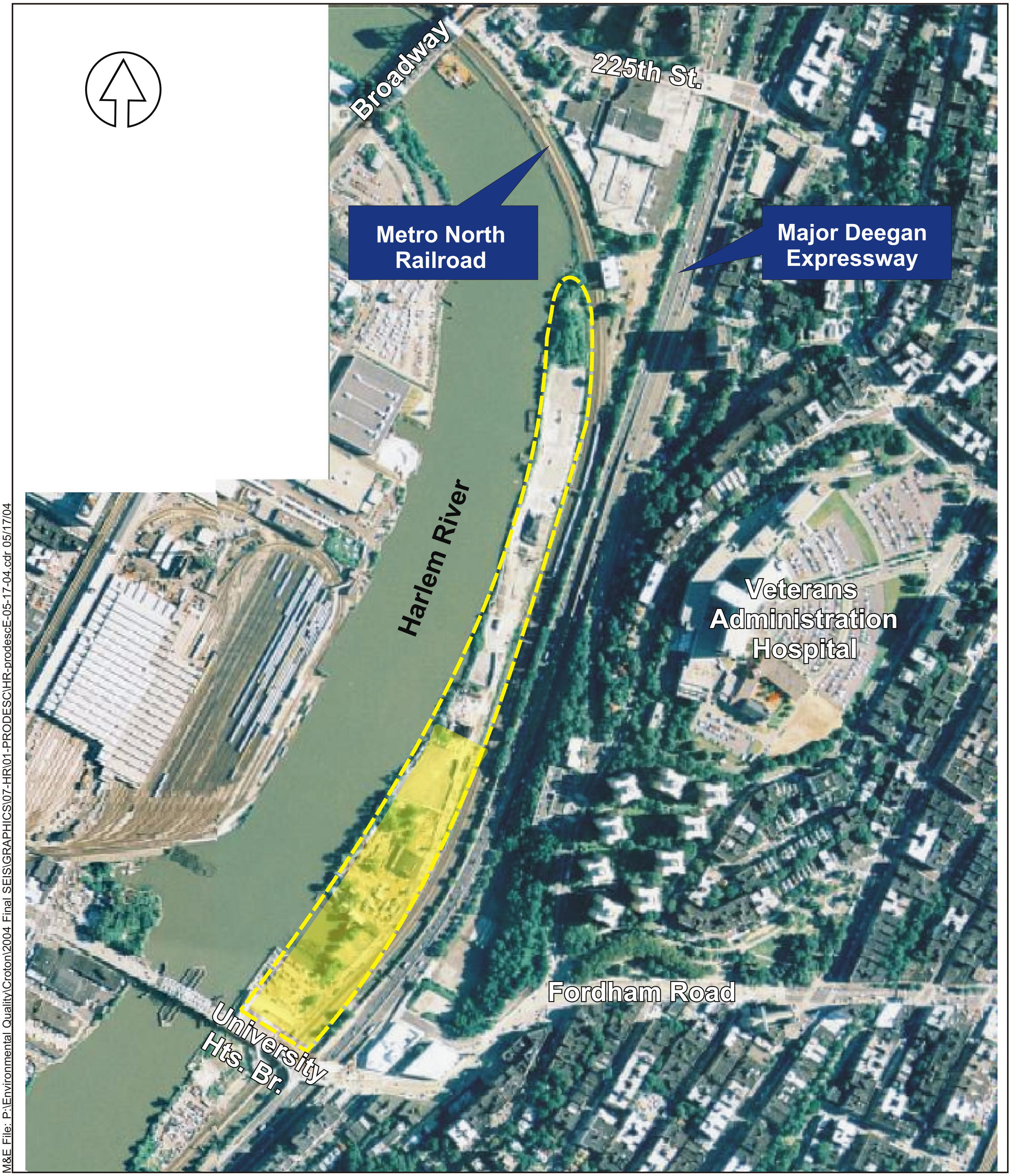
The proposed plant at the Harlem River Site would include the water treatment building (housing the treatment processes, administrative offices, and a process laboratory), a raw water tunnel from the NCA, a pump station building, and a treated water tunnel. Separate structures adjacent to the water treatment building would house the electrical facilities. Figure 7.1-5 presents an aerial view of the proposed plant on the Harlem River Site, and Figure 7.1-1 presents an overview of the Harlem River Site and surrounding study area. A summary of the proposed project facilities is presented in Table 7.1-3.

TABLE 7.1-3. PROPOSED PLANT STATISTICS

Approximate dimensions – WTP main building	920 ft x 260 ft
Approximate dimensions – Other buildings	527 ft x 45 ft 190 ft x 85 ft 320 ft x 180 ft
Maximum building height above final grade	Penthouse - 76.5 ft Roof - 65 ft
Approximate WTP and Pump Station buildings footprint area	272,000 sq. ft.
Length of Raw Water Tunnel	1,415 ft
Length of Treated Water Tunnels	350 ft-combined tunnel 6,640 ft-High Level tunnel

TABLE 7.1-3. PROPOSED PLANT STATISTICS

	1,200 ft-Low Level tunnel
Approximate existing grade	9.5 - 13 ft
Approximate final grade	10 ft
Approximate area of affected during construction	17.5 acres
Approximate finished WTP site area (buildings and roads)	11 acres



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Existing Harlem River Site

Figure 7.1-5

7.1.2.5.5. Process Laboratory

The proposed plant would include a process laboratory for monitoring and controlling the treatment process. The laboratory would be equipped to analyze a number of water quality parameters such as turbidity, color, pH, alkalinity, disinfectant residuals, particle counts, iron, and manganese. The laboratory would also process other samples for shipment to off-site laboratories for analysis. Several of these analyses use bench top analyzers, which would require a minimal amount of chemicals for sample preparation and instrument maintenance and calibration: The other analyses would be performed using colorimetric processes with commercially-prepared reagent packets. A summary of anticipated analytical chemical usage is presented in Table 7.1-4.

TABLE 7.1-4. PROCESS LABORATORY ANALYTICAL REQUIREMENTS AND WASTE DISPOSAL

ANALYSIS	METHOD[1]	REQUIRED REAGENTS	QUANTITY	DAILY WASTE DISCHARGES TYPE	DISPOSAL METHOD
Turbidity	SM180.1	None		Water	
Color	SM204	None		Water	
PH	SM424	None		Water	Neutralizing sink/sewer
Alkalinity	SM403	0.02 N Sulfuric Acid	Approx. 100 ml per sample per day	Solution	Neutralizing sink/sewer
Particle Count	Laser Diode Technology	None		Water	Sanitary Sewer
Iron	SM310A	FerroVer [2]	Approx. 10 ml per sample per day	Solution	Neutralizing sink/sewer
Manganese	USEPA LR PAN Method	PAN indicator [3] Alkaline Cyanide [4] Ascorbic Acid	1ml – PAN 0.5ml – Alkaline 1 packet – Ascorbic (each per sample/day)	Solution	Neutralizing sink/sewer
Chlorine Residual	SM409E	None		Solution	
Cleaning Reagents		Nitric Acid (4%) Standard Detergent (Alconox)	5 gallons per year 10 gallons per year	Solution	Neutralizing sink/sewer
Total Estimated Discharge Volume To Sewer Per Day					42 gal

Notes:
1. SM – Standard method for the analysis of water and wastewater
2. FerroVer – Iron Phenanthroline
3. PAN Indicator – Dimethyl Formamide, Ammonium Acetate, Triton X, Water
4. Alkaline Cyanide – Water, Sodium Cyanide, Sodium Hydroxide

Electrical Power. Energy conservation would be universally implemented in the design and operation of the proposed plant. Premium efficiency motors, pumps, transformers, lighting and energy-consuming appliances would be specified as much as possible. Electric power for the proposed plant would be furnished by the New York Power Authority (NYPA), which has a contract to supply electricity to New York City government facilities. NYPA generates, buys, and transmits electrical power on a wholesale basis, but does not have its own distribution system. NYPA would supply electrical power through Consolidated Edison (Con Edison). The distribution of electricity to the proposed plant at the water treatment plant site would be the responsibility of Con Edison. The electric supply for the proposed plant would be provided from the Con Edison Sherman Creek Substation, located in Upper Manhattan, along the Harlem River, about seven blocks south of the University Heights Bridge. Underground feeders would run north along the Harlem River from the Con Edison Sherman Creek Substation and cross the river into the water treatment plant site on the existing Con Edison property. The feeders would follow the route of the existing submersible cables that currently pass through the water treatment plant site. All feeders would enter the site underground and would be connected to a step-down substation located to the north of the main treatment building.

Determination of the electrical power demands was estimated based on three scenarios: connected load, maximum demand, and average demand. The connected load is the sum total electrical load of all equipment installed in the facilities, including standby units that normally would not be operating. This amount is not used for supply capacity. Maximum demand is the total maximum demand of all electrical loads when the proposed plant is operating at its maximum flow capacity (290 mgd). Average demand is the total maximum demand of all electrical loads when the proposed plant is operating at its average flow capacity (144 mgd). Table 7.1-5 presents the estimated electrical power demands for these three scenarios. In addition, there would be an emergency power system to run emergency and safety equipment, not to operate the proposed plant. Two diesel generators would provide the power for this emergency system.

TABLE 7.1-5. ESTIMATED ELECTRICAL POWER DEMANDS FOR THE PROPOSED PLANT

Facilities	Connected	Estimated Electrical Load, kW		
		Maximum	Average	Emergency
Proposed Plant:				
Raw Water Pumping Station	32,118	18,711	11,369	124
Treatment Processes[1]	10,474	8,100	6,488	532
Residuals	514	353	353	145
Administration, HVAC, Service Areas	2,554	2,024	1,616	565
Total	**45,660**	**29,187**	**19,825**	**1,366**

Notes:
1. Treatment Processes includes filtration, Dissolved Air Flotation, and Ultraviolet Light Disinfection.

The proposed plant at the water treatment plant site would require up to six underground service feeders, each at 13.2-kV. The Bronx, where the water treatment plant site is located, is designated by Con Edison as a “second contingency” area, meaning that any two feeders maybe taken out of service at anytime and the remaining feeders must be able to carry the maximum demand load.

Electrical Power Distribution. The electrical loads within the proposed plant would be divided into three groups: Plant A – south side of the process loads; Plant B – north side of the process loads; and common facilities – treated water pumps, HVAC, service areas, administration and maintenance areas. The treated water pumps would not operate when the two half plants (Plant A and Plant B) are off line. Each of the two half plants, Plant A and Plant B, could be operated or shut down independently of each other, or at the same time. The common facilities would be able to operate when either or both Trains A and B are running up to maximum capacity. In addition, any required components of the common facilities would be able to run when both treatment process trains are shut down.

The main substation would receive the incoming underground service feeders and step down the voltage to 4.16-kV for distribution throughout the proposed plant. Power distribution feeders would be 4.16-kV-shielded cables in PVC-coated galvanized rigid steel conduits. Conduits would be run exposed in utility galleries from the main substation to the electrical rooms of major process areas. Medium-voltage switchgear would distribute power to large motors and secondary unit substations (SUS). The SUS would further step down the voltage to feed 480-volt motor control centers, general process loads, and HVAC equipment. Dry type transformers would convert power from 480 volts to 240, 208 and 120 volts to supply power to lighting and small loads connected to lighting panel-boards.

The raw water that passes through the turbine generator would generate additional power that could be used within the proposed plant. Approximately 1.3 Megawatts (MW) of power at the average plant flow of 144 mgd and 2.6 MW of power at the maximum plant flow of 290 mgd would be recovered.

Electrical Design Considerations. The basic electrical design considerations would be safety, reliability, flexibility, energy conservation, ease of operation and maintenance, and life cycle costs. The electrical design would comply with all applicable Federal, State, City, and local codes and other applicable codes and standards. All major electrical equipment would be located indoors in dedicated electrical rooms. The underground and indoor installation of electrical facilities and the state of the art design, including shielding, would reduce electromagnetic fields and extremely low frequency emissions to background levels in areas where the public would have access.

Emergency Power. In case all Con Edison feeders are out of service, two emergency diesel generators, each rated 1,500 kW, 480 volts, one operating and the other as backup, would provide emergency power. The generators would be available for fire pumps, fire alarms, fire protection, smoke purging exhaust fans, emergency elevators, and other emergency equipment in case of fire or other emergency conditions. Emergency power for the security system, communication systems, lighting protection system, plant control system and other safety equipment would also be provided. Treatment processes and pumping operations would be stopped until Con Edison power is restored.

All process controls, and computers and communications systems would have individual uninterruptible power supplies (UPS). Batteries, chargers, and UPSs would be supplied with automatic transfers to the emergency generator. An underground fuel storage tank would be provided, at least 20 feet away from any means of egress. The size of the fuel storage tank would be 3,000 gallons, based on 24 hours of continuous full-load operation of one generator.

Traffic Circulation. Access to the Harlem River Site would be from a two-way public ramp connecting West Fordham Road with Exterior Street. Vehicular traffic would enter the site via a security guardhouse at the north end of Exterior Street, and then travel north on the eastern edge of the site. A turn around loop would be located at the northern end of the water treatment plant site to allow trucks and vehicles to reverse direction to exit the site. A one-way road on the western edge (adjacent to the Harlem River) of the site would provide passenger vehicles with an alternate route to circumvent the site. Vehicles, trucks and passenger cars, would exit the water treatment plant site via the guardhouse at Exterior Street.

Parking facilities (25 spaces) would be provided adjacent to the administration building entrance for employees and visitors. Additional parking facilities (29 spaces) would be provided at the northern section of the facility. The parking facilities would include provisions for handicapped individuals. A shipping/receiving area with roll-up doors would be located on the east side of the process building. This centrally located area would serve as the equipment removal point for the entire process building. The chemical fill stations (two truck bays) would also be located on the eastern side of the process building.

During construction, barging would be utilized to transport materials to and from the water treatment plant site. The barging would be routed through a high-traffic waterway (the Harlem River). Two bridges are located along the anticipated navigation route, the Spuyten Duyvil Bridge and the Broadway Bridge. The proposed barges would be an estimated 50 to 60 ft wide, while the narrowest section of the navigational route is approximately 90ft. wide at the mouth of the Harlem River under the Spuyten Duyvil Bridge. The maximum height of the barge is estimated to be below 25 ft. above the water line. This height would allow the proposed barge activity to not require the raising of the Broadway Bridge. The Spuyten Duyvil Bridge, which is normally opened for all river traffic, would need to be opened for the barging activities under the proposed project. During peak construction periods (2009), barging activities would require up to one round-trip per day. The contractor would be required to select a barge operator. The contractor would be responsible for identifying and obtaining the appropriate permits to conduct barging activities. In addition, the barge operator would be responsible for identifying and obtaining permits for operating a barge. The proposed project would apply appropriate safety practices and standards to protect against possible spills and accidents.

Architectural Considerations. The architectural spatial layout for the water treatment plant would be designed to accommodate a staff of administrative, operation and maintenance personnel. The design for the site would incorporate certain “green building” concepts. For instance, the facility would be design to have a green roof on all buildings. The concepts would be limited to a few conservation methods and renewable energy technologies that embody a design intent on balancing energy efficiency, environmental responsiveness, indoor air quality, resource conservation, and cultural and community sensitivity. The master plan for the site would incorporate areas for public amenities. Pedestrian and waterfront access would be provided in the form of an elevated promenade along the bulkhead.

Due to the unique life safety concerns related to the building with levels below grade, additional active and passive fire safety features would be incorporated into the overall building design. Precast concrete panels are proposed for the building exterior skin, to provide a structurally sound building and one that invokes a sense of permanence. Flat panels, which are easily transported and installed, are proposed for this purpose. Projecting elements, textures, patterns, and other accents and details would be used to create visual interest in the façade.

7.1.2.6. Treated Water Conveyance

The Croton System in the City consists of a three level service system: a High Level Service, an Intermediate Level Service and a Low Level Service[9]. Croton Water is currently pumped into the Intermediate Level Service and High Level Service to maximize the use of Croton water when needed.

The normal areas supplied by the Croton System are the Low Level service areas in Manhattan and the Bronx. These areas are fed by gravity from the Jerome Park Reservoir. The pressure in these areas is controlled by the surface elevation of the Jerome Park Reservoir (typically elevation 131-133 feet MSL), less hydraulic losses in the transmission and distribution systems downstream of the reservoir. Croton water is conveyed to Manhattan through the NCA, downstream of the reservoir to Shaft 33 and then through transmission mains. Croton water is conveyed from the Jerome Park Reservoir to the East Bronx through Gate House No. 5 and to the South Bronx through Gate House No. 6. Regulators are used when necessary to release Intermediate and High level Service Area water into the Low Level Areas, to meet peak demands. This Intermediate and High level Service Area water is from the Catskill and Delaware Systems.

Currently, the Mosholu Pumping Station supplies the High Level Service and the Jerome Pumping Station supplies the Intermediate Level Service. The Mosholu Pumping Station, which is located under Gate House No. 7, can pump up to 52 mgd of Croton water into Shaft No. 3 of City Tunnel No.1, High Level Catskill/Delaware service. The Jerome Pumping Station has the capacity to pump up to 50 mgd of Croton water into the Intermediate Level Service distribution for the Bronx. Under normal operation, two pumps operate conveying about 38 mgd to the system. The third pump serves as a spare.

Under the proposed project, the Jerome Park Reservoir would remain in service as a raw water reservoir, and act as a balancing reservoir to meet the fluctuating water supply needs of the City. Treated water would be conveyed from the wet well/treated water pumping station through a combined treated water tunnel; consisting of a High Level Service tunnel, and a Low Level

[9] Levels (Low, Intermediate, and High) refer to the topographic height of the neighborhoods served. For example, Low Level Service includes low-level areas of the East and South Bronx and Manhattan. This water is transmitted through the distribution system at a lower level than the Intermediate and High Level Service. Intermediate Level Service would be provided from the High Level Service via existing regulators in the distribution system.

Service tunnel. The combined tunnel would be 350 feet long and would have a diameter of 24 feet. Upon exiting the combined tunnel, the High Level tunnel, which would be 6,640 feet long, would convey up to 290 mgd of the High Level Service treated water to the new Shaft Chamber in the vicinity of the Jerome Park Reservoir.

With the plant located at the Harlem River Site, distribution system redundancy would be provided by keeping the Croton and Catskill/Delaware systems separated until after treatment. This redundancy would enable water to still be supplied to users in the event something were to occur to either the Croton or Catskill/Delaware System. In addition, this separation allows water to be delivered to both the high-level (the Catskill/Delaware System) as well as the low-level (the Croton System) service areas. The Harlem River Site would provide a connection to the high-level service in addition to the low-level service.

7.1.2.7. Treated Water Pumping Station

A treated water pumping station would be included in the proposed plant, adjacent to the UV disinfection facility. From the UV facility up to 290 mgd of treated water would flow by gravity into a wet well. Ten pumps would be located inside the wet well, six High Level pumps and four Low Level pumps. Three High Level pumps and two Low Level pumps would be made available for each of the two wet well compartments. The wet well divider wall would have a sluice gate and stop logs which would allow water to be transferred from one compartment to another if required.

The four low-level service pumps would discharge to the Low Level treated water tunnel conveying treated water back to the NCA. The six High Level service pumps discharge treated water to the High Level treated water tunnel and convey treated water to the new Shaft Chamber in the vicinity of Jerome Park Reservoir.

If needed, the High Level Service water could be added to the Low Level Service system through pressure reducing valves. The flow would discharge into the Low Level Service pump discharge line and flow into the Low Level treated water tunnel to be conveyed to the Manhattan Low Level Service.

7.1.2.8. Treated Water Tunnels and Distribution System Operation

Treated water would be conveyed from the wet well/treated water pumping station through a combined treated water tunnel; consisting of a High Level Service tunnel, and a Low Level Service tunnel. The combined tunnel would be 350 feet long and would have a diameter of 24 feet. The combined tunnel would cross beneath the Metro-North Rail Road tracks and the Major Deegan Expressway (Interstate 87). At these crossings, the tunnel would be constructed using soft ground tunneling techniques. This is a complex technique that can be quite slow. In addition the rail tracks and the expressway would have to be supported from beneath while the tunnel would progress.

Upon exiting the combined tunnel, the High Level tunnel, which would be 6,640 feet long, would convey up to 290 mgd of the High Level Service treated water to the new Shaft Chamber in the vicinity of the Jerome Park Reservoir. Treated water would be distributed to High Level

Service City Tunnel No. 1, Shaft Nos. 3 and 4, and to City Tunnel No. 3, Shaft No. 4B. Flow meter chambers would also be installed to measure the treated water conveyed to City Tunnel No. 1 (Flow Meter Chamber B) and City Tunnel No. 3 (Flow Meter Chamber C).

These new High Level Service connections would replace the Mosholu Pumping Station, an existing facility, which would be taken off line.

High Level treated water could also be conveyed from the new Shaft Chamber to the Low Level System through sleeve valves. A new pipe would be constructed from the new Shaft Chamber to the existing Valve Chamber C to deliver up to 30 mgd of Low Level treated water to the East Bronx. Low Level Service could also be conveyed, through sleeve valves, from the new Shaft Chamber to the South Bronx. A new flow meter (Flow Meter Chamber D) would connect to the existing service in the vicinity of Jerome Park Reservoir. This service continues along the floor of the south basin of the Jerome Park Reservoir and by passes Gate House No. 6.

Low Level treated water would be pumped from the proposed plant to the NCA downstream of Shaft No. 22 via a new Low Level treated water tunnel. The treated water tunnel would supply up to 155 mgd of treated water to Manhattan.

Upon exiting the combined tunnel, the Low Level tunnel, which would be 1,200 feet long, would convey up to 155 mgd of Low Level treated water to the NCA downstream of NCA Shaft No. 22. At the point of connection of the Low Level tunnel to the NCA, rock dowels and welded wire fabric would be used to support the rock. A tunnel plug, made of cast-in-place concrete, would be installed upstream of NCA Shaft No. 22 to provide a complete physical separation of raw and treated water. The Low Level tunnel would be constructed in rock using drill-and-blast methods and immediate rock support to maintain stable ground. This blasting is not anticipated to cause significant vibrations on the surface; see Section 7.10, Noise, for further details. NCA Shaft No. 22 would be kept open for operations and maintenance purposes.

Intermediate Level Service to the Bronx would be supplied through the in-City High Level service using existing regulators. This would replace the Jerome Pumping Station, which would be taken off line.

7.1.2.9. Treated Water System Off-Site Facilities

The treated water High Level Service connection would require the construction of a new shaft chamber east of the Jerome Park Reservoir and modifications to existing piping facilities around Gate House No. 5. The Jerome Park Reservoir would be used as a raw water reservoir. Additionally, work would occur at Gate House Nos. 2, 3, 5, 6, and 7. The Jerome Pumping Station would no longer be needed and would be taken off line. The Mosholu Pumping Station, contained within Gate House No. 7, would be taken off line. Minor rehabilitation work would occur at NCA Shaft No. 21; this shaft would direct raw water from Jerome Park Reservoir to the proposed plant via the NCA. See Section 8, Off-Site Facilities, for further details regarding work to be performed at these off-site facilities.

7.1.2.10. Emergency Bypass

If the proposed plant is taken out of service (electrical or other failure) and the Croton System would be required to meet the demand, subject to NYSDOH approval, a connection at the proposed plant between the raw water shaft and the treated water shaft would enable untreated Croton water to be conveyed to the NCA downstream of NCA Shaft No. 22. This bypass would be capable of delivering raw water to the Low Level Service in Manhattan in an emergency.

7.1.2.11. Solids Removal

Treatment of Croton Water would result in the production of residuals throughout the treatment process. Separating, handling, and managing these residuals would allow reclamation of usable water and minimization of residuals waste disposal. The residuals handling facility would recover a substantial amount of the generated process wastewater. The residuals handling facility would serve to reclaim filter-to-waste water (e.g. water wasted during the start-up of a filter after backwashing), and waste backwash water. The reclaimed wastewater would be recycled to the head of the plant for treatment. The floated coagulated material from the DAF (Dissolved Air Floatation) process used by the proposed plant would flow to the floated solid storage tanks. Floated sludge and sedimentation from the filter-to-waste and waste backwash water would also be directed to the floated solid storage tanks. The design average and maximum mixed solids flow rates of two percent solids would be approximately 121,000 gallons per day (gpd) and 284,000 gpd, respectively.

There would be no residuals treatment on-site at the Harlem River Site. The mixed solids from the floated solids storage tanks would be pumped through two proposed six-inch force mains (each would be able to handle the maximum flow) to the Hunts Point WPCP, which is located in the South Bronx, NY, approximately six miles from the water treatment plant site. The sludge would be dewatered at the Hunts Point WPCP dewatering facility.

There are three sludge storage tanks at the Hunts Point WPCP, which receives flow from Newtown Creek WPCP and the Hunts Point WPCP. The quantity of mixed solids from the proposed plant would not compromise these sludge storage tanks or the dewatering facilities at the Hunts Point WPCP. The Hunt Points WPCP dewatering facility maintains 13 centrifuges, each with a capacity of 250 gallons per minute (gpm). Typically, the centrifuges are operated four to nine at a time with a combined capacity of 1,000 gpm to 2,250 gpm, depending on the amount of sludge received. The maximum flow of 197 gpm of mixed solids from the proposed plant would not impact the operation of these centrifuges.