

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

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5.1. 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 the Jerome Park Reservoir. Three sites for the proposed 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 (KCT). This project description provides details relating to construction and operation of the proposed plant if it were built at the Eastview Site.

Construction of the proposed Croton Water Treatment Plant at the Eastview Site would include a new raw water¹ connection to convey untreated water from the NCA to the water treatment plant site; a raw water pumping station (RWPS) that would deliver the raw water to the head of the proposed plant; a main treatment building located predominantly aboveground that would house all the process elements, plant offices, a conference room, a small process laboratory, maintenance and storage facilities, and the electrical and heating ventilation and air conditioning (HVAC) rooms; a guard house; and treated water conveyances. The Eastview Site is less secure than the Mosholu Site since the main treatment building is located predominantly aboveground. There is also a concern with this site because it would concentrate the City's water treatment facilities at one site due to the planned construction of the Catskill / Delaware Ultraviolet Light (UV) Facility at the same site. The treated water connection alternatives are described in Section 3, Proposed Project and Engineering Alternatives. The plant would be placed into operation in 2010. In addition, construction of the proposed plant would require the stabilization of several off-site Croton System facilities in order to pressurize the NCA south of the Eastview Site if the NCA is chosen as the treated water conveyance. The off-site location points at which significant activity would occur have been identified as the following: NCA Shaft No. 9 (the Village of Sleepy Hollow, NY), NCA Shaft No. 14 (Ardsley, NY), NCA Shaft No. 18 (Yonkers, NY), Gate House No. 1 (Bronx, NY), as well as modifications to the facilities in and around the Jerome Park Reservoir (Bronx, NY). Work at these locations along the NCA is described in Section 8, Off-Site Facilities.

The use of space at the Eastview Site has been maximized by placing the proposed plant in a location on the property that has been previously cleared of trees. The facility uses stacked components and other space-saving design to save on space and cost. The space savings are intended to preserve the remainder of the site in its current condition and to allow for the construction of other water treatment facilities if future needs require additional construction on the City-owned property. However, the construction of the Croton WTP at the same site and approximately on the same schedule of the Cat/Del UV Facility complicates the utilization of

¹ Raw water refers to fresh untreated water.

this site. It would require that additional stockpiling and staging for excavated material for the Cat/Del UV Facility would have to be utilized, further increasing the impacts of both projects and adding costs.

5.1.1. Site Description

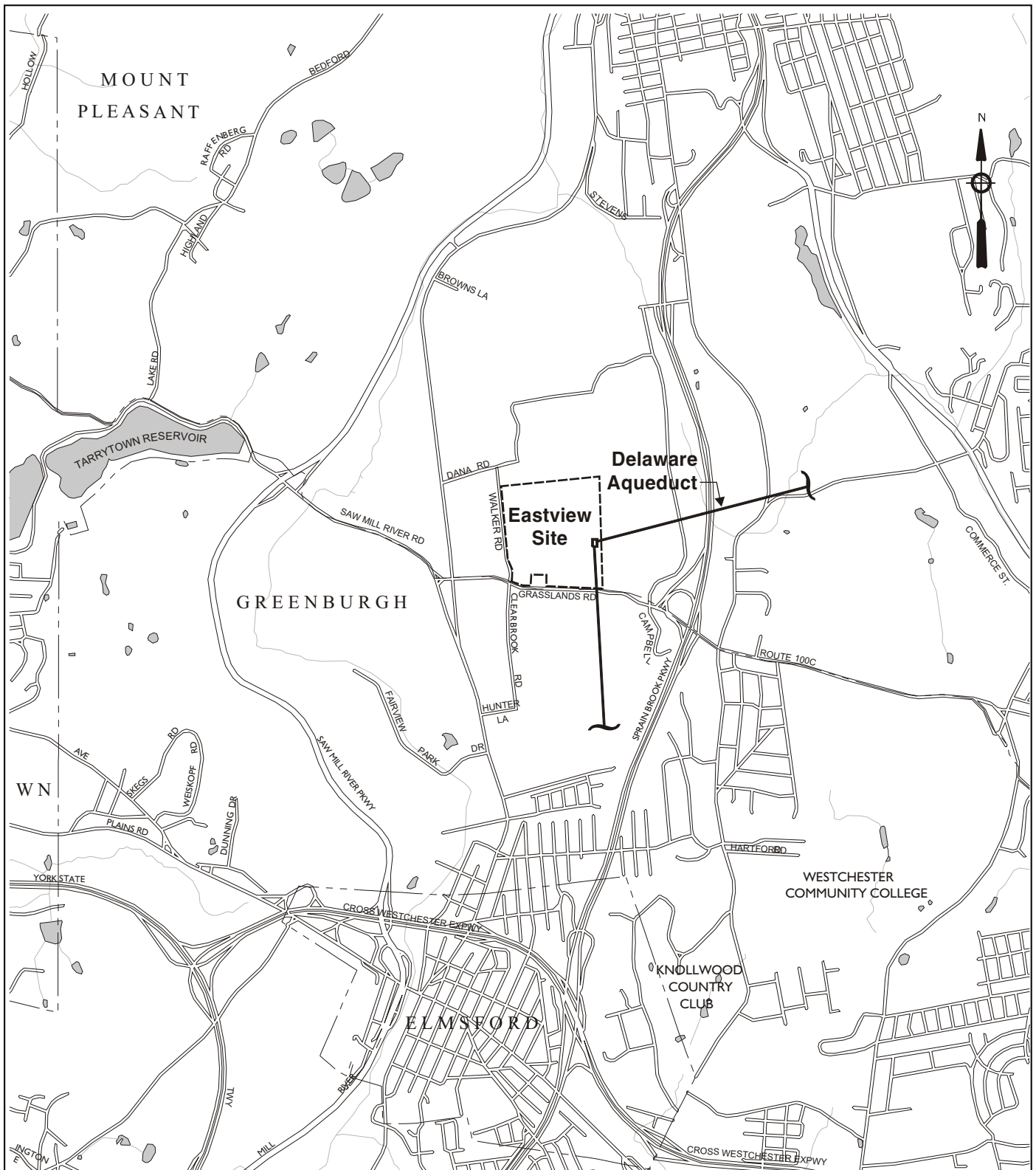
The City of New York (the City) owns approximately 153 acres of largely undeveloped land located within central Westchester County, New York, that is known as the Eastview Property. The Westchester County Grasslands Reservation borders the property to the north, east and northwest. Additional City-owned property is located to the south and southwest, with a residential development to the southeast along Taylor Road, and corporate office parks to the south and southwest. The property consists of approximately 83² acres situated in the Town of Mount Pleasant and 66 acres situated in the Town of Greenburgh. The two portions of the property are bisected by Grasslands Road/Route 100C, which serves as the border between the Towns. The proposed project would be situated on approximately 83 acres of the property within the Town of Mount Pleasant, which would be referred to as the Eastview Site throughout this document.

The Eastview Property and eight acres of land just east of the parcel located in Greenburgh were purchased by the City in the early 1900s and were equipped with connections to the Catskill and Delaware Aqueducts in anticipation of a need for water treatment facilities.

The site is identified by Section 116-16, Tax Block 1, Lot 2 and Section 116-20 property tax Block 1, and is currently zoned as OB-2 (Office/Business). The entire City-owned property is currently undeveloped, with the exception of: 1) Shaft No. 19 of the Delaware Aqueduct, situated on the eastern side of the Mount Pleasant parcel with an access road off Grasslands Road/Route 100C; 2) the Catskill Aqueduct Connection Chamber, adjacent to the Greenburgh parcel with an access road off Grasslands Road/Route 100C; 3) an electrical substation (owned and maintained by Con Edison), situated off Grasslands Road/Route 100C on the Greenburgh parcel; 4) Walker Road (under an easement to Westchester County) just to the west of the Mount Pleasant parcel that provides access to a satellite bus facility associated with Westchester County's Bee-Line Transit System and Grasslands Reservation; and 5) the historic Hammond House, adjacent to Grasslands Road/Route 100C on the Mount Pleasant parcel. A location map and aerial photo of the property are presented in Figures 5.1-1 and 5.1-2 and identify the existing structures and roadways.

² A four-acre easement was recently provided to Westchester County for the extension of Walker Road along the western boundary of the site; this reduced the acreage from the 87 acres formerly reported.

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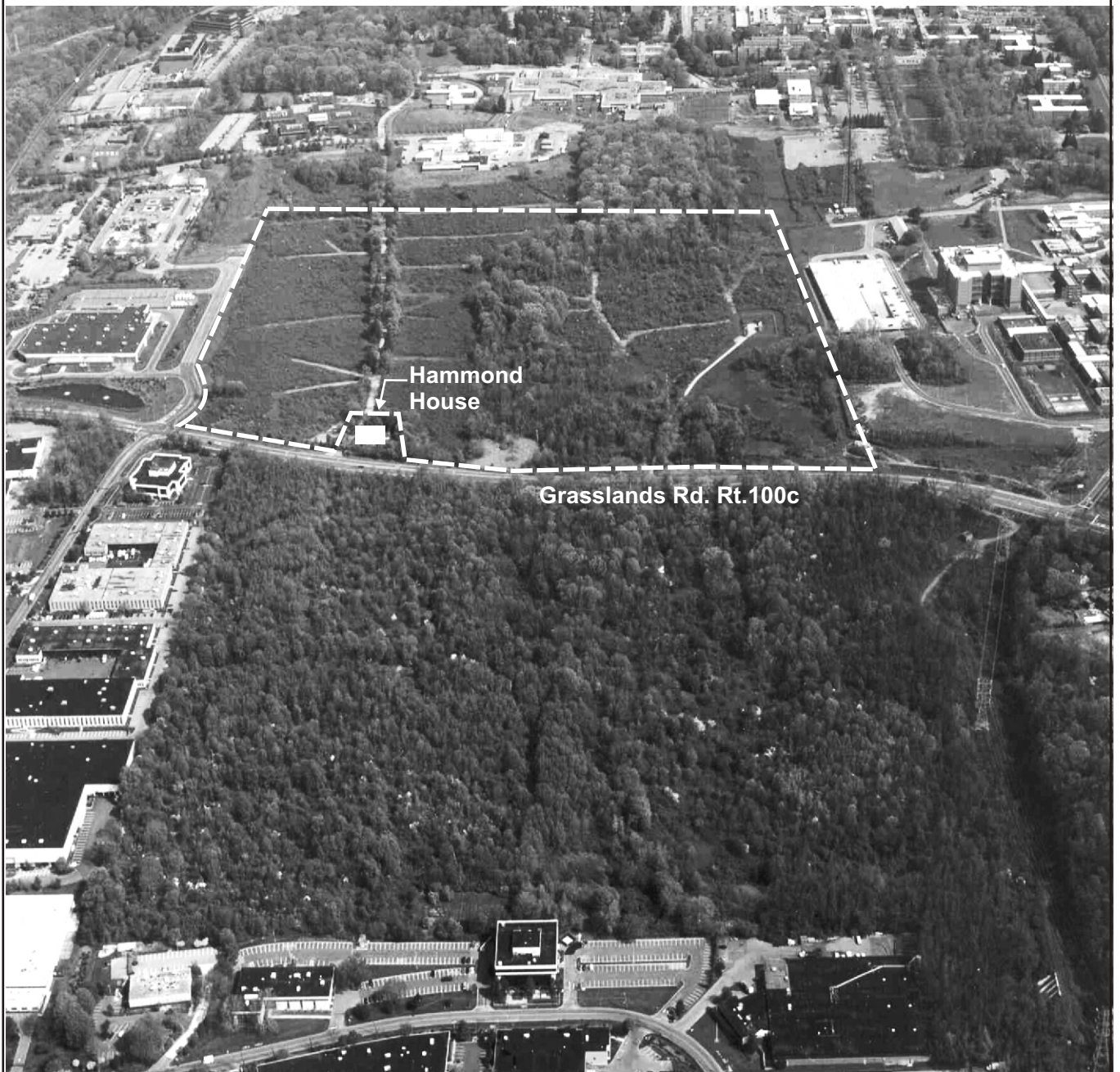


Not to Scale

Eastview Site

Croton Water Treatment Plant

Figure 5.1-1



5.1.1.1. Topography

The Eastview Site is primarily characterized by successional field and woodland communities, including mature upland woods and successional woods and fields. Mine Brook, a tributary to the Saw Mill River, flows through the central portion of the Site, from north to south, creating various wetland communities on the Eastview Site (Figure 5.1-3).

The Eastview Site topography consists of varied slopes, low-lying areas adjacent to small streams, and gently sloping uplands. A stream corridor intersects the central portion of the site. Elevations range from a low of 298 feet mean sea level (MSL, referring to the Mean Sea Level at Sandy Hook, New Jersey) along the stream corridor, with a relatively low rise of 334 feet MSL to the west and a somewhat greater rise to 364 feet MSL to the east. The western portion of the site is the most level area, and in which the majority of the proposed plant would be situated.

5.1.1.2. Surface Water

Surface water on the Eastview Site is characterized primarily by the north/south flowing stream, Mine Brook, and numerous smaller intermittent tributaries that contribute flows to Mine Brook. Wetland areas are established both adjacent to Mine Brook and in isolated areas on the site where the poorly drained soils allow water to collect near the surface.

5.1.1.2.1. Off-Site

Mine Brook enters the Eastview Site at the northern property boundary, through four closely spaced culverts and one principal tributary that convey flow from developed land on the Westchester County Grasslands Reservation, located north and east of the site.

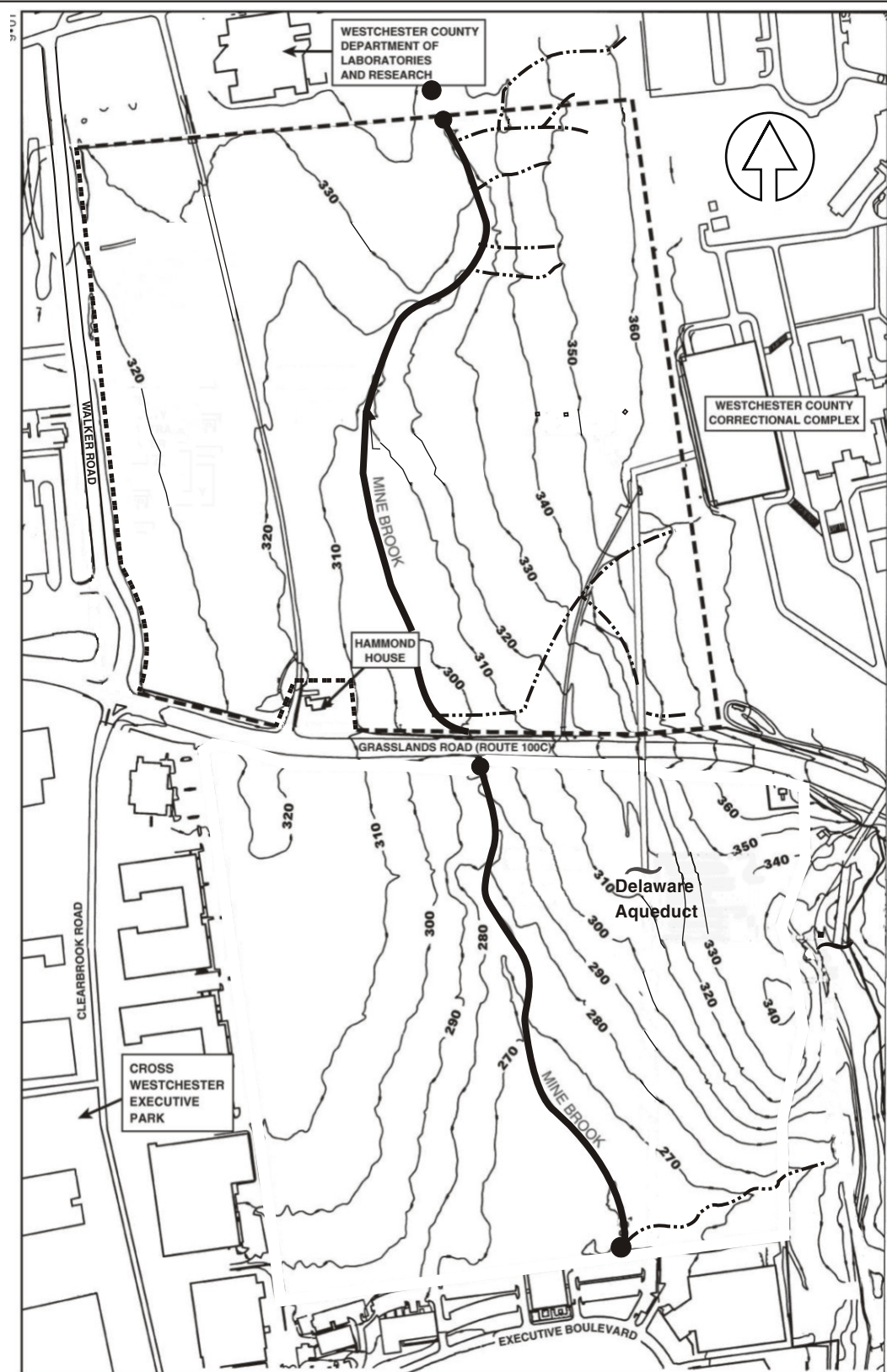
Surface water that enters the Eastview Site from the north via the culverts is currently uncontrolled. Westchester County may choose to adjust these flows in the future as part of a stormwater control plan for the Grasslands Reservation.

5.1.1.2.2. On-Site

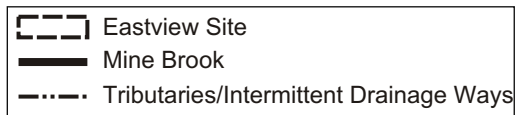
As Mine Brook flows through the Eastview Site, it picks up groundwater and surface water from surface flow, stormwater discharge, and intermittent small tributaries. During dry flow periods, the average base flow of Mine Brook is approximately 118 gallons per minute (gpm) at the point where it exits the northern portion of the site under Grasslands Road/Route 100C.

On-site flows from the site would be collected by a storm drainage system consisting of grass-lined channels flowing to stormwater inlets and piping which would convey the flows to a detention basin. The detention basin would then discharge the flows to Mine Brook. The basin would provide attenuation for all required return-period storm events such that post-developed outflows do not exceed pre-developed flow levels, as per Westchester County Stormwater Management Rules.

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Not To Scale



Eastview Site Topography

Croton Water Treatment Plant

Figure 5.1-3

5.1.1.3. General Geology

Two distinct geologic sequences underlie the site: Inwood Marble and the Manhattan Formation. The Manhattan Formation is the more predominant rock formation and consists of metamorphic rock types dominated by garnetiferous quartz-biotite-plagioclase gneiss with abundant sillimanite. These rock types are of Ordovician age and are often found folded with metamorphosed schists that are accentuated by alternating thin layers of light and dark gray. The western portion of the property includes bedrock from the Inwood Marble Formation. The Inwood Marble, of Cambro-Ordovician age, is a medium to coarse-grained marble ranging in composition from calcite to pure dolomite.

The site subsurface deposits consist of glacial till. Till is composed of unsorted deposits of debris varying in composition from rocks and boulders to clay-sized particles.

5.1.1.4. Seismicity

The property is located in the general seismic Zone 2A, which implies a maximum horizontal ground acceleration of 0.15g for a 500-year return period earthquake. Design of foundations for the water treatment plant site would be made in accordance with the requirements of the New York State Building Code (NYSBC). Based on the data from the 2002 subsurface investigation, most of the soils belong to Site Class C as defined by the NYSBC at the proposed plant foundation level, with Site Class D soils mainly present in the central portion of the site. NYSBC states that when two different site classes are present, the lesser class shall be selected. Site Class C has been selected for preliminary design; however, selection of Site Class C for final design would depend whether it would be cost-effective to enhance the existing Site Class D soils by ground improvement, as opposed to design the structure for a lesser class, such as Site Class D. Ground response coefficients C_a (acceleration-based coefficient) and C_v (velocity-based coefficient) given in the Uniform Building Code (UBC), for seismic Zone 2A and Site Class C, are respectively equal to 0.18 and 0.25.

5.1.1.5. Subsurface Conditions

The different strata identified through the 2002 subsurface investigation at the site, can be described as follows:

5.1.1.5.1. Fill Material

A possible fill or modified till layer, consisting of dense dark brown to gray-brown silty sand with gravel, approximately 8 to 20 feet thick (approximately between Elevations 360 and 340 MSL) was encountered immediately to the east of Delaware Shaft No. 19. The presence of this material is likely related to backfilling around the shaft during construction. This layer overlays natural glacial till. The only area where such a material was encountered during the 2002 subsurface investigation was in the vicinity of Shaft No. 19.

5.1.1.5.2. Glacial Till

With the exception of the area described above, the rest of the Eastview Site is underlain by a thick layer of glacial till, which can be generally classified as brown to gray fine sand to silty fine sand with occasional cobbles and boulders. Its thickness, starting from ground surface, varies between 18 and 120 ft or approximately between Elevations 340 and 200 MSL. The upper 10 feet of the till deposit are, in general, loose to medium dense throughout the site overlying medium dense to very dense material. In particular, in the center of the plant footprint where the ground surface is at or below Elevation 326 MSL, near the proposed foundation level at Elevation 315.5 MSL (bottom of the crushed stone layer), the till exhibits areas of medium dense compactness involving a total area of about 80,000 square feet. At this location, the till becomes medium dense to dense below Elevation 314 MSL, and very dense below Elevation 308 MSL.

5.1.1.5.3. Glacial-Fluvial Material

This layer is discontinuous and consists of dense, brown silty fine sand with sub-rounded quartz gravel, or of fine sand with no gravel. This layer occurs at depths varying between 53 and 113 feet or approximately between Elevations 280 and 217 MSL, mainly along the eastern portion of the Eastview Site surrounding Mine Brook.

5.1.1.5.4. Decomposed Rock

In boreholes drilled to bedrock to determine subsurface conditions, a relatively thin layer (6 to 18 ft) of totally decomposed rock was encountered overlying the bedrock. This material is a very dense silty sand soil and is anticipated to be continuous throughout the site between Elevations 200 and 330 MSL, following the bedrock profile at the Eastview Site.

5.1.1.5.5. Bedrock

Gneiss or schist belonging to the Manhattan Formation was encountered at depths ranging from 34 ft (eastern portion of the Eastview Site) and 135 ft (western portion of the site) or approximately between Elevations 327 and 185 MSL. The bedrock is generally moderately weathered in the top 10 ft. The bedrock encountered in the vicinity of Shaft No. 19 appears to be a local rise in the bedrock surface, which is generally at a depth greater than 80 ft.

Based on the Standard Penetration Resistance and grain size distribution of the subgrade soils, neither fill material nor natural soils are considered susceptible to liquefaction during a seismic event.

5.1.1.5.6. Groundwater

The groundwater table generally increases in depth at the Eastview Site from east toward west, and intersects Mine Brook. The highest groundwater elevation (354 ft MSL) occurs south east of the Eastview Site near Shaft No. 19. The lowest groundwater elevation (305 ft MSL) occurs on the western edge of the site.

Groundwater in the overburden west of Mine Brook consists of direct infiltration of precipitation and infiltration of surface water from Mine Brook. Mine Brook is in turn recharged by groundwater and precipitation infiltration from the east. The till layer generally has low flow characteristics with a hydraulic conductivity in the order of 1×10^{-5} cm/sec.

Groundwater levels at the Eastview Site generally range from 5 to 25 ft below existing grade, with most of the levels at an average depth of 10 ft. While two-thirds of the plant foundation toward the west would be constructed above the water table, the eastern third of the plant would be below the water table at an approximate average elevation of 321 ft MSL. Assuming groundwater fluctuations during rainy periods, a design groundwater elevation of 324 ft MSL was used for preliminary design for the east portion of the proposed plant.

5.1.2. WATER TREATMENT PLANT AT THE EASTVIEW SITE

The proposed plant at the Eastview Site would include the water treatment building (housing the treatment processes, administrative offices, chemical storage, a process laboratory, electrical facilities, residuals treatment, security maintenance, and the HVAC system), a raw water tunnel from the NCA, an underground raw water pumping station with a wet well, and a treated water pipe to Shaft No. 19 on the Delaware Aqueduct, a treated water tunnel to the NCA or a potential connection to the possible Kensico-City Tunnel KCT³.

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 of some process components. Below-grade structures and water-retaining structures would be constructed of reinforced concrete. The structural components would be designed in accordance 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

³ An alternative means of conveying treated water to the City would be the construction of a new tunnel directly from the Eastview Site to the City. A feasibility study of this new tunnel has been completed. Not enough design information is available to determine the engineering advantages and disadvantages, cost implications, or environmental impacts of this new tunnel. If this new tunnel were constructed, then the NCA downstream of the proposed plant would be utilized to convey plant overflows and to release surges during unplanned shutdowns. If this alternative were selected, a weir would be built at the connection point of the new raw water tunnel and the NCA instead of the concrete plug. The Delaware Aqueduct would be used to convey the Croton treated water to the City as an interim measure and as a permanent backup to the long-term treated water conveyance. This alternative would take at least 10-15 years to implement, would probably be sized to accommodate all of the City's upstate supplies, and its environmental impacts would be assessed as part of an individual process from this project.

project. Therefore, the proposed project would incorporate an “n+1+1”⁴ redundancy 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 used to lift raw water greater than 100 feet to the entrance of the treatment process at the proposed plant. Treated water would flow by gravity to the High Level and Low Level service (see Section 5.3.6). Low Level service would be provided in the City from the High Level service by distributing water from existing boundary valves and pressure regulators. The average design flow would be 144 mgd with a maximum design flow of 290 mgd.

5.1.2.1. Raw Water Supply

The original Croton System was constructed in the mid 1800's, but only a minor 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 5.1-4). 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 and this 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, in the Town of Yorktown. During outages of the Croton System the Catskill/Delaware System can meet 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 300 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, 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 about 135th Street 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

⁴ n+1+1 means that a process or piece of equipment has two full standby or backup units so that one can be taken out of service for maintenance and a backup unit still remains.

Croton Branch Aqueduct) transmits water from Gate House No. 1 to Jerome Park Reservoir, a distance of about one mile.

5.1.2.2. *Raw Water Conveyance*

Similar to current practices, raw water would be conveyed from the Croton Lake Gate House, in the Town of Yorktown, through the NCA downstream of NCA Shaft No. 10 to a new tunnel connection. NCA Shaft No. 10 is located in Tarrytown. This below grade structure contains an iron cover and a ladder.

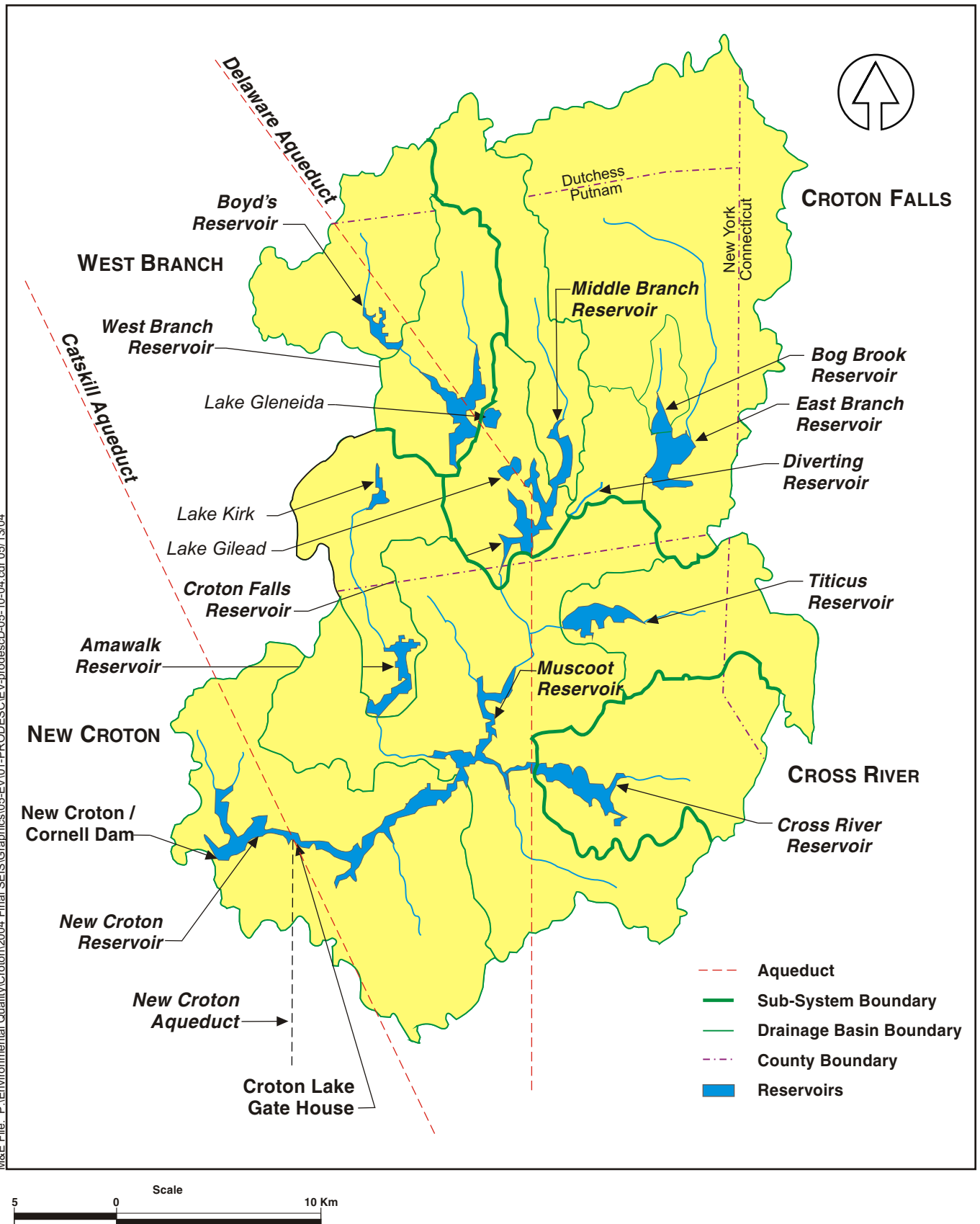
Additional rehabilitation would be required from NCA Shaft No. 9 to the raw water tunnel connection at the NCA, to handle surge conditions (see “Surge Analysis” below). The NCA would be pressurized up to 1 to 2 psig. The NCA would be prepared for pressurization by use of contact grouting of the entire tunnel sides and invert and along sections of the tunnel crown. This would be required to provide support for the new concrete tunnel lining. The concrete lined sections require grouting to prevent any movement of the existing brick and mortar lining and backing material due to the internal pressure during surge conditions.

5.1.2.2.1. *Croton Lake Gate House*

There are two visible superstructures at this location on the south shore of New Croton Reservoir: the 1890 Croton Lake Gate House, and the 1994 Croton Lake Gate House, which was built in 1994. The Old Croton Lake Gate House was built in 1840 to convey water through the abandoned Old Croton Aqueduct and is now submerged. The Gate Houses are located adjacent to the New Croton Reservoir, in the Town of Yorktown, to the east of the New Croton Dam. The 1994 Croton Lake Gate House contains the flow control facility that releases water into the NCA. The 1890 Croton Lake Gate House contains facilities including chlorine and copper sulfate feeding systems to treat raw water from the New Croton Reservoir.

In the proposed project, the 1890 Croton Lake Gate House could be used as a location for the potassium permanganate (KMnO_4) facility. The flow control facility would be upgraded to provide up to 290 mgd of raw water to the proposed plant from the New Croton Reservoir. The 1890 Croton Lake Gate House would be rehabilitated to remove the existing copper sulfate facility. If the filter media currently proposed at the water treatment plant changes from a dual sand and anthracite media to a dual sand and granulated activated carbon (GAC) media a potassium permanganate facility would be added at the Croton Lake Gate House. The existing chlorine system would be left in place and operational. However, the use of the gas chlorine system as a pre-treatment oxidant would be on an as needed basis. A chlorine scrubber system would be installed to purify the air in the chlorine facility in the event of a leak. Continued use of the chlorine facility would be infrequent (likely less than once per year), but potentially necessary to control biofilm growth in the NCA. This would involve redesigning the 1890 Gate House’s interior to provide spaces for the existing chlorine and new KMnO_4 storage and the chemical feeding equipment.

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Croton Watershed and Reservoirs

Croton Water Treatment Plant

Figure 5.1-4

5.1.2.2.2. NCA Shaft No. 9

NCA Shaft No. 9 is located in the Village of Sleepy Hollow. The superstructure extends approximately 20 ft below grade and contains a ladder for access. The Pocantico Blow-Off is an out of service NCA surge control mechanism located at NCA Shaft No. 9. The Pocantico Blow-Off pipe connects to the NCA with gates and a weir wall. The blow-off outlet is currently sealed but formerly drained to Welker's Brook (also known as Carl's Brook), which flows into the Pocantico River.

Under the proposed project, NCA Shaft No. 9 would serve as a raw water surge blow-off and a NCA drainage location. The blow-off would need to be rehabilitated and upgraded to service an increase in maximum flow capacity and the change in hydraulic and longitudinal profiles of the NCA. The changes are the result of the proposed raw water conveyance and the proposed design capacity of 290 mgd. Therefore, construction work at NCA Shaft No. 9 would include rehabilitation of the blow-off facilities within the Shaft No. 9 building. NCA Shaft No. 9 also contains an emergency back up community connection to the Village of Sleepy Hollow. This emergency connection would also need rehabilitation.

Surge⁵ Analysis. Under existing operations, the amount of flow in the NCA is controlled at the 1994 Croton Lake Gate House. Variations in flow, and surges due to flow changes, are absorbed by the storage capacity of the Jerome Park Reservoir. The large capacity of the Jerome Park Reservoir (about 30 million gallons per foot of water level, with a total volume of about 773 million gallons) is very effective for acting as a large surge tank.

Once the proposed plant would commence service, Jerome Park Reservoir would be taken off-line. Surge conditions have been identified and analyzed to determine the most beneficial method of operation to alleviate surge problems.

⁵ In the event of an unplanned shutdown of the raw water pumps at the Eastview Site, water in the raw water shaft and the raw water tunnel would flow back to the NCA and meet with water flowing down the NCA from the Croton Lake Gate House. This would create a surge in pressure in the NCA. For the Kensico-City Tunnel treated water alternative and the interim/permanent backup systems alternative connection to Delaware Shaft No. 19, a weir wall would be available at the connection of the raw water tunnel with the NCA to relieve the extra pressure by allowing water to flow over the top of the weir and continue down the NCA to the Jerome Park Reservoir. For the pressurized NCA alternative, the NCA would be plugged, so water would back up to NCA Shaft No. 9 and would then overflow a weir at the existing NCA Shaft No. 9 blow-off into the Pocantico River.

5.1.2.3. *Raw Water Connection*

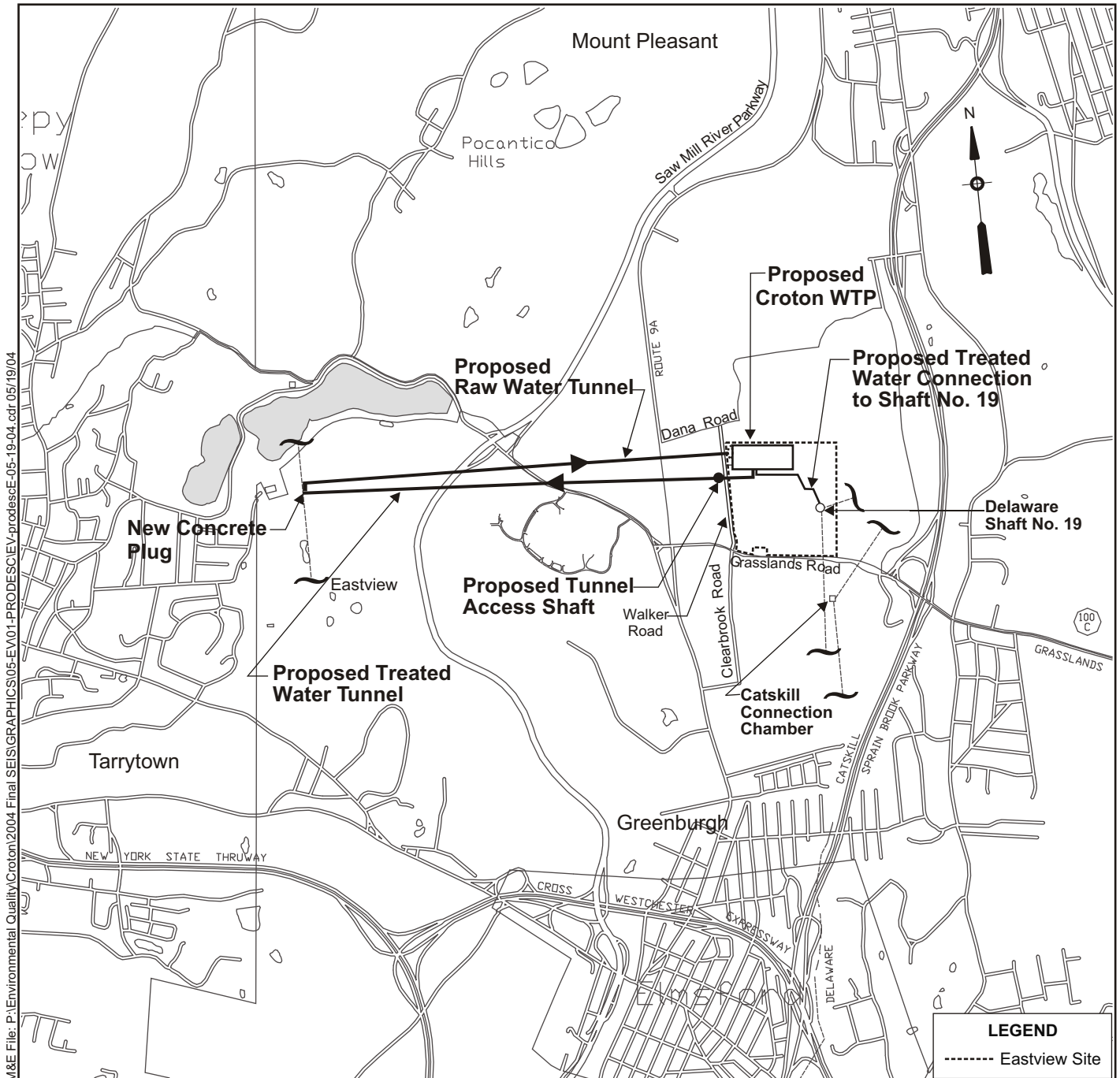
A new connection at the NCA would be located approximately 1,800 ft south of NCA Shaft No. 10. A new tunnel would be constructed from beneath the proposed plant to connect to this location. The connection at the NCA would be perpendicular to the NCA, and would be designed to match the invert elevation of the NCA at this location. A tunnel plug, made of cast-in-place concrete, would be installed downstream from the connection to the NCA; this plug would prevent raw water from continuing down the NCA and would divert the water to the proposed plant⁶. The new raw water tunnel from the NCA to the proposed plant would be approximately 7,500 ft long. From this connection point, the tunnel would slope down to the inlet channel of a raw water pumping station that would be constructed at the western end of the proposed plant. The tunnel would be constructed entirely in rock by a tunnel-boring machine and by drill and blast methods near the connection to the NCA. The tunnel would be lined with reinforced, cast-in-place concrete. A plan of the raw water tunnel from the NCA to the proposed plant is presented in Figure 5.1-5.

5.1.2.4. *Raw Water Pumping Station*

The purpose of the raw water pumping station would be to raise the raw water from the new tunnel into the proposed plant. To do so, pumps would lift the raw water approximately 235 feet into the plant raw water inlet at the entrance to the treatment process.

The raw water pumping station would either consist of a cylindrical shaft approximately 125 feet in diameter extending to a depth of 212 feet below existing grade, or a rectangular shaped (approximately 170 feet by 85 feet) structure that would extend to a depth of 45 feet below existing grade. Both configurations are entirely below ground. Both configurations are described below:

⁶ One alternative to the use of the NCA to convey treated water downstream of the proposed plant at the Eastview Site is to use a tunnel, which is currently being considered, directly from the Eastview Site to the City. A feasibility study of this new tunnel has been completed; the City is currently procuring a contract for preliminary design of the project. Not enough design information is available to determine the engineering advantages and disadvantages, cost implications, or environmental impacts of this new tunnel. If this new tunnel were constructed, then the NCA downstream of the proposed plant would be utilized to convey plant overflows and to release surges during unplanned shutdowns. If this alternative is selected, a weir would be built at the connection point of the new raw water tunnel and the NCA in addition to the concrete plug. This alternative would take at least 10-15 years to implement, would probably be sized to accommodate all of the City's upstate supplies, and its environmental impacts would be assessed as part of a different, independent project.



Proposed Project General Arrangement Eastview Site

Croton Water Treatment Plant

Figure 5.1-5

5.1.2.4.1. Cylindrical Configuration

The raw water pumping station would be located adjacent to the west end of the main treatment building and be approximately 212 ft below grade. From the raw water tunnel, raw water would enter a divided pump station wet well through six sets of sluice gates. Each of the two sections of the wet well would supply three raw water pumps, for a total of six pumps. Each pump would have the nominal capacity of 72.5 mgd. Using only four pumps, the pumping station would be capable of providing the maximum plant capacity. Two pumps would serve as backups.

The raw water wet well would contain an overflow weir at Elevation 149.3 to a detention tank located on the back wall of the pump bays. If a surge condition were to occur, the detention tank (0.72 MG) would reduce the maximum surge level at the wet well.

The pumping station would also contain two access stairwells, a personnel elevator, six equipment removal hatches, and an HVAC/electrical/plumbing area. Equipment would enter and exit the pumping station through six equipment hatches just below grade. Facilities in the electrical building would control the speed of the pumps.

5.1.2.4.2. Rectangular Configuration

The raw water pumping station would be located adjacent to the west end of the main treatment building and be approximately 45 feet below grade. From the raw water tunnel, raw water would enter a cavern that would serve as the wet well for the pumps. Twelve pumps would be provided, with each pump having the nominal capacity of 29 mgd. Using ten pumps (two backups), the pumping station would be capable of providing the maximum plant capacity.

The raw water shaft would contain three overflow weirs at Elevation 152.0 to the three individual overflow tunnels extending radially outward. If a surge condition were to occur, these three individual overflow tunnels would provide detention up to 0.28 MG.

Equipment would enter and exit the pumping station through equipment hatches just below grade. Facilities in the electrical building would enable the starting and stopping of the pumps.

5.1.2.5. Water Treatment Plant

5.1.2.5.1. Treatment Process Plant

The primary goals of the proposed project are to meet the public water supply and public health needs of the City of New York and to comply with State and Federal drinking water standards and regulations. The NYSDOH and the US 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* cysts⁷ and *Cryptosporidium* oocysts⁸, making both turbidity⁹ 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), and 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 points in the distribution system) that have been identified.

Treated water quality goals developed for the Croton WTP design are presented in Table 5.1-1. 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.

5.1.2.5.2. 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.

⁷ A cyst is a small capsule like sac that encloses certain organisms in their dormant or larval stage.

⁸ An oocyst is a thick-walled dormant reproductive stage for some sporozoans.

⁹ Turbidity refers to having sediment or foreign particles stirred up or suspended.

TABLE 5.1-1. TREATED WATER QUALITY GOALS

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

⁽¹⁾ Biodegradable Dissolved Organic Carbon (BDOC)

⁽²⁾ Running Annual Average (RAA)

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 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 used for the deactivation of both *Cryptosporidium* oocysts and *Giardia* cysts. Following its approval by the USEPA for the inactivation of *Cryptosporidium* oocysts, UV disinfection has been selected for the proposed plant.

Ancillary systems in the proposed plant would include pre/post-treatment chemical storage and handling; process waste backwash water handling and residuals facilities, with necessary support

facilities such as electrical, instrumentation; plumbing, and security; HVAC systems. The treatment process is described in detail for the three water treatment plant sites in Section 3, Proposed Project and Engineering Alternatives.

5.1.2.5.3. 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 5.1-2.

- Potassium permanganate: Used for oxidation of iron/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 for sodium hypochlorite and potassium permanganate, which would be based on 15-day storage in order to standardize the design of the chemical systems. 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. Each chemical system would be divided into two sub-systems, each serving one half of the treatment plant.

TABLE 5.1-2. CHEMICAL SYSTEM DESIGN CRITERIA¹

Chemical	DOSE (mg/L)		DESIGN USAGE ²		STORAGE ²		Application Point
	Average	Maximum	Active Chemical (Lbs/day)	Active Chemical (Gal/day)	No. of Tanks	Volume per tank (gallon)	
Potassium Permanganate ³	3.0	3.0	7,256	N/A	15 cycle bins	3,300 lbs	1890 Croton Lake Gate House
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 Chambers
Hydrofluorosilicic Acid	1.0	1.0	601	327	2	5,252	Filtered Water Discharge from UV Chambers
Sodium Hydroxide	5.0	12.5	3,004	468	2	7,800	Filtered Water Discharge from UV Chambers
Corrosion Inhibitor (Orthophosphate or Phosphoric Acid)	1.0	2.0	601	168	2	5,252	Filtered Water Discharge from UV Chambers

TABLE 5.1-2. CHEMICAL SYSTEM DESIGN CRITERIA¹

Chemical	DOSE (mg/L)		DESIGN USAGE ²		STORAGE ²		Application Point
	Average	Maximum	Active Chemical (Lbs/day)	Active Chemical (Gal/day)	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 installed at the 1890 Croton Lake Gate House. 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 the 1890 Croton Lake Gate House 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 for being used as a coagulant.
- (5) Sodium hypochlorite tanks store both pre-feed and post-feed sodium hypochlorite.

5.1.2.5.4. Eastview Site Overview

The proposed plant at the Eastview Site would include the water treatment building (housing the treatment processes, administrative offices, chemical storage, HVAC system and a process laboratory), and a raw water and treated water conveyance system. Figure 5.1-2 presents an aerial view of the proposed plant at the Eastview Site, and Figure 5.1-6 presents a general site plan. A summary of the proposed project facilities is presented in Table 5.1-3.

TABLE 5.1-3. PROPOSED PLANT STATISTICS

Approximate dimensions – main building (including RWPS)	1,000 ft x 267 ft
Maximum building height above final grade	65 ft
Approximate main building footprint area	262,000 sq. ft
Approximate existing grade	330 ft
Approximate final grade	330 ft
Approximate Eastview Property in Mount Pleasant	83 acres
Approximate area affected during construction	30 acres
Approximate finished water treatment plant site area	12 acres
Approximate dimensions - guard booth (2)	25 ft x 10 ft
Length of raw water tunnel from the NCA to the proposed plant	7,500 ft
Length of treated water tunnels The NCA option proposes a tunnel from the proposed plant to the NCA. Both options, NCA and KCT, require an interim / permanent	7,500 ft – NCA option

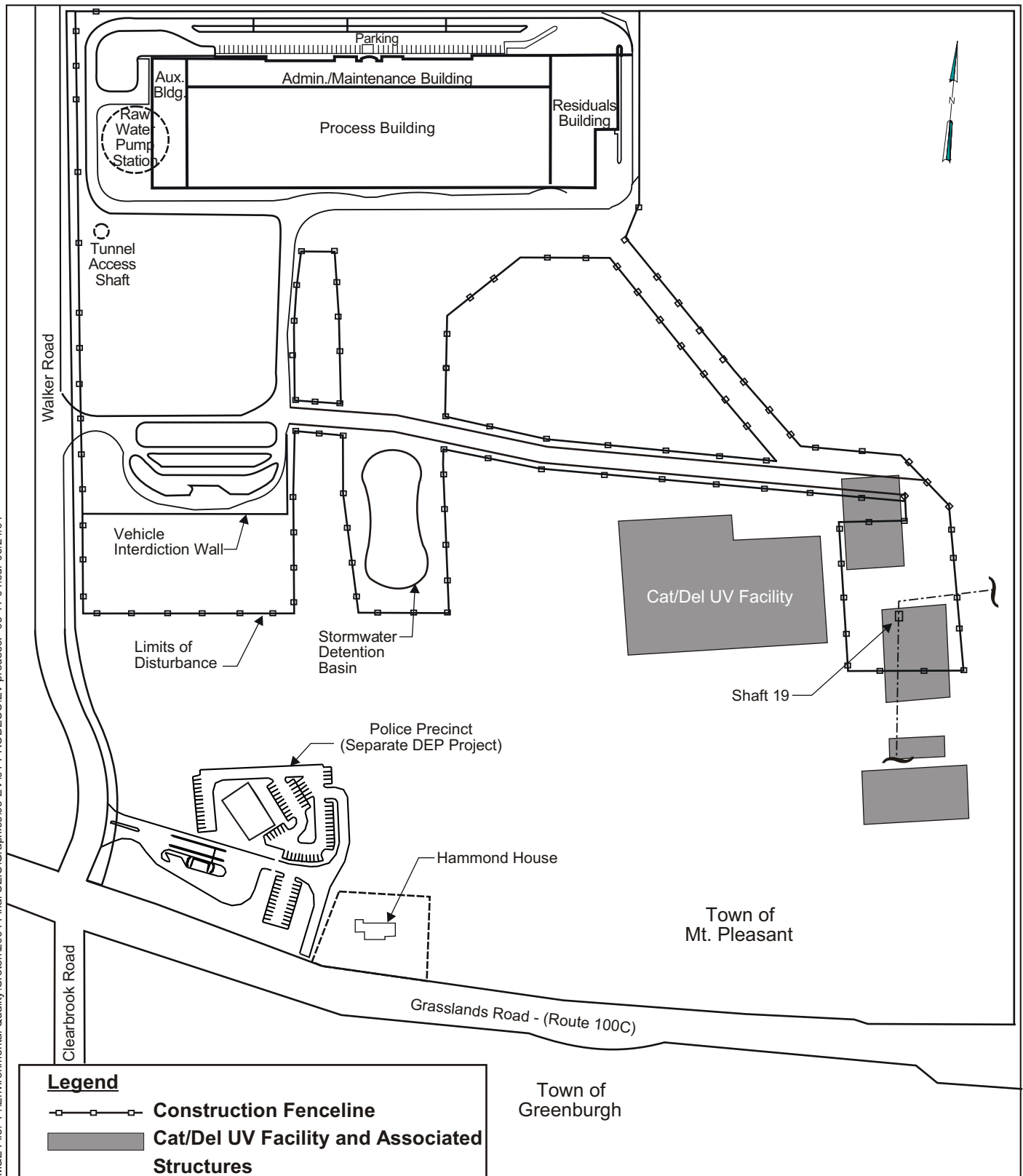
TABLE 5.1-3. PROPOSED PLANT STATISTICS

back-up 1,950 ft treated water pipeline to the Delaware Aqueduct. The length of the potential connection to the KCT has not been determined. These options are described in detail in Section 5.1.2.6.	
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The proposed plant would be designed such that the main flow of water through the treatment processes would be by gravity, with pumping only used to bring raw water up to the proposed plant inlet (entrance) to the facility. The average design flow would be 144 mgd with a maximum capacity of 290 mgd. The main treatment processes would be divided into two parallel water treatment trains (Train A and Train B), with the design principle that no single plant component would treat, convey, or power more than 50 percent of the plant design flow. The two trains provide redundancy that minimizes the chance of plant failure. Further subdivision, yet parallel process units, would appear in the plant design.

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 5.1-4.

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Not To Scale

General Site Plan Eastview Site

Croton Water Treatment Plant

Figure 5.1-6

TABLE 5.1-4. 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 Methods 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 the Consolidated Edison Company of New York (Con Edison) distribution system. The distribution of electricity to the proposed plant at the Eastview Site would be the responsibility of Con Edison. The electric supply for the

proposed plant would be provided from the Grasslands Reservation Substation located adjacent to the Eastview Site on the eastern edge via underground feeders using triplexed shield cables.

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 of 290 mgd. Average demand is the total maximum demand of all electrical loads when the proposed plant is operating at its average flow capacity of 144 mgd. Table 5.1-5 presents the estimated electrical power demands for these three scenarios.

TABLE 5.1-5. ESTIMATED ELECTRICAL POWER DEMANDS FOR THE PROPOSED PLANT

Facilities	Connected	Estimated Electrical Load, kW		
		Maximum	Average	Emergency
Proposed Plant:				
Raw Water Pumping Station	24,767	15,030	7,740	96
Treatment Processes ¹	11,712	8,164	7,404	740
Residuals	1,122	774	656	225
Administration, HVAC, Service Areas	2,902	1,996	1,716	424
Total	40,504	25,964	17,515	1,484

Notes:

1. Treatment Processes includes mixing and flocculation, pre- and post-treatment chemical addition, filtration, dissolved air flotation, and ultraviolet light disinfection.

The proposed plant at the Eastview Site would require up to six underground service feeders, each at 13.2-kV. Westchester County, and is designated by Con Edison as a “single contingency” area, meaning that any one feeder may be taken out of service anytime and the remaining feeders should be able to carry the maximum load. However, the NYCDEP prefers at least “second contingency,” similar to other large NYCDEP plants. A “second contingency” service would be negotiated with Con Edison and NYPA.

Electrical Power Distribution. The electrical loads within the proposed plant would be divided into three groups: Train A – west side of the process loads; Train B – east side of the process loads; and common facilities – administrative/maintenance areas, HVAC and general use equipment (raw water pumps and dewatering facilities). Both of the treatment process trains (Train A and Train 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. Feeders to the plant would run from Con Edison Grasslands Substation west along Grasslands Road/Route 100C, turn north onto Walker Road, and then east to the electrical substation located within 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. A medium-voltage switchgear (MVS) 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 (MCC), 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.

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 the 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 (EMF/ELF) 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 alarm, 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, lightning 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. Standby power to run the entire facility is not required at this time.

All process controls, and computer 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 ft 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.

Gas Demand. Con Edison maintains two natural gas mains that could potentially be used to supply the proposed plant: a high-pressure 8-inch main gas line that runs along Saw Mill River Road, and a low-pressure 8-inch gas line along Dana Road. Con Edison would deliver natural gas to the gas meter room within the proposed plant. Natural gas would supply the hot water heaters, HVAC boilers, and laboratory use.

Traffic Circulation. Access to the Eastview Site would be off Walker Road. A security screening area would be constructed several hundred feet south of the proposed plant. Separate screening areas would be provided for cars and trucks. All vehicular traffic would enter the site

via a secured entry road and travel in a counter-clockwise manner from the south along an internal roadway system (Figure 5.1-6). Chemical delivery truck parking would be located on the south side of the proposed plant. The chemical fill station would be located in this area. Two truck bays would be located on the east side of the proposed plant. Residuals removal trucks would enter the truck bays from the south of the plant, collect residuals hoppers, leave the truck bay proceeding north along the internal roadway, and exit the Eastview Site to the south via the security area.

Employee parking facilities (64 spaces) would be located to the north of the proposed plant. A shipping/receiving area would be located to the east of the employee parking facility. This area would serve as the central equipment removal point for the facility with roll-up doors. Due to the size and layout of the proposed plant, electrical carts would be provided for use by and for the convenience of staff members. The carts would be capable of transporting lightweight materials and equipment within the proposed plant.

Architectural Considerations. 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. The use of embedded clay tiles with brick-like appearance and coursing patterns would be employed to create dimensional effects and provide a “brick” look to normal panelized construction. The brick faced panels would alternate with buff colored panels to help break down the massing of this large structure. Horizontal banding of curved precast concrete elements has been integrated into the façade to visually reduce the vertical geometry of the facility.

Architectural designs for the proposed plant would be coordinated with other NYCDEP facilities planned for the Eastview Site so that the architectural character of facilities throughout the site would be consistent.

5.1.2.6. *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 Service¹⁰. 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 ft MSL), less hydraulic losses in the transmission and distribution systems downstream of the reservoir. Croton water is conveyed to Manhattan through the NCA,

¹⁰ 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.

downstream of the reservoir to Shaft No. 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.

Currently, the Mosholu Pumping Station supplies the High Level Service and the Jerome Pumping Station supplies the Intermediate Level Service. Mosholu Pumping Station, which is located under Gate House No. 7, can pump up to 50 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 is a spare. However, the existing pumping facilities for both pumping systems are in need of replacement.

The proposed project includes two designs for treated water conveyance; one for interim condition and permanent emergency backup and a second for long-term conveyance. Both designs are described below.

5.1.2.6.1. Interim/Permanent Back-up Treated Water Conveyance

Upon completion of the proposed plant, treated water would be conveyed to the Delaware Aqueduct via Shaft No. 19, located on the Eastview Site. Treated water would pass through flow meters, and be combined into one 14-foot diameter steel pipe. This pipe would be routed approximately 1,950 ft to Shaft No. 19 of the Delaware Aqueduct, on the eastern side of the site. The maximum water level at Shaft No. 19 is 342.70 ft MSL. The pipe route would follow the existing topography and the route would follow the edge of the existing wetlands to the property boundary. Since treated water would be conveyed to the Delaware Aqueduct via Shaft 19, the Jerome Park Reservoir would no longer remain in service. To meet the fluctuating water supply needs of the City the Croton Lake Gate House (CLGH) would need to constantly adjust flow in the NCA, because the New Croton Reservoir would be the final raw water reservoir before water reaches the proposed plant for treatment at the Eastview Site.

During the interim and back-up operations, the City's Low Level and Intermediate Services would be supplied from the in-City High Level Service, using existing and regulators. Implementation of an adopted long-term treated water conveyance would downgrade the Shaft No. 19 connection as a permanent (emergency) back-up system. A schematic showing the connection to Shaft No. 19 is provided in Figure 5.1-5.

5.1.2.6.2. Long Term Treated Water Conveyance

For the long-term treated water conveyance there are two alternatives under consideration, the pressurization of the NCA and the use of the proposed Kensico-City Tunnel. The two alternatives are presented below.

NCA Pressurization. A new treated water tunnel would connect to the NCA below ground, immediately downstream of the concrete plug in the NCA that would be constructed downstream of the proposed raw water tunnel. The NCA downstream of the treated water tunnel connection would convey High Level treated water to a new shaft chamber located in the vicinity of Gate House No. 5 at Jerome Park Reservoir. High Level and Low Level treated water would be conveyed from the new shaft chamber to Manhattan and the Bronx. This alternative would require the lining and pressurization of the entire gravity flow section of the NCA downstream of the connection with the new proposed treated water tunnel. Since treated water would be conveyed to the New Croton Aqueduct under pressure, the Jerome Park Reservoir would no longer remain in service. To meet the fluctuating water supply needs of the City the Croton Lake Gate House (CLGH) would need to constantly adjust flow in the NCA, because the New Croton Reservoir would be the final raw water reservoir before water reaches the water treatment plant for treatment at the Eastview Site.

Originally designed as a gravity flow tunnel that could collect additional water through ground infiltration, the NCA would require lining to ensure the ability of delivering a pressurized treated water conveyance and grouting to repair existing cracks and to prevent the contamination of treated water. Currently two sections of the NCA are pressurized, between Shaft Nos. 11A and 11C where the NCA drops below Gould's Swamp in the Town of Greenburgh, and south of Gate House No. 1 in the Bronx to its terminus at the 135th Street Pumping Station in Manhattan. Under this alternative the existing pressurized section would be increased to 143 psig while the remainder of the NCA (gravity flow portion) would be pressurized to 92 psig.

The number of shafts currently open along the NCA would be minimized to protect the treated water from possible contamination. Shafts that would be plugged/closed would be completed before the tunnel liner was in place. Shafts to remain open downstream of the treated water connection to the NCA would be rehabilitated, and relined, and capped with a pressure-tight seal to protect the High Level treated water. The shafts left open would be integrated into the new tunnel lining to protect against contaminate entry through these structures. Access to the inside of the treated water portion of the NCA for pressurization work would be gained from NCA Shaft No. 14, NCA Shaft No. 18, Gate House No. 1 and NCA Shaft No. 21 in Jerome Park Reservoir. Work at these shafts related to the pressurization of the NCA is described in Section 8.1-8.6.

The only work required in the raw water section of the NCA would be the rehabilitation of the existing overflow weir at Shaft No. 9 in the Village of Sleepy Hollow. This overflow would divert raw water to a small tributary of the Pocantico River, alternatively known locally as Carl's Brook or Welker's Brook. Although the overflow is an existing use, it would be used more frequently if the water treatment plant were built at Eastview and the NCA was utilized as the principal means of long-term conveyance. The potential impacts of the construction and operational use of the overflow at Shaft No. 9 are presented in Section 8, Off-Site Facilities.

The pressurization of the NCA below the finished water connection, south of Shaft No. 10, would involve work in addition to the baseline rehabilitation work to the NCA described earlier as a separate environmental review. This additional work would take place after the water treatment plant is completed, between 2010 and 2015. The principal staging areas and normal

access points for the workers for this project would be Shaft No. 14 in Ardsley, Shaft No. 18 in Yonkers, Gate House No. 1 in Van Cortlandt Park, the Bronx, and Shaft No. 21 at Jerome Park Reservoir in the Bronx. All these facilities would be fitted with pressure caps.

In addition to these access points, some workers would have to gain access to the one-mile length of the NCA between the connection of the proposed treated water tunnel with the NCA south of Shaft No. 10 and the existing pressurized section south of Shaft 11A. Workers would access this one-mile length of tunnel from the treated water shaft at the Eastview Site (see following section). During the peak of the pressurization work up to 70 workers could enter from this location. This work would occur after the construction of the water treatment plant, between 2011 and 2015. At this time the treated water would be conveyed via the temporary connection to Shaft No. 19 of the Delaware Aqueduct. The construction workers would be provided with ample parking on site on one of the lots used immediately before this work for the construction of the water treatment plant. No work would take place at the Eastview Site. The traffic generated by this activity would be at a much lower level than the peak construction traffic described and analyzed throughout Section 5.9 of this document. As described in Section 8.1.1, the materials and supplies for this section of the NCA pressurization work would be lowered into the NCA for this segment of the aqueduct from Shaft 11A. At the discretion of the contractor, some materials may be moved down the treated water tunnel to the NCA, but these deliveries would also be at a much lower volume than the construction deliveries that would have been generated by the construction of the water treatment plant at the Eastview Site.

The existing sluice gates and stop logs in Gate House No. 1 would be replaced with new sluice gates. The new sluice gates would have to be upgraded so that they would be pressure tight. A new Shaft Chamber and connections to distribution pipes would be constructed in the vicinity of Gate House No. 5. This work would take place between 2007 and 2011. In addition, Shaft Nos. 11A, 11B, 11C, in the Town of Greenburgh, and Shaft No. 16 in the Village of Ardsley would be used for ventilation, personnel access, and lowering of equipment and supplies, but then pressure capped or permanently sealed. See Section 8, Off-Site Facilities, for a detailed discussion of work to be performed and the potential environmental impacts.

Treated Water Tunnel. Pressurized treated water would be conveyed from the proposed plant to the NCA downstream of NCA Shaft No. 10 through a new treated water tunnel. The treated water tunnel would be a 7,500-foot-long, 12-foot-diameter tunnel. The alignment of this treated water tunnel would be parallel to the raw water tunnel. The distance between the treated water and raw water tunnels would be approximately 190 ft (centerline to centerline). The invert elevation at the treated water shaft would be at Elevation 118 ft MSL, approximately 210 ft below grade (Elevation 330 ft MSL at the Eastview Site). The slope of the tunnel would be 0.2 percent, and the tunnel would connect to the NCA at a location approximately 2,000 ft south of NCA Shaft No. 10. The tunnel would be constructed entirely in rock by a tunnel-boring machine and drill and blast methods near the connection to the NCA. The excavated tunnel diameter would be approximately 16 ft; the treated water tunnel would have a finished diameter of 12 ft and would be lined with steel as required. A plan of the treated water tunnel from the NCA to the proposed plant is presented in Figure 5.1-7.

The connection of the treated water tunnel would be perpendicular to the NCA and would be designed to match the invert elevation of the NCA at this location (Elevation 131.75 ft MSL). 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 between the raw water tunnel and treated water tunnel connections to the NCA, to provide complete physical separation of raw and treated water.

Kensico-City Tunnel. One alternative that is still under consideration is the construction of an entirely new tunnel from Kensico Reservoir to the Eastview Site and from there to the City's distribution system (at the Van Cortlandt Valve Chamber in the Bronx). This "Kensico-City" Tunnel (KCT) could potentially be sized to accommodate all of the City's flows, be able to bypass Hillview Reservoir, and provide system redundancy for future maintenance of the other City water supply conveyances. If the Croton System were to use this new tunnel, the NCA would be removed from service downstream of the raw water connection but it would be rehabilitated throughout its length so that it could be used for emergencies and for system overflows. Since treated water would be conveyed to the KCT, the Jerome Park Reservoir would no longer remain in service. To meet the fluctuating water supply needs of the City the Croton Lake Gate House (CLGH) would need to constantly adjust flow in the NCA, because the New Croton Reservoir would be the final raw water reservoir before water reaches the water treatment plant for treatment at the Eastview Site.

A feasibility study has been completed for the proposed KCT. Its primary purpose would be to provide system flexibility for the Catskill/Delaware supplies. The feasibility study describes three alternative alignments, including three possible intake locations alongside Kensico Reservoir. No specific shaft sites are recommended, but all the alternatives under consideration terminate at the Van Cortlandt Valve Chamber in the Bronx. Siting of the shafts would require a thorough environmental impact analysis. The shaft sites would have to accommodate up to 140 workers and would generate truck traffic from the removal of spoils. This truck traffic would be less than 120 trucks per day, but the long duration of the construction (about 15 years) would require a detailed analysis of the impacts of this proposed work on Traffic, Air, Noise, Neighborhood Character, and other environmental parameters. If construction of this new tunnel were to be proposed by NYCDEP there could be up to a one-year overlap between the start of the KCT work and the completion of the proposed plant at the Eastview Site. The KCT design is still in the future, and if it is adopted it would be subject to a separate, thorough public environmental review. If a decision were made to advance the proposed KCT and use it as the treated water conveyance from the proposed project at the Eastview Site, the pressurization of the NCA would not proceed. The Croton water would be blended with the Catskill and Delaware water and conveyed at the same pressure to the City. The existing Intermediate and Low Level distribution systems would be supplied by from the High Level through regulators in the distribution system.

The Eastview Site long-term treated water conveyance alternatives provide a choice of whether the City wants to keep the redundancy that is currently in the system by keeping the Croton and the Catskill/Delaware systems separate until the water reaches the distribution system by using the New Croton Aqueduct, or to have all of the City's water conveyed through the Catskill/Delaware systems by using the KCT. However, the utilization of either conveyance

alternative treated water would be supplied only to the high-level service; distribution to the low-level service would require the use of regulator valves.

5.1.2.6.3. Distribution System Operation

The proposed plant would operate in a range from a minimum flow of 90 mgd to a maximum flow of 290 mgd. High Level Service would receive priority in the water distribution and all treated water would be sent from the new shaft chamber via two 48-inch diameter pipes to City Tunnel No. 1, Shaft No. 3, a 48-inch diameter pipe to City Tunnel No. 1, Shaft No. 4, and an 84-inch diameter pipe to City Tunnel No. 3, Shaft No. 4B.

Low Level Service to Manhattan and the Bronx would be supplied through the in-City High Level Service, using existing regulators. High Level treated water could also be conveyed, during emergency situations, from the new shaft chamber to the Low Level system through sleeve valves. A new 48-inch diameter 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. A 144-inch diameter connection with a sleeve valve would be constructed from the new shaft chamber to the NCBA. Low Level treated water would be conveyed from the NCBA to Gate House No. 5 and flow through the existing 11-foot diameter tunnel to Shaft No. 21. At Shaft No. 21, the treated water would be conveyed to the NCA (up to 155 mgd to Manhattan) and to a new 48-inch diameter service connection located at the north side of the dividing wall (up to 6 mgd to the South Bronx).

A schematic of the conveyance is provided in Figure 5.1-7. Intermediate Level Service to the Bronx would be supplied from the in-City High Level Service using regulators.

5.1.2.6.4. Emergency Bypass

If the proposed plant is taken out of service and the Croton Water Supply was required to meet demand, an emergency bypass, subject to NYSDOH review and approval, would be available to convey Croton water downstream of the proposed plant. If the Kensico-City Tunnel were chosen as the long-term treated water conveyance, an overflow structure would be constructed in the NCA at the raw water tunnel connection. If the proposed plant were taken out of service, raw water would fill the wet well and detention tank at the raw water pump station. The water would rise to a maximum level and cause the water to reverse direction and overflow at the weir located in the NCA. Water would flow through the NCA, at Low Level, to Jerome Park Reservoir. Low Level water could be conveyed through the NCA to Manhattan.

If the design for the pressurized treated water to the NCA is chosen as the Long Term Treated Water Conveyance, the overflow structure in the NCA would not be capable of serving as an emergency bypass. A plug would be installed upstream from the treated water tunnel connection to the NCA. Subject to NYSDOH approval, a connection at the proposed plant from the raw water shaft to the treated water shaft would serve as a bypass and allow untreated Croton water to be conveyed to the NCA downstream of Shaft No. 10. Due to the loss of power, no pumping would be available and Low Level water would be distributed to the new shaft chamber at Jerome Park Reservoir. Alternatively, the water could be allowed to back up in the raw water section of the NCA and overflow through the existing blow-off at NCA Shaft No. 9 in the Village of Sleepy Hollow, NY. Potential environmental impacts to the area around NCA Shaft No. 9 and to the receiving waters of Carl's Brook and the Pocantico River are described in Section 8.1.2.

5.1.2.7. 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 residual 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 solids and sedimentation from the filter-to-waste and waste backwash water would also be directed to the floated solid storage tanks. The floated solids would receive additional polymers before flowing to the centrifuges where a dewatering process would take place. The dewatered "cake" would be hauled off-site for disposal (refer to Section 5.1, Introduction and Project Description, and Section 5.18, Solid Waste). This material is non-hazardous and suitable for landfills or surface applications. The centrate from the centrifuges would be discharged to the plant main drainage system. This discharge would add an additional 0.12 to 0.28 mgd of centrate with a solid loading of 17,300 to 44,500 lbs/day to the sewer system.

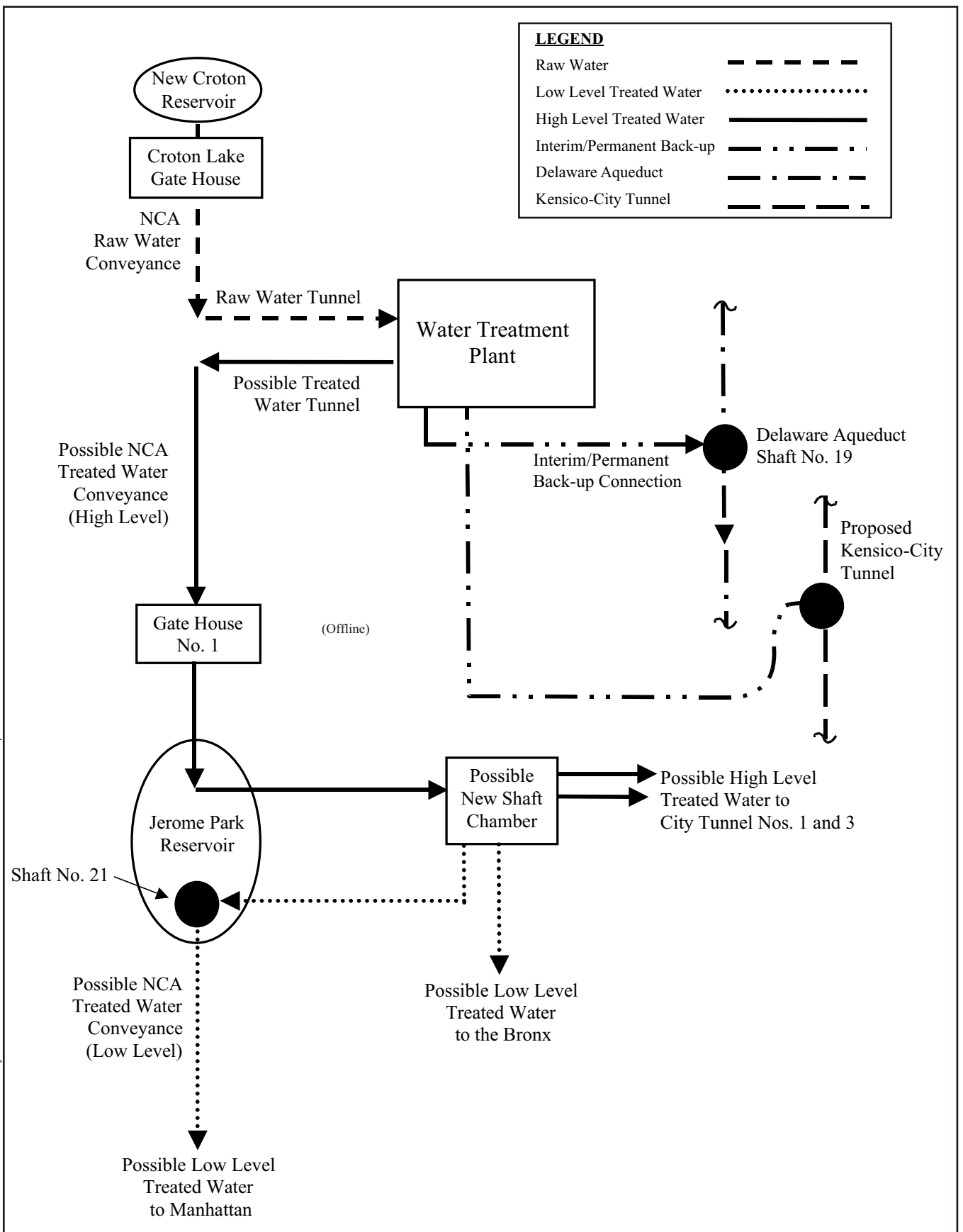
5.1.3. FUTURE NYCDEP PLANS FOR THE EASTVIEWSITE

In addition to the Croton project, NYCDEP is considering several other projects that could be built at the Eastview property. This property includes 83 acres in the Town of Mount Pleasant and 66 acres in the Town of Greenburgh. The NYCDEP Catskill/Delaware Ultraviolet (UV) Light Disinfection Facility (Cat/Del UV Facility) is a large facility that is currently undergoing a separate environmental review. By the peak construction year, two additional NYCDEP projects could be located on the Eastview Site, namely a Police Precinct and possibly an NYCDEP East-of Hudson Administration Building¹¹. The Police Precinct may be located in the southwest corner of the Eastview Site. The location of the Administration Building is less certain; however, since the Eastview Site is one of several properties currently being evaluated as a

¹¹ This depends on the results of a siting evaluation that is currently ongoing. The siting decision will be evaluated and discussed as part of a separate independent environmental review.

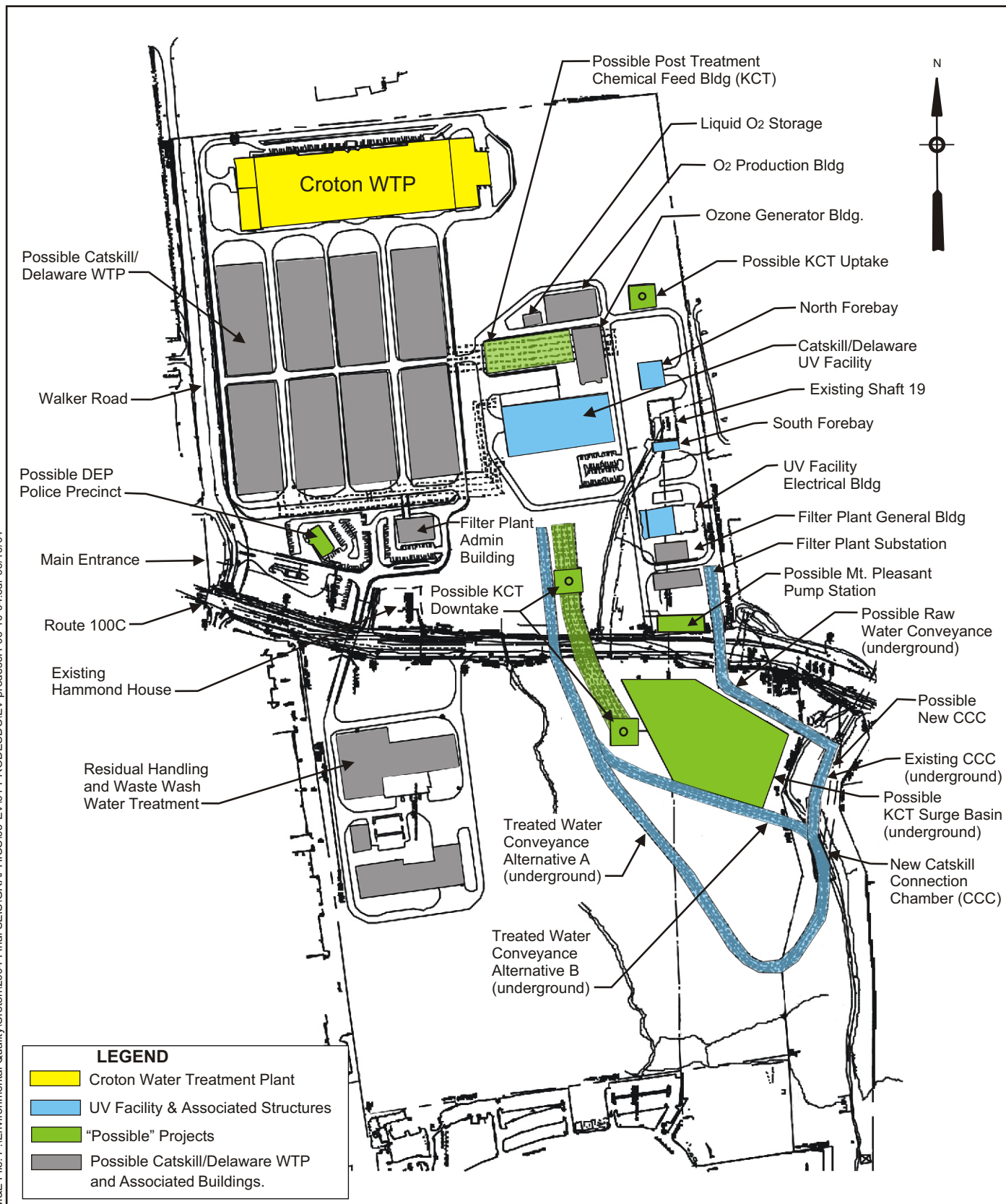
possible site for this facility. In addition to these projects, NYCDEP's Kensico-City Tunnel may be under construction at the Eastview Site starting in 2009. All of these NYCDEP projects are analyzed in this Final SEIS to the extent to which information is available. They are all separate actions from the proposed Croton project and will undergo their own independent environmental reviews. The projects for which planning designs are available are depicted in Figure 5.1-8.

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Raw and Treated Water Conveyances

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Not To Scale

NYCDEP's Comprehensive Long-Term Management Plan for the Eastview Site

Croton Water Treatment Plant

Figure 5.1-8