

**FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE
CATSKILL/DELAWARE UV FACILITY**

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1. INTRODUCTION & PROJECT BACKGROUND

1.1. INTRODUCTION

In accordance with the terms of the November 2002 Filtration Avoidance Determination (FAD) issued by the United States Environmental Protection Agency (USEPA), the New York City Department of Environmental Protection (NYCDEP) proposes to design, construct and place into operation an Ultraviolet Light (UV) Disinfection Facility (UV Facility) for the Catskill/Delaware Water Supply System capable of disinfecting a maximum flow of 2,020 million gallons per day (mgd), with an average flow of 1,310 mgd.¹ Because of the ongoing success of New York City's watershed protection program and continued excellent water quality of the Catskill and Delaware water supplies, NYCDEP and USEPA have agreed that the design and construction of a UV Facility is feasible and appropriate for the Catskill and Delaware water supplies. With the commitments to protect the Catskill and Delaware water supply and to construct the UV Facility at the Eastview Site, the USEPA has granted the City relief from the requirement of the original 1993 FAD to complete a Final EIS for and Final Design of a Catskill/Delaware filtration facility. The project is being proposed to meet the water supply needs of the City of New York (the City) and lower Westchester County and to comply with state and federal drinking water standards. The introduction of this additional disinfection "barrier" would significantly enhance the City's water supply protection programs.

The proposed UV Facility would be constructed on City-owned property (Eastview Site) within the Towns of Mount Pleasant and Greenburgh, in Westchester County, New York. The property was purchased by the City of New York in the early 1900s²; the site was equipped with connections to the Delaware and Catskill Aqueducts in anticipation of the potential future need for a water treatment facility.

As currently proposed by NYCDEP, the proposed UV Facility would include a main disinfection building that would contain the disinfection elements and administrative functions; two forebay structures at the existing Delaware Shaft No. 19 which would contain the water conveyance systems (raw and treated) for the Delaware and Catskill Aqueducts; raw and treated water conduits between Delaware Shaft No. 19, the Catskill Aqueduct, and the proposed UV Facility; and an electrical/generator building. In addition, the proposed facility would require modifications to several existing Catskill/Delaware facilities within the Town of Mount Pleasant. This work would be conducted on City-owned property, and under the jurisdiction of the NYCDEP for water supply use within two main areas: one area adjacent to the Kensico

¹ The proposed UV Facility could be designed to handle up to 2,400 mgd for future potential needs. The potential increase in capacity could be required if the City decides to build the Kensico-City Tunnel, which could have a capacity of 2,400 mgd.

² When the City embarked on the construction of the Catskill Water Supply System during the early 1900s, it anticipated the possibility that filtration would become necessary to remove impurities found in the water. This potential need for filtration became more apparent as land in the watersheds became more developed. The City purchased an approximately 315 acre site within the Towns of Mount Pleasant and Greenburgh (the Eastview Site) following the Bureau of Water Supply Report of 1909. Following early investigations and preliminary designs, the City chose to concentrate on improving the reservoirs and controlling pollution sources instead of constructing a filtration facility. The City subsequently released 152 acres of the Eastview Site to the Town of Mount Pleasant and Westchester County.

Reservoir, and an area adjacent to the Taconic State Parkway within the Mount Eden and Gate of Heaven cemeteries. These sites would allow for construction staging and direct access to the Catskill Aqueduct. This modification work on the Aqueduct would entail seasonal construction work for approximately three to four years.

1.2. NEW YORK CITY WATER SUPPLY SYSTEM

New York City possesses one of the greatest metropolitan water supply systems in the world; the system has exceptional source water quality and is almost entirely supplied by gravity. The City supplies water to its consumers from three primary sources: the Croton, the Catskill, and the Delaware Water Supply Systems ([Figure 1-1](#)). Water flows by gravity from upland storage reservoirs to balancing reservoirs in Westchester County (Hillview Reservoir; Catskill/Delaware System) and in the City of New York (Jerome Park Reservoir; Croton System) and then to the City distribution system. Water from all three supply systems is distributed to the City by gravity through three aqueducts (New Croton Aqueduct, Catskill Aqueduct, and the Delaware Aqueduct) and four tunnels (City Tunnel Nos. 1, 2, 3, and the Richmond Tunnel).

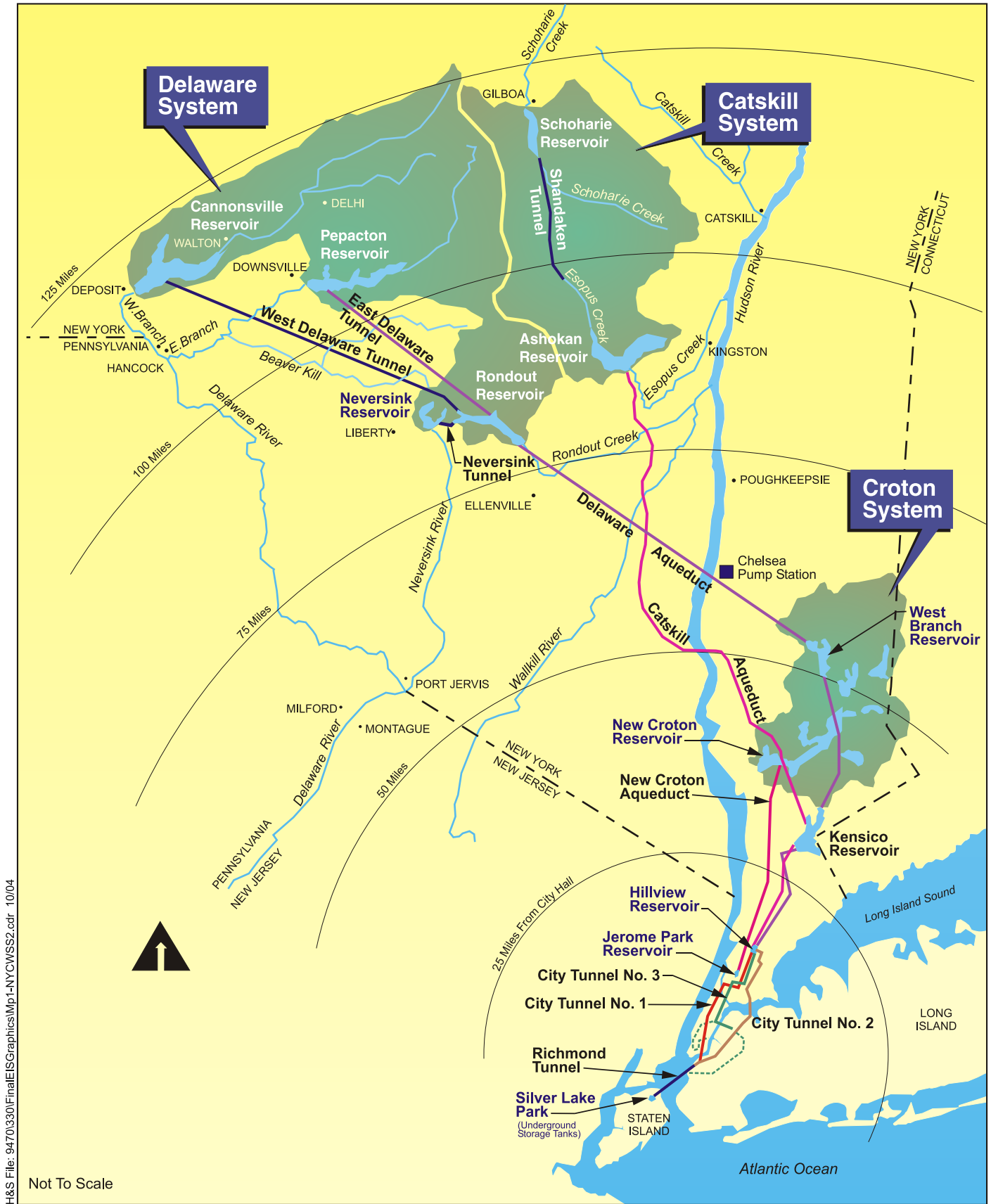
With a safe yield (i.e., a drought period's availability of water to meet consumers' demand) of about 1.29 billion gallons per day (bgd) and a total available storage capacity of about 558 billion gallons, the City Water Supply System provides drinking water to approximately nine million New Yorkers (eight million within the City and one million to upstate consumers). The three water systems were designed and constructed with various interconnections to increase the systems' flexibility and permit the exchange of water from one system to another. This feature reduces the effects of localized droughts and takes advantage of excess water in any of the three systems.

1.2.1. Croton System

The Croton Water Supply System (Croton System) is the oldest and smallest system. The original Croton System was constructed in the mid 1800s, 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 watershed consists of a series of interconnected reservoirs and lakes on the Croton River, with tributaries and branches extending into Westchester, Putnam, and Dutchess Counties in New York State and into Fairfield County in Connecticut ([Figure 1-1](#)). The Croton watershed encompasses a total of 375 square miles. The New Croton Reservoir is the southernmost of the 12 reservoirs and three controlled lakes in the Croton System that intercepts overland flow within the Croton watershed.

Croton water is conveyed 31 miles from the New Croton Reservoir to Shaft No. 33 in Manhattan by the New Croton Aqueduct (NCA), with Jerome Park Reservoir located approximately 25 miles from the New Croton Reservoir. Jerome Park Reservoir, a distribution reservoir, is located at the downstream end of the system and is the point at which water from the Croton System enters the City's distribution system. With a total storage capacity of 94.6 billion gallons and a safe yield of 240 mgd, Croton water is primarily used in low-lying areas in the Bronx and Manhattan, but can also be pumped to the Intermediate and High Level Service areas normally

serviced by the NYC Catskill/Delaware System. Currently under a federal Consent Decree, the City is planning for the design, construction, and operation of a water treatment plant for the Croton System. With the selection of the Mosholu Site as the preferred site for the Croton Water Treatment Plant, the plant is scheduled to be in operation by 2011; however, the Eastview Site is still being considered as a possible site for the Croton Water Treatment Plant due to ongoing legal challenges.



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New York City Water Supply System

Catskill/Delaware UV Facility

Figure 1-1

1.2.2. Catskill System

The Catskill System is located approximately 100 to 125 miles north of lower Manhattan, with a watershed area of 571 square miles. The Catskill watershed consists of relatively sparsely populated areas in the central and eastern portions of the Catskill Mountains. This system was constructed in two stages. The first stage, completed in 1917, includes the Ashokan Reservoir, the Catskill Aqueduct, the Kensico Reservoir, the Hillview Reservoir, City Tunnel No. 1, and the terminal Silver Lake Reservoir in Staten Island (which was replaced by the Silver Lake Tanks in 1971). The second stage was completed in 1927 and includes Schoharie Reservoir and the Shandaken Tunnel ([Figure 1-1](#)).

Water from the Catskill System flows from the Schoharie Creek into the Schoharie Reservoir. From Schoharie Reservoir, water proceeds through the 18 mile-long Shandaken Tunnel and through a stone-lined channel that leads to the Esopus Creek. The Esopus Creek then conveys the water to Ashokan Reservoir, where the Catskill Aqueduct begins. From the Ashokan Reservoir, water is conveyed 92 miles by the Catskill Aqueduct to the Kensico Reservoir, which is located east of the Hudson River in the Towns of Mount Pleasant, Harrison, and North Castle, Westchester County ([Figure 1-1](#)). From the Kensico Reservoir, water returns to the Catskill Aqueduct and is conveyed to the Hillview Reservoir. With a total storage capacity of 178 billion gallons and a safe yield of 470 mgd, the Catskill System accommodates approximately 35 percent of the City's average day demand for drinking water.

The segment of the Catskill Aqueduct passing through the Eastview Site, where the proposed UV Facility would be constructed, includes the Catskill Connection Chamber (CCC) and the Eastview Overflow, both located on the south parcel along the aqueduct. The CCC was designed with the intent to provide flow to and from a future water treatment plant (to be located at the Eastview Site). The Eastview Overflow is located downstream of the CCC; the function of the overflow is to preserve open channel flow conditions in the aqueduct and prevent pressurization of the downstream segment of the Aqueduct between the Eastview Site and Hillview Reservoir. The estimated capacity of this segment of the Aqueduct is 700 mgd.

1.2.3. Delaware System

Planned in the 1920s and constructed between 1936 and 1964, the Delaware System extends between 85 and 125 miles northwest of lower Manhattan. As shown in [Figure 1-1](#), the 1,010-square mile Delaware Watershed is located west of the Catskill Watershed. Three of the system's reservoirs (Cannonsville, Pepacton, and the Neversink) collect water from the region surrounding the branches of the Delaware River. These reservoirs then feed the water eastward to the West Delaware, East Delaware, and the Neversink Tunnels. The water is then conveyed by these tunnels to the Rondout Reservoir, where the Delaware Aqueduct begins.

From the Rondout Reservoir, the water is conveyed 70 miles by the Delaware Aqueduct to the West Branch Reservoir, located east of the Hudson River in Putnam County. From the West Branch Reservoir, which is part of the Croton System, the Delaware Aqueduct proceeds south to

Kensico Reservoir and finally to the Hillview Reservoir. The capacity of the Delaware Aqueduct from the Rondout Reservoir to the West Branch Reservoir is about 890 mgd. From the West Branch Reservoir to the Kensico Reservoir the capacity increases to about 1,000 mgd, and from Kensico to Hillview Reservoir the capacity increases further to 1,800 mgd. However, along this last segment of the aqueduct, weir blocks added to Delaware Shaft No. 19 have reduced the capacity to about 1,350 mgd. Improvements at Shaft Nos. 18 and 19 on the Delaware Aqueduct are under construction to increase the capacity to about 1,500 mgd. With a total storage capacity of 326 billion gallons and a safe yield of about 580 mgd, the Delaware System accommodates approximately 55 percent of the City's average day demand for drinking water. During drought emergencies, the flow in the Delaware Aqueduct can be supplemented by up to 100 mgd of water from the Hudson River using the Chelsea Pumping Station.

1.2.4. Catskill/Delaware System

Although Kensico and Hillview Reservoirs were constructed as part of the Catskill System, they also serve as balancing and distribution reservoirs, respectively, for the Delaware System. Water from both the Catskill and Delaware System Aqueducts is normally discharged into Kensico Reservoir before being conveyed through the Delaware and Catskill Aqueducts to Hillview Reservoir. The Kensico and Hillview Reservoirs, the sections of the Catskill and Delaware Aqueducts between the two Reservoirs, and the three water tunnels that extend from Hillview Reservoir into New York City are generally referred to as the "Catskill/Delaware System."

1.2.4.1. *Kensico Reservoir*

The Kensico Reservoir is situated approximately 30 miles north of Manhattan in the Towns of Mount Pleasant, North Castle, and Harrison. The reservoir has a maximum storage capacity of about 31 billion gallons. Placed into service in 1915, its major function during normal operations is to receive water from all six Catskill and Delaware System reservoirs, and to make those water supplies available for the fluctuating daily demands of City and certain upstate consumers. Catskill and Delaware water supplies are typically held in Kensico Reservoir for approximately 15 to 25 days before proceeding to the City's distribution system, allowing additional time for settling out of impurities, including solids and microorganisms. As the water leaves Kensico Reservoir at the southwestern shore of the reservoir, it is chlorinated for primary disinfection and fluoridated to reduce tooth decay. The water supply is then returned to the Catskill and Delaware Aqueducts and conveyed to Hillview Reservoir.

1.2.4.2. *Hillview Reservoir*

The Hillview Reservoir is situated approximately 15 miles north of Manhattan in the City of Yonkers. It has a maximum storage capacity of approximately 929 million gallons (mg), of which about 210 mg is considered usable in normal operations. The Hillview Reservoir supplies water to the City distribution system through City Tunnels Nos. 1, 2, and 3 (Figure 1-1). Hillview Reservoir serves to balance the inflows and outflows of water from the Kensico Reservoir with the hour-by-hour needs of the City. Unlike the Kensico Reservoir, the Hillview Reservoir is an artificial reservoir made of earth embankments and lined with concrete.

1.3. HISTORY OF THE PROJECT

1.3.1. Project Background

As part of the Federal Safe Drinking Water Act (SDWA), the Surface Water Treatment Rule (SWTR) and the Interim Enhanced Surface Water Treatment Rule (IESWTR) require that all public water systems supplied by unfiltered surface water sources meet and maintain specific filtration avoidance criteria, or filter their supplies. These criteria include standards for water quality, operations, watershed controls, and microbial protection. The SWTR provides criteria under which a supply may qualify for a Filtration Avoidance Determination (FAD) from the USEPA or the New York State Department of Health (NYSDOH) where the latter entity is granted “primacy” by the USEPA (“Primacy” is the responsibility for implementing and enforcing the drinking water regulations).

The USEPA grants primacy enforcement responsibilities following review and approval of state primacy packages that outline implementation and enforcement responsibilities. Following granting of primacy the USEPA then oversees state actions. However, when the USEPA promulgates new rules and regulations the USEPA retains primacy until such time that the USEPA can approve a state primacy program. In the State of New York, the USEPA granted primacy for the SDWA on September 9, 1997, and following public hearings held on December 7, 1993, the USEPA delegated primacy to the NYSDOH to enforce the SWTR for public water systems in the State of New York with the exception of the Catskill/Delaware Water Supply System. The USEPA has plans to delegate primacy for the Catskill/Delaware System on May 15, 2007. To date, the NYSDOH has not applied for primacy of the IESWTR.

A summary of the City of New York’s action in obtaining filtration avoidance for the Catskill/Delaware System, as delineated under the SDWA and the SWTR, is provided below.

USEPA’s First Determination (January 1993): Following NYCDEP’s July 1992 submission of an application not to filter its Catskill/Delaware Water Supply System, the USEPA determined that the system met the objective criteria for filtration avoidance. USEPA also concluded that the City’s existing watershed protection programs were adequate and met the SWTR goal for a watershed control program. On January 19, 1993, USEPA issued a conditional determination granting filtration avoidance pending further evaluation of the Catskill/Delaware Water Supply System, on or before December 31, 1993, or earlier if the City failed to meet the conditions for avoidance.

USEPA’s Second Determination (December 1993): In September 1993, NYCDEP submitted “New York City’s 1993 Long-Term Watershed Protection and Filtration Avoidance Program” to demonstrate that the Catskill/Delaware system could and would continue to meet the filtration avoidance criteria in the future. USEPA reviewed the program and concluded that the Catskill/Delaware system met each of the SWTR objective criteria for filtration avoidance. USEPA also concluded that NYCDEP’s existing watershed protection programs continued to be adequate and met the SWTR’s criteria for a watershed control program, but that the program’s ability to meet the criteria in the future was still uncertain. USEPA determined that progress was made toward enhanced watershed protection programs. However, USEPA sought a more refined

characterization of the watershed and more specific data concerning the identification and location of the activities within the watershed. USEPA also wanted the watershed protection programs to operate for a longer time period in order to evaluate the effectiveness of the programs' long-term abilities to monitor and control activities that have the potential to pollute the water supply.

On December 30, 1993, USEPA issued a second conditional determination that allowed New York City's Catskill/Delaware public water system to remain unfiltered. This second determination was intended to be effective until a further determination was made, scheduled for December 15, 1996, and contained conditions primarily related to enhanced watershed protection and monitoring programs, pathogen studies, reservoir modeling and other efforts to characterize the watershed and human activities. The conditions also included design of filtration facilities should USEPA deem filtration necessary in the future.

USEPA's Third and Fourth Determinations (January and May 1997): By 1995, implementation of a number of conditions of the 1993 determination had not yet occurred. At that time, USEPA and other interested stakeholders urged the Governor of New York State to intercede. Governor Pataki brought the parties together in a consensus-building approach to negotiate reasonable, effective and scientifically defensible watershed protection programs. The January 1997 New York City Memorandum of Agreement (MOA), signed by New York State, New York City, watershed towns and counties, environmental parties and USEPA, enabled NYCDEP to implement watershed protection programs necessary to continue to avoid filtration. On January 21, 1997, NYCDEP received a water supply permit from the New York State Department of Environmental Conservation (NYSDEC), which authorized NYCDEP to acquire land and conservation easements in the watershed of the City water supply system. The City promulgated new Watershed Rules and Regulations and established economic partnerships with watershed communities to assist the City and stakeholders in their efforts to protect the watershed. In addition, the MOA mandated wastewater treatment plant upgrades, non-point source pollution controls, and a review of the existing monitoring program.

USEPA issued a four-month interim FAD on January 21, 1997, followed by a FAD in May 1997, granting New York City conditional relief from filtering its Catskill/Delaware system until the agency made a further determination, scheduled for April 15, 2002.

USEPA's Fifth Determination (November 2002): In May 2000, USEPA conducted a mid-course review of the 1997 Filtration Avoidance Determination. That review concluded that while New York City had made significant progress in many of its watershed protection programs, there were a number of corrective actions for specific FAD tasks as well as program enhancements that needed to be implemented to ensure the long-term viability of filtration avoidance. The USEPA's review identified two critical areas where the City should increase its efforts: (1) acquiring land or conservation easements around the Kensico Reservoir, where nearly all of the water from the Catskill/Delaware system flows before it enters the distribution system, and (2) upgrading the treatment technology at the 34 non-City-owned sewage treatment facilities that account for 60 percent of the sewage discharged in the Catskill/Delaware watershed.

The 1997 FAD required that NYCDEP, in addition to implementing a watershed protection program, continue the design of the Catskill/Delaware system filtration plant in the event that filtration is later determined by USEPA to be necessary. It also provided the opportunity for the City to seek relief from initiating filtration plant final design work. Relief was to be granted if the City was in substantial compliance with the FAD, and appeared to be providing adequate protection of its Catskill/Delaware watershed so as to render unnecessary the initiation of the final design. The City requested this relief in December 2000. With the completion of the preliminary design on September 30, 2001, and in view of progress made in addressing concerns raised by the USEPA in its FAD Mid-Course Review, USEPA granted the City conditional relief from final design requirements for the Catskill/Delaware filtration plant on November 29, 2001. As a condition of the relief, the City is required to (1) complete the upgrade of the largest wastewater treatment plants by June 2002, (2) conduct a feasibility study and then design and construct an ultraviolet light (UV) disinfection facility for the Catskill/Delaware system, in accordance with a USEPA-approved schedule, (3) institute biennial review of the Catskill/Delaware filtration plant preliminary design, and (4) conduct other watershed planning activities.

The Final EIS is being presented in accordance with the construction schedule in place under the FAD. However, NYCDEP is currently in discussion with USEPA to extend the FAD schedule. This extension is being requested due to the more extensive construction associated with the Eastview Site, and NYCDEP's commitment to perform full-scale validation testing of the UV units.

1.3.2. Watershed Protection Program

As previously mentioned, the MOA united support for a comprehensive watershed protection program that protects and preserves the quality of the City's water supply while promoting economic growth in the watershed communities. With a total financial commitment from the City of approximately \$310 million, the watershed protection program includes partnership programs, monitoring and assessments of water quality, special management practices, and public education programs.

The partnership programs entail locally-based watershed protection initiatives, funded by the City, that are designed to build and support a strong working relationship between the City and its upstate neighbors. One of the foremost initiatives is the Catskill Watershed Corporation (CWC), a local non-profit entity that administers much of the approximately \$260 million the City has committed to water quality and economic development programs in the Catskill and Delaware watersheds. Some of the water quality programs include septic system inspection and rehabilitation, construction of new, centralized sewage systems to correct existing water quality problems, upgrading existing non-City-owned treatment plants to meet State standards; stormwater management measures; environmental education; improved storage of sand, salt, and de-icing materials; and stream corridor protection. The primary economic development program includes the Catskill Fund for the Future, a \$60 million "bank" that issues loans and grants to support responsible, environmentally sound development projects in the west-of-Hudson watershed. The MOA also created a City-funded Watershed Protection and Partnership Council, which serves as a regional forum for the discussion of watershed issues.

The monitoring and assessment component of the MOA requires routine water quality monitoring, special studies of pollutants such as pathogens and agricultural runoff, and model development for improving assessment techniques. The water quality monitoring program entails sampling from all 110 wastewater treatment plants in the watershed and increases sampling in reservoirs and other waterways.

Special management practices have included the introduction of several stormwater Best Management Practices (BMP) and waterfowl mitigation programs in the Kensico Reservoir watershed to control coliform peaks that have, in previous times, restricted the use of the reservoir. The development of stream corridor protection programs has improved stream bank stabilization within the watershed, helping to minimize soil erosion. Forestry management programs have funded programs and projects intended to promote forest management and better protection of the reservoirs from storm runoff pollutants.

In addition, public education programs have been introduced throughout the watershed communities, promoting and teaching the Watershed Rules and Regulations and watershed management practices.

1.3.2.1. Watershed Rules and Regulations

The 1997 Watershed Rules and Regulations, replacing those in effect since 1953, were designed to provide a higher level of protection against threats to the water supply, while permitting responsible development and community revitalization in existing population centers. The new regulations, among other things, established standards for the design, construction, and operation of wastewater treatment plants; set design standards and setback requirements for septic systems; and required the implementation of stormwater control measures for a variety of commercial, residential, institutional, and industrial projects. The regulations also provided for City review and approval of certain activities within the watershed that may have a potentially adverse impact on water quality, with strict timeframes for review and decision-making, expedited procedures in case of emergency, and rights of appeal.

1.3.2.2. Land Acquisition Program

Under the MOA, the NYSDEC issued a 10-year Water Supply permit (with a five-year renewal option) to enable the City of New York to acquire, through outright purchases or through conservation easements, interests in undeveloped watershed land near reservoirs, wetlands and watercourses, or land possessing certain other natural features that are water quality sensitive.³ Of the \$260 million that has been committed to this effort, \$250 million has been allocated to the Catskill/Delaware System. Although the City is not required to purchase a specific amount of acreage, it must contact the owners of more than 350,000 acres of eligible land. The City will not use condemnation procedures to acquire land under this program. Since 1997, NYCDEP has secured over 25,000 acres. Based on a willing buyer/willing seller process,

³ USEPA and the State of New York. *NYC Watershed Memorandum of Agreement*, January 21, 1997,

the City has solicited approximately 107,000 acres, with approximately 13,700 acres of land in the purchase contract stages and more than 1,363 acres acquired to date.

1.3.3. City's 2001 Long-Term Watershed Protection Program

In mid-2001, the USEPA began discussions with the NYCDEP and the State of New York, and instituted an outreach program with several watershed stakeholders to prepare for the release of the City's new long-term watershed protection program. The USEPA's objective was to ensure that the new (revised) program adequately addressed the recommendations of the USEPA in its FAD Mid-Course Review and addressed issues raised by the watershed stakeholders. On December 15, 2001, the NYCDEP submitted its Long-Term Watershed Protection Program; in it the City committed to building substantially on the program set forth in the 1997 FAD and emphasized watershed protection. These steps exemplified the City's long-term commitment and strategy of an adequate watershed control program (pursuant to the SWTR/IESWTR) and when presented to the USEPA showed an important and appropriate adjustment to the existing program, which drove the USEPA's filtration determination.

The City's 2001 Long-Term Watershed Protection Program continued most of the existing program components, providing significant enhancement (i.e. time and money) to several programs, expanding program responsibilities to cover additional watershed areas, and introducing a number of new program initiatives. Several of these changes are highlighted below.

1.3.3.1. Watershed Rules and Regulations

NYCDEP will enhance its participation under the SEQRA planning process that involves projects that raise water quality concerns. NYCDEP will encourage the analysis of appropriate measures of managing stormwater and minimizing impervious surfaces. NYCDEP will also review and make appropriate modifications to the Stormwater Pollution Prevention Plan guidance. Working with the NYSDEC and the State Attorney General's Offices, the NYCDEP has initiated coordination of stormwater enforcement efforts to ensure compliance with regulatory requirements and to ensure prompt detection and remediation of water quality violations. The NYCDEP will increase existing educational and outreach activities as they relate to the Watershed Rules and Regulations. In addition, the NYCDEP will work with the NYS Department of Transportation in consultation with the NYSDEC to establish a pilot program that encourages the efficient use of appropriate winter highway de-icing materials within the watershed.

1.3.3.2. Land Acquisition

The City will continue to solicit land as outlined in the FAD and MOA through the next five years, as well as implement a resolicitation strategy and establish methods to reduce the time interval between contract and closing. Within the next five years, the USEPA and the NYSDOH will evaluate the City's needs to add \$50 million to the program. In addition, the City will seek to renew its water supply permit from the NYSDEC for the next five years.

1.3.3.3. *Wastewater Treatment Plant (WWTP) Upgrades*

The City has completed the upgrade of WWTPs that account for approximately 83 percent of the flow from non-City-owned plants in the Catskill/Delaware watershed. The remaining upgrades will be completed on a staggered schedule through 2004.

1.3.3.4. *Filtration and Ultraviolet (UV) Disinfection Facilities*

As a condition of relief from the FAD requirements for final design of filtration facilities for the Catskill/Delaware water supply system, the City of New York has agreed to a schedule for a feasibility study, design and construction of UV disinfection facilities. In addition, the City will update preliminary designs for a filtration facility every two years to ensure that design documents do not become obsolete.

The City's 2001 Long-Term Watershed Protection Program also provides a detailed description of the various units within the NYCDEP that support its watershed protection program and how they interact to accomplish program goals. The City has committed "the staff, funds, and expertise necessary to support all elements of the watershed protection program and to meet all associated milestones." The revised program identifies additional resources that may be necessary as well as commits to preparing, on a yearly basis, a detailed staffing table and written documentation of resources and funding levels as they pertain to the watershed program.

1.4. NEW YORK CITY WATER SUPPLY SYSTEM USERS

The NYC Water Supply System has the potential and the resources to serve not only City residents, but also a substantial number of communities in upstate New York. Under the terms of the Water Supply Act of 1905, which permitted the City to expand its water supply system west of the Hudson River and develop the Catskill System, the City is required (upon request) to provide a water connection to municipalities and water districts within counties in which the City's water supply facilities are located. Currently, the City Supply System serves as a regional supply for Greene, Delaware, Schoharie, Sullivan, Ulster, Orange, Putnam, and Westchester Counties.

Westchester County is the primary user of the City Water Supply System outside of the City. Water connection agreements between the NYCDEP and the municipalities and water districts grant the withdrawal of water from the Catskill, Delaware, and the New Croton Aqueducts.

Within the City, the water supply system serves a population of approximately eight million inhabitants in the Boroughs of Manhattan, Brooklyn, Bronx, Queens, and Staten Island. City residents receive water from the Catskill/Delaware and Croton Systems, which include the New Croton Aqueduct (NCA), City Tunnels Nos. 1, 2, 3, and the Richmond Tunnel. These tunnels are the main structures responsible for water distribution throughout the in-City system. City Tunnel Nos. 1, 2, and 3 serve the majority of City residents, delivering water to Staten Island, Queens, Brooklyn, northwest Bronx, and middle and lower Manhattan. The Croton System serves the areas of upper and lower Manhattan, and the southeast Bronx (Figure 1-2).

1.4.1. Catskill/Delaware Water Supply Users

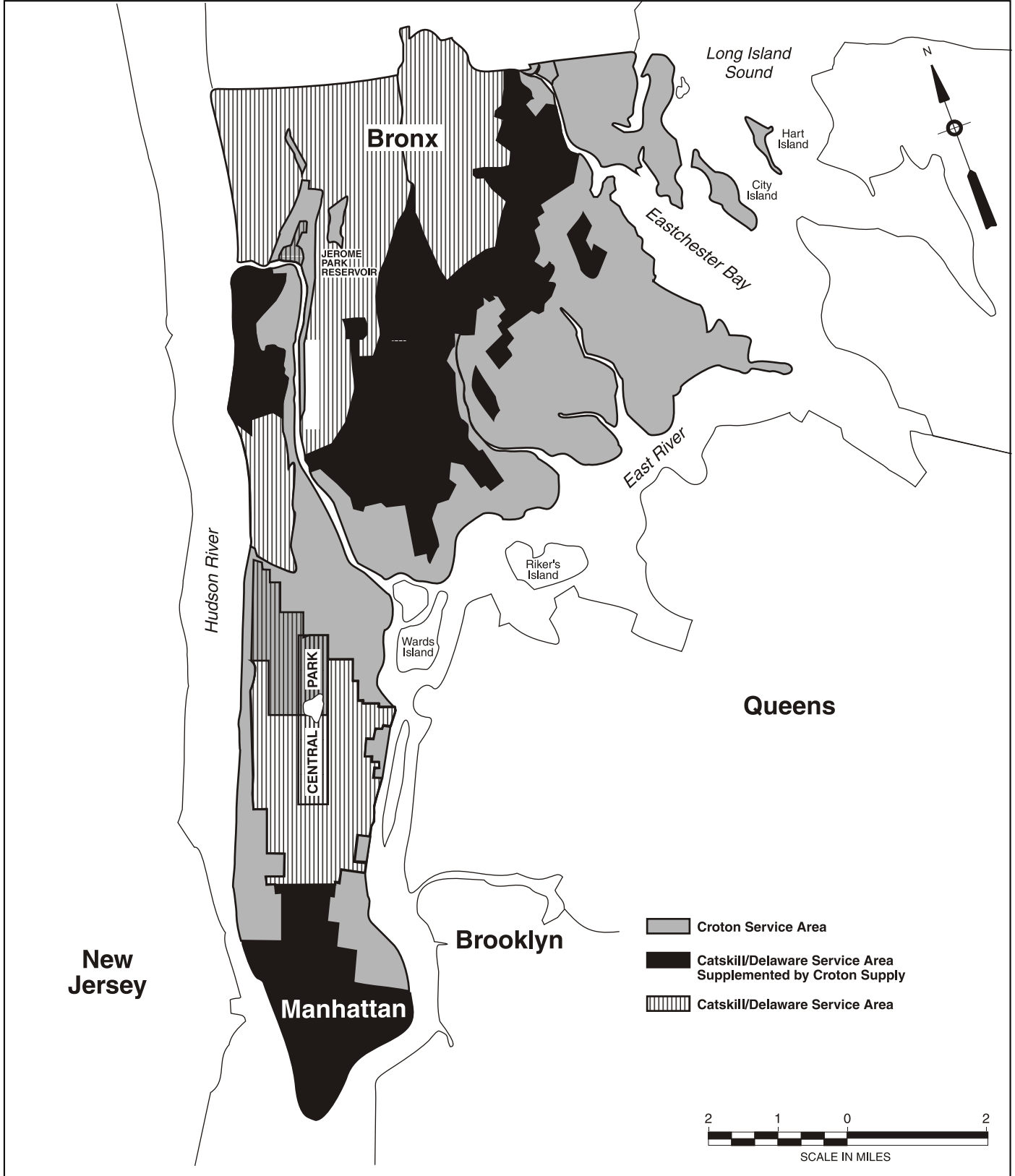
1.4.1.1. Upstate Users

Currently there are several connections to the City Water Supply System within the eight counties that contain City Water Supply facilities (see [Table 1-1](#)). The majority of upstate consumers are located in lower Westchester County, in the vicinity of the Kensico Reservoir or south of the reservoir. The upstate consumers obtain water from the Catskill/Delaware System via the Catskill Aqueduct, the Delaware Aqueduct, the Bronx-Kensico Pipeline, or directly from the Kensico or Hillview Reservoir (the Bronx-Kensico Pipeline, which is owned and operated by the Westchester County Water District No.1, is located between Kensico Reservoir and the Westchester-Bronx boundary). A few upstate consumers have direct connections to the City's distribution system at the New York/Westchester County line.

As evaluated in the *Task 2 Report*⁴, the Catskill and Delaware Aqueducts south of the Kensico Reservoir serve as the primary source for consumers residing in lower Westchester County. Between 1997 and 1998, the average day demand by Westchester County users ranged between 114 million gallons per day (mgd) and 115 mgd, with 99 mgd consumed by southern Westchester users.⁵ Since 1994, there has not been a significant change in the average day demand on NYC's supply by Westchester users. Therefore, the 1994 estimated maximum day demand of 200 mgd for all upstate users is similar to recent maximum day demands. However, since the 1990 U.S. Census, Westchester's population has increased 5.6 percent, representing an increase of almost 50,000 persons. This growth has not been uniform around the County; the central and northern regions have grown at a greater rate than the southern region.

⁴ NYCDEP, Catskill and Delaware Water Treatment, *Task 2 Report Volume 1: Development of Treatment Schemes*, August 1998.

⁵ NYCDEP BWQP, 1997 & 1998 Annual Consumption, November 29, 1999.



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Not To Scale

Existing NYC System Service Area

Catskill/Delaware UV Facility

Figure 1-2

TABLE 1-1. EXISTING UPSTATE WATER SUPPLIERS

Upstate Community/ Water District	Connections	Capacity	Year 2002 Usage
Between Kensico Reservoir and the Eastview Site			
Valhalla ^{1,14}	Catskill Aqueduct	0.66 mgd	243 MG
Hawthorne ^{2,14}	Catskill Aqueduct	0.68 mgd	250.9 MG
Westchester County Water District #3 ³	Catskill Aqueduct	1.1mgd	295,276 MG
Downstream of Eastview Site			
Greenburgh ⁴	Delaware Aqueduct	6.822 mgd	2.804 MG
Westchester Joint Water Works (WJWW) Low Service Zone ⁵	Delaware Aqueduct	11.49 mgd	4,456 MG
Westchester County Water District #1 ³	Delaware Aqueduct	10 mgd	3,549 MG
Sleepy Hollow ⁶	Catskill Aqueduct	11.0 mgd received from the transmission main from The Catskill Aqueduct at Shaft 10; 4.0 mgd is supplied by The Catskill Pumping Station	372,674 MG
Tarrytown ⁷	Catskill Aqueduct	2.201 mgd	810.5 MG
Greenburgh (Knollwood) ⁸	Delaware Aqueduct	1.5 mgd	Used as an Emergency Standby 8/1/02-750,000 gallons 8/2/02-1,179,000 gallons
Elmsford ⁹	Catskill Aqueduct	0.646 mgd	236.1 MG
Greenburgh (Hartsdale) ⁸	Catskill Aqueduct	1.5 mgd	Emergency Standby not used in 2002
United Water New Rochelle ¹⁰	Catskill Aqueduct	20 mgd	7.3 billion gallons

TABLE 1-1. EXISTING UPSTATE WATER SUPPLIERS

Upstate Community/ Water District	Connections	Capacity	Year 2002 Usage
Scarsdale ¹¹	Catskill Aqueduct	3.36 mgd	1.23 billion gallons
Yonkers ¹²	Catskill Aqueduct	29.3 mgd	10.7 billion gallons
Mount Vernon ¹³	Catskill Aqueduct	11 mgd	526 MG

Notes:

1. ADWQR 2002 obtained from the Valhalla Water District.
2. ADWQR 2002 obtained from the Hawthorne Improvement District.
3. Westchester County Water Districts No. 1 & Westchester County Water District No. 3 ADWQR 2002 obtained from www.westchestergov.com. Also noted that WD#3 is located downstream of the Eastview property and could potentially receive treated water.
4. Information gathered from the Town of Greenburgh website <http://www.greenburghny.com>.
5. Obtained from the Westchester Joint Water Works website <http://www.wjww.com>.
6. ADWQR 2002 obtained from Sleepy Hollow.
7. ADWQR 2002 obtained from Village of Tarrytown.
8. Greenburgh (Hartsdale, Knollwood) information obtained from the Town of Greenburgh Superintendents Office.
9. Obtained ADWQR 2002 from the Village of Elmsford Water Department.
10. ADWQR 2002 obtained from the UNWR website <http://www.unitedwater.com>. Approximately 90 percent of out supply is from Catskill System. The remaining 10 percent is from Delaware and Croton Systems.
11. ADWQR 2002 obtained from the Village of Scarsdale website <http://www.village.scarsdale.ny.us>.
12. ADWQR 2002 obtained from the City of Yonkers website <http://www.cityofyonkers.com>. Of the total, 9.02 billion purchased from NYC, 1.65 billion from the Westchester County Water District #1 and 7.55 million from the Town of Greenburgh.
13. Information obtained on conversation from the City of Mount Vernon, Superintendents Office.
14. Thornwood Pumping Station (taps Catskill before Kensico), Valhalla Pumping Station and Hawthorne Pumping Station to be abandoned when Mt. Pleasant Commerce St. Pumping Station is on-line.

1.4.1.2. New York City Users

As shown in [Figure 1-3](#), water from the Catskill/Delaware System is distributed within New York City through four City Tunnels (Nos. 1, 2, 3 and the Richmond Tunnel). City Tunnel No. 1 is about 18 miles long and extends south from Hillview Reservoir through the western part of the Bronx to Manhattan and Brooklyn. This tunnel is situated 200 to 750 feet below the surface and has a nominal flow of approximately 500 mgd, but can deliver at rates between 800 and 900 mgd during peak demand periods. City Tunnel No. 2, approximately 20 miles long, travels through the eastern part of the Bronx, under the East River at Rikers Island, through Queens, where it connects to City Tunnel No. 3, and then through Brooklyn where it connects to City Tunnel No. 1, followed by the Richmond Tunnel. City Tunnel No. 2 is situated 200 to 800 feet below the surface, and has a nominal flow of approximately 700 mgd, but can deliver at rates between 1,100 and 1,200 mgd during peak demand periods.

City Tunnel No. 3 is being implemented in four stages, with portions still under construction. As illustrated in [Figure 1-3](#), the first, completed and placed into operation in 1997, follows a 13-mile route that extends south from Hillview Reservoir to Central Park in Manhattan, and then east under the East River and Roosevelt Island to Long Island City, Queens. Stage 2 consists of two sections (Manhattan and Queens/Brooklyn). The Manhattan section extends south from the Central Park Reservoir into lower Manhattan. The Queens/Brooklyn section extends east from Long Island City and then south through Brooklyn.



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Existing and Proposed Distribution System

Figure 1-3

To supply Staten Island, the Queens/Brooklyn section of City Tunnel No.3 will connect to the existing Richmond Tunnel in Brooklyn, where it will also converge with City Tunnel No. 2. Stage 3 of City Tunnel No.3 (i.e. potential Kensico-City Tunnel (KCT) project) would extend from Kensico Reservoir to the Van Cortlandt Valve Chamber, which is located south of Hillview Reservoir. This stage could also serve as a potential bypass of Hillview Reservoir, in the event of a problem within the system, and as an additional raw (or untreated) water supply to the proposed UV Facility at the Eastview Site. Stage 4 is intended to deliver additional water to the eastern sections of the Bronx and Queens. This stage of the tunnel will extend southeast from the Van Cortlandt Valve Chamber in the Bronx to Queens, and then southwest to connect with the Queens/Brooklyn section of Stage 2.

The five-mile Richmond Tunnel, which connects to City Tunnel No. 2 in Brooklyn, conveys water beneath the Upper New York Bay to Staten Island. Along with the Richmond Distribution Chamber, Richmond Aqueduct, and the underground Silver Lake Park storage tanks, the Richmond Tunnel was designed to improve to delivery of water to Staten Island. As noted above, Stage 2 of City Tunnel No. 3 will connect to the Richmond Tunnel.

1.5. SITE SELECTION PROCESS

1.5.1. Introduction

The following site selection process was developed as part of a USEPA requirement, as outlined in the 1997 FAD, to plan for a treatment facility for the Catskill and Delaware Water Supply Systems. This process assisted the City of New York in identifying possible location(s) and possible treatment schemes. From the site selection process, the City-owned Eastview Site was identified as a high-scoring possible site. Conceptual Designs were prepared using the Eastview Site and the location of a water treatment plant. In November 2002, the USEPA granted the City of New York a waiver from continuing plans for full filtration with the understanding that the City must move forward with plans to implement UV Disinfection. With this requirement, the City re-evaluated the site selection process and determined that the Eastview Site remained the preferred location at which to implement treatment facilities for the Catskill/Delaware Water Supply System. Therefore, the site selection process is presented below in summary with the decision-making guidelines for the proposed UV Facility project.

1.5.2. Background

When the City embarked on the Catskill Water Supply System during the early 1900s, it anticipated that filtration would become necessary to remove impurities found in the water. Thus, following the Bureau of Water Supply Report of 1909, the City of New York purchased an approximately 315-acre site (the Eastview Site), located within both the Towns of Mount Pleasant and Greenburgh, in Westchester County, for the potential construction of a water treatment facility. Following early investigations and preliminary designs, the City chose to concentrate on improving the reservoirs and controlling pollution sources within the watershed instead of constructing a filtration facility. With this decision, the City released approximately 162 acres of the Eastview Site to the Town of Mount Pleasant and Westchester County, and retained approximately 149 acres in both Mount Pleasant and Greenburgh. Nonetheless, when

the City constructed the Catskill and Delaware Aqueducts in 1913 and 1942, respectively, provisions were made to allow the diversion of water from the aqueducts to the Eastview Site to facilitate connections to a future filtration facility. These include the Delaware Shaft No. 19 and the Catskill Aqueduct Filter Connection Chamber (CCC).

Since then, the City has steadily worked to maintain the water quality of its Catskill and Delaware Systems. However, as mentioned earlier, in a second conditional filtration avoidance determination issued by the USEPA on December 30, 1993, the USEPA instructed the City of New York to design filtration facilities for the Catskill/Delaware water system should the USEPA deem that filtration would become necessary in the future. This second determination was intended to be effective until a further determination was made, scheduled for December 15, 1996, and contained additional conditions primarily related to enhanced watershed protection and monitoring programs, pathogen studies, reservoir modeling, and other efforts to characterize the watershed and human activities (see [Section 1.3.1](#), Project Background).

1.5.3. Water Treatment Plant Site Selection Process

The siting of a large industrial-type water treatment plant can lead to great controversy and cause delays to the project if the selection process is perceived as unfair with a predetermined outcome. Therefore, the process must be carefully documented, with valid reasons given for each criterion and for each decision. Reasonable criteria should be developed and take into account the purpose of the plant and the effects it could have on the surrounding area. A wide range of viewpoints representing not only engineering and operation, but also environmental impacts should be included.

Therefore, the site selection process developed in 1998 for a potential Catskill/Delaware Water Treatment Plant entailed four steps or tiers of analysis that: identified potential sites; applied a scoring and ranking system to the sites; identified serious detriments that could make a site unfavorable; and reviewed and eliminated unfavorable sites. The intent of the first tier analysis was to cast a wide net and to find as many sites as possible. This first tier analysis identified 577 potential sites. The purpose of the second tier analysis was to identify characteristics that would make a site difficult to develop for a filtration plant. This was not a “fatal flaw” analysis because no single detriment could be found that could absolutely rule out a potential site. Therefore, sites needed to possess two or more detriments to be removed from further consideration. This second tier analysis eliminated 179 sites, leaving 398 potential sites for further consideration.⁶ Then, 30 ranking items were used in a semi-quantitative third tier analysis to identify the most promising sites. From this tier, 19 of the 296 sites evaluated were carried forward. The fourth tier in the site selection process was a weighted matrix analysis. A total of 51 criteria were grouped into seven sets of related issues. These groups of related issues were given a weight and within each group, the criteria were given point values. A definition for each criteria and standardized application of point values were developed. The scoring results identified the preferred sites along each of the various segments of the aqueducts. From this four-tier analysis approach, the single weighted score for each potential site ranged from 300 to 438 points.

⁶ An additional 102 physical sites were held back from further review because the areas were located west of the Hudson River. This decision was made because it was determined that there were an adequate number of potential sites located closer to the City’s aqueducts. Therefore, 296 sites were carried forward into the third tier analysis.

Parallel with the site selection process, treatment configurations were developed. A configuration was formed by the number of plants, their respective treatment capacity, and their location along the aqueducts with respect to the Kensico Reservoir and, for the Delaware Aqueduct, West Branch Reservoir. When sites were ranked, they were compared to other sites for the same capacity and general locations. As an example, a site that could handle both the Catskill and Delaware water south of Kensico was ranked in comparison to similar sites, and not in comparison to a site that could only handle Catskill water north of Kensico. This led to certain sites being ranked for different uses, such as Catskill water alone and combined Catskill and Delaware water treatment. The dual ranking was necessary to determine the most promising sites for each configuration so that they could be combined into treatment schemes. This multiple scoring technique led to some sites being identified multiple times.

The result of combining sites ranked through the four-tier analysis with potential treatment configurations was the development of treatment schemes. For each treatment configuration the sites with the highest score for each segment of the aqueducts were combined to develop several schemes. A total of 25 schemes were then developed and evaluated. Issues that influenced the selection of a preferred treatment scheme were identified and grouped into five major categories. These categories included: Costs (Capital and O&M), Implementation, Operational Flexibility and Reliability, Purpose and Need, and Acceptability. Relative weights were developed between these categories. A relative value for each scheme's site evaluation was also taken into account. The 25 schemes were then evaluated in a weighted matrix.

From the multiple level site selection process, the City-owned Eastview Site was identified as the preferred location for the Catskill/Delaware water treatment facility. The treatment scheme consisting of a location south of the Kensico Reservoir and a single plant at the Eastview Site achieved the highest score. Even in the cost comparison analysis, the Eastview Site was again identified as the preferred location.

1.5.4. Subsequent Siting Studies

Under the 1997 FAD, the City was provided the opportunity to seek relief from initiating filtration plant final design work. Relief was to be granted if the City was in substantial compliance with the FAD, and appeared to be providing adequate protection of its Catskill/Delaware watershed so as to render unnecessary the initiation of the final design. The City requested this relief in December 2000. Following a mid-course review in May of 2000, the USEPA granted the City conditional relief from final design requirements for the Catskill/Delaware filtration plant on November 29, 2001. The conditional relief was contingent upon the City, among other items, conducting a feasibility study and then designing and constructing ultraviolet light (UV) disinfection facilities for the Catskill/Delaware system, in accordance with a USEPA-approved schedule (see [Section 1.3.1](#), Project Background).

1.5.4.1. UV Disinfection Feasibility Study

The introduction of a potential disinfection facility in place of the full water treatment plant gave the City the opportunity to re-affirm the site selection process conducted in 1998 by looking at three ideal locations for construction of a proposed UV facility. The three locations were selected, in addition to the 1998 siting process, based on two criteria: 1) the integrity of the distribution system downstream of a disinfection facility, and 2) proximity to both the Catskill and Delaware Aqueducts. Therefore, the feasibility study conducted in 2001 examined the feasibility of constructing an ultraviolet light disinfection facility for the Catskill/Delaware System at: 1) the Aerators at the inlet of the Catskill and Delaware Aqueducts immediately downstream of Kensico Reservoir; 2) the City-owned Eastview Site; or 3) Hillview Reservoir.

The study prepared schematic layouts of potential facilities at each location to demonstrate adequate space was available, connections to both aqueducts were possible, and hydraulic considerations associated with each site. The schematic layouts were based on a single capacity and UV unit equipment type to evaluate equal facilities.

From reviewing the example layouts, the Kensico and Eastview Sites provided sufficient area to accommodate a facility for the Catskill and Delaware aqueducts (independently and combined). The Hillview Reservoir, which covers a majority of the Hillview Site, limited the available area for a UV facility at that location without directly impacting the reservoir. All three of the locations showed that UV disinfection was suitable for the water quality of the Catskill/Delaware supply, and that the locations were feasible from an engineering aspect. Therefore, following a cost analysis of the three locations and independent of the long-term goals, the City selected the Kensico Site and began to prepare conceptual designs for a Catskill/Delaware UV Disinfection Facility. In addition to the estimated lower cost of constructing the facility at the Kensico Site, the location offered operational flexibility because separate UV facilities could be constructed at this site; system reliability could be maintained without pumping; less onerous construction activities were anticipated; less site constraints existed; the facility would be located upstream of the addition points for existing (and continuing) treatment chemicals; and most Westchester County water users would have the benefit of receiving flows from the facility.

1.5.5. Moving from Kensico to Eastview

Following the 2001 Feasibility Study, the City evaluated the introduction of a disinfection facility into the overall City water supply system and took into consideration the long-term goals for the City's water supply in conjunction with anticipated improvements to water quality regulations. The following long-term scenarios were considered:

- Should the USEPA require the construction of a water treatment plant for the Catskill/Delaware System, the plant would be constructed at the Eastview Site with UV disinfection incorporated into the system. Therefore, if the proposed UV Facility were to be constructed at the Kensico Site, this facility would be abandoned and dismantled if a water treatment plant was required.

- With the establishment of a modified Flow Control Structure at the Kensico Site, introducing the UV Facility at the Kensico Site would result in abandoning the flow benefits provided by the modified structure. If the UV Facility was moved to the Eastview Site, the facility would benefit from the increased flow the modified structure would provide to the Delaware Aqueduct.
- If the UV Facility were located at the Eastview Site, the pressurization of the Catskill Aqueduct would allow the UV Facility to receive increased flow from the Catskill Aqueduct, providing overall improved reliability for the Delaware and Catskill Aqueducts between Kensico and Eastview.
- With the City's commitment to construct a new water supply tunnel (the KCT) between the Kensico Reservoir and the City, connections could be made at the Eastview Site that would again increase the overall redundancy of the systems.

Evaluation of these considerations identified the benefit of locating the proposed facility at the Eastview Site. Therefore, the City could benefit in the long-term from locating the proposed UV Facility at the Eastview Site through the ability to incorporate the facility into a potential water treatment plant for the Catskill/Delaware System, while increasing the System's redundancy in service from the Kensico Reservoir to the City's Distribution System. Therefore, the City has selected the Eastview Site as the location for the proposed Catskill/Delaware Ultraviolet Light Disinfection Facility.