3.1-1 INTRODUCTION

As discussed in Chapter 1, "Program Description," the Delaware Aqueduct is critical to the New York City water supply system. Shutting down the Delaware Aqueduct during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing, would require DEP to first implement Project 2A, Water Supply System Augmentation and Improvement. Project 2A would comprise a number of additional projects to supplement DEP's water supply sources and ready the water supply system for the effects of the shutdown period.

To date, DEP has identified five supplemental water supply sources that could be activated during the Project 2B to ensure the available water supply during the shutdown period. These are the potential augmentation projects:

- Demand Management
- Upper Catskill Aqueduct Optimization
- Queens Groundwater Reactivation
- New Jersey Interconnection
- Nassau County Interconnection

In addition, during the shutdown period, water flowing into the Delaware watershed reservoirs would not be diverted to the RWBT. Therefore, some potential projects may be necessary to accommodate the cessation of flow in the RWBT, since water that would normally flow through the RWBT would need to flow elsewhere. These are the Delaware Watershed Reservoir Improvements.

These projects are varied in scope and location (see **Figure 3.1-1**) and they are described in more detail in the subsequent sections of Chapter 3. As described in Chapter 1, "Program Description," the Project 2A projects are in the preliminary stage of facility planning, and not enough information has been developed to enable a complete environmental review. Therefore, this first EIS provides a description of these projects and a generic assessment of their potential impacts. Prior to the approval and implementation of any of these projects, additional environmental review as part of a second EIS will be undertaken. In the second EIS, more detailed descriptions of the projects will be provided (since facility planning will have been

12.16.11

Projects Proposed to Supplement the DEP Water Supply System

Delaware Watershed Reservoir Improvements

Figure 3.1-1

Water Supply System Augmentation and Improvement Projects

advanced), and detailed evaluations of potential environmental impacts from these projects will be disclosed.

It is possible that as project planning continues, one or more of the projects identified in this EIS may not move forward and/or additional projects may be identified.

Subsequent sections of Chapter 3 are organized as follows:

- Section 3.2, “Demand Management.”
- Section 3.3, “Upper Catskill Aqueduct Optimization.”
- Section 3.4, “Queens Groundwater Reactivation”
- Section 3.5, “New Jersey Interconnection”
- Section 3.6, “Nassau County Interconnection” ✷

3.2-1 INTRODUCTION

DEP has an ongoing Demand Management program that would reduce water demand during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing.

This section presents an overview of DEP's water supply and wastewater system. It also details the Demand Management program, which is designed to reduce the total demand for water both in New York City and upstate water supply users, thereby supporting the shutdown of the RWBT and connection of the bypass tunnel.

The Demand Management program consists of several components that, when implemented together, would reduce the demand for water supply across all users. Discrete components of this program include the installation of Automatic Meter Reading to provide real-time information on water use, changes to water use rules, implementation of water efficiency programs and water reuse programs, utilizing educational opportunities to reduce water use and the development of metrics to track water demand for opportunities for additional savings.

Section 3.2 is organized as follows:

- Section 3.2-2, "Project Description"
- Section 3.2-3, "Actions and Approvals"
- Section 3.2-4, "Project Phasing and Implementation"
- Section 3.2-5, "Potential Impacts"

3.2-2 PROJECT DESCRIPTION

3.2-2.1 BACKGROUND

WATER SUPPLY

New York City's distribution system is sourced from three upstate reservoir systems (the Croton, Catskill and Delaware Systems). They were designed and built with various interconnections to increase flexibility by permitting exchange of water from one system to another. This feature

mitigates localized droughts and takes advantage of excess water in any of the three watersheds. The distribution system is currently furnishing water to users in portions of four of the eight eligible northern counties. The distribution system provides approximately 85 percent of the water used in Westchester County and approximately 7.5 percent of the water used in Putnam, Orange and Ulster Counties.

Approximately 95 percent of the total water supply in New York City is delivered to buildings by gravity. Only about 5 percent of the water is regularly pumped by DEP to maintain the desired pressure. As a result, operating costs are relatively insensitive to fluctuations in the cost of power. However, when drought conditions exist, additional pumping is required. DEP has continued to work with regulators and other agencies over the years to monitor and support conservation efforts.

Although there is an ample supply of water in the region, DEP continues to use conservation methods whenever they are cost effective and do not conflict with other important agency goals. Although current levels of water consumption are near historic lows, it is important to maintain these gains to prepare for the Delaware Aqueduct repair and increased volatility that may occur due to climate change, and to create additional storage in our sewer system for storm water. DEP's policy and experience is that saving water is usually the most cost-effective and environmentally benign method of ensuring an ample supply of water for the region. The city's water conservation programs address the many sources of water use and waste and have been developed in cooperation and collaboration with regulators, non-governmental organizations, and the citizens and businesses of the city over a period of more than 20 years. With the city's population expected to rise to 9.1 million by 2030, water efficiency would continue to have an important role to play, not just to help assure supply but also to assist in meeting goals to reduce combined sewer overflows, maintain wastewater quality, and meet nitrogen removal goals.

PROJECT DESCRIPTION

The Demand Management program is multi-faceted and designed to take advantage of reduced water consumption in a host of different ways. The following section provides additional detail on the following programs.

- DEP tracks and analyzes current and past water consumption trends, which are largely based on the consumption data dating from 2001 to the present. Data on water supply, distribution, and wastewater flows are used in conjunction with various planning efforts within the agency, such as emergency preparedness, study of DEP's rate structure, and projecting future water use.
- Automatic Meter Reading (AMR) allows DEP to remotely monitor water use and provide users with real-time data on consumption. This is an important improvement to old meters which were only read quarterly.

- DEP also implements a number of programs to promote efficient use of water and detect, target, and fix leaking components in the water system. System specific programs, such as leak notification, are designed to monitor the distribution and open hydrant emergency response system.
- Several properties in New York City have implemented water reuse initiatives and have taken advantage of the Comprehensive Water Reuse Program rate, which provides for a discounted water and sewer rate in mixed use or residential buildings. Additionally, state and local guidance has become available or is in the process of being developed.
- New water supply rules took effect in June 2009. The changes address several water quality and leak prevention issues in addition to a number of technical and procedural changes. Another round of updates and revisions are under way in 2011.
- Education and outreach programs on water and water efficiency directed at both students and adults.
- Future projects include vouchers to subsidize the cost of upgrading to water-efficient toilets, replacing large meters to ensure that all water is accounted for, replacing toilets and other fixtures in city-owned buildings, and transitioning buildings currently billed on frontage rate to a Multifamily Conservation Program.

Tracking and Projecting Water Demand

DEP tracks and analyzes current and past water consumption trends, which are largely based on the consumption data dating from 2005 to the present. Consumption is estimated for each available borough, block and lot are verified. As a part of this effort, DEP also tracks this data against water supply, distribution, and wastewater flows.

The data is then used in conjunction with various planning efforts within the agency, such as emergency preparedness, study of DEP's rate structure, and projecting future water use.

New York City water consumption has declined approximately 30 percent since the early 1990s and continues to decline despite increases in population. However, it is reasonable to assume that water usage would remain stable or even continue to decline due to customers' ability to track their usage via Automatic Meter Reading (see below), requirements for low-flow fixtures, and desire to reduce customer bills, since entirely based on metered consumption. Metered billing based on the amount of water used is a way to encourage conservation by pricing water according to use.

DEP uses water demand analysis and projections for many purposes including water supply and wastewater infrastructure planning, revenue analysis, water supply augmentation, assessing the effects of new growth and rezoning, and understanding the effects of water demand on agency operations.

Automatic Meter Reading

DEP is automating its water meter reading capabilities to increase billing accuracy and provide customers with the tools they need to better manage their water usage. The AMR system consists of small, low-power radio transmitters (MTUs) connected to individual water meters that send daily readings to a network of rooftop receivers throughout the city. In most cases, the transmitters are placed where water meter receptacles are currently located.

The genesis of this program began in 1985, when the City Council began its first steps to reduce water supply demand by requiring installation of meters in new or renovated construction, and, in 1987, DEP began installing meters in residential properties. DEP began the installation of a citywide AMR system in August 2008 with substantial completion expected by the end of 2011. Website access to customers was developed in tandem, and DEP began offering real-time consumption data during summer 2010, and added an email Leak Notification service in late 2010.

The AMR works by remotely connecting to Data Collection Units (DCUs) linked to a citywide wireless system. DEP began to install rooftop DCUs in August 2008 and network completion is expected to finish in central Staten Island during fall 2011. The network provides close to double redundancy so coverage has been provided for almost all of Brooklyn, Queens, the Bronx, and Manhattan. Wide-scale installation of the transmitters (MTUs) on water meters, and by mid-2011 approximately 80 percent of MTUs had been installed.

Installation of the AMR system will not only improve customer service and collections but will increase the volume of water use data by orders of magnitude. DEP will move from having meters read four times a year with an 85 percent actual read rate overall, to four times a day (for most customers) or hourly (for larger customers) with a 98 percent actual read rate.

DEP is making efforts to install MTUs in apartment buildings that are physically metered but are still billed under the flat-rate or frontage system so the building owners or managers can better understand their water use.

Water Efficiency Programs

There is a host of DEP programs designed to promote efficient use of water and to detect, target, and fix leaking components in the system. The leak notification program monitors the distribution of water including open hydrants, while the water meter replacement program ensures accurate metering of water usage. DEP offers water saving kits and residential surveys. New requirements, such as the “Green Codes” and Local Law 84 and Local Law 86 are making new construction and government buildings more water efficient.

Leak Notification Programs

The Leak Notification Program is a new initiative that allows DEP to proactively alert customers to potential water leaks on their property. In late 2010 DEP began to introduce a leak notification service for one-to-three family properties covered by the AMR system. The Leak Notification

Program gives customers the opportunity to sign up online to receive email notifications when their water use increases significantly over a period of several days, enabling homeowners to quickly respond to potential leaks and fix them before they become a serious billing problem.

DEP uses their 24-hour response teams and leak detection crews to investigate infrastructure leaks and replace water mains as necessary. Additionally, the same leak detection crews respond to customer complaints, which result in significant annual water savings of approximately 6 percent citywide.

DEP also has a field team dedicated to monitoring unauthorized fire hydrant use and closing full flowing hydrants, particularly during the summer peak days. On days where temperatures reach over 90° F, this can result in significant water losses and pressure drops. During high peak days, DEP proactively installs spray caps in locations with a history of unauthorized hydrant use. Additionally, this year, DEP enhanced its Fire Hydrant Abuse Prevention Program (see page 18 of Education Programs for details).

DEP continues to offer free water saving kits to homeowners as well as free walk-through surveys of private homes to identify leaks and install low-flow showerheads, faucet aerators, and toilet displacement bags.

Meter Repair and Replacement Program

Water meters become less accurate as they age. The exact age when replacement makes sense may depend on the physical age of the meter, the amount of water that has flowed through the meter over the years, water quality, the type of meter and the manufacturer. Cost of access to a building to perform the replacement work is also a consideration. For meters that are less than 1 inch in size, it appears that replacement is cost effective 18-22 years after initially installation. Accurately reporting meters improve the quality of data and result in more accurate bills.

Green Codes

Mayor Bloomberg, Council Speaker Quinn and the U.S. Green Building Council sponsored a wide-ranging review of the city's Building Code to meet environmental and green building goals. The cooling system amendment which prohibits the use of potable water for most once-through cooling systems went into effect January 1, 2011, as did an amendment that requires alarms and sub-meters to detect water leaks and monitor usage on water equipment.

Two other changes will become mandatory July 1, 2012: one that lowers the maximum water consumption flow rate or quantity for certain plumbing fixtures and allows the installation of dual-flush toilets; and a law requiring drinking fountains in commercial buildings to have a separate faucet designed to fill a container with water. The code changes apply to new construction and the repair or replacement of existing structures and fittings.

Local Law 86 and LEED® Rating Systems

The New York City green building law, Local Law 86, requires that certain buildings must achieve a minimum of 20 to 30 percent drinking water use reduction below the standards of the

U.S. Environmental Protection Agency Energy Policy Act of 1992 as well as a minimum Silver rating under the US Green Building Council's Leadership in Energy and Environmental Design (LEED®) rating systems program. The requirements of the law may apply to projects where construction is directly managed by either city agencies or non-city entities that receive a certain amount of city funding, such as cultural organizations, state agencies and private developers.

Buildings seeking LEED certification and Water Efficiency (WE) credit 3.1 are required to reduce water use by 20 percent through the use of low flow plumbing fixtures on efficient buildings. More efficient buildings can achieve WE credit 3.2 for 30 percent water reduction. For landscaping and irrigation, a LEED WE Credit 1.1 can be achieved for reducing potable water used for building irrigation by 50 percent. Ultra efficient and innovative buildings could obtain the additional WE credit 1.2 for reducing the potable water for irrigation by 100 percent.

Water Reuse Programs

Several properties in New York City have implemented water reuse initiatives and have taken advantage of the Comprehensive Water Reuse Program rate, which provides for a discounted water and sewer rate in mixed use or residential buildings. Additionally, state and local guidance has become available or is in the process of being developed.

Comprehensive Water Reuse Program

In 2004, the New York City Water Board created the Comprehensive Water Reuse Program (CWRP) rate which provides for a discounted water/sewer rate for mixed use or residential buildings that recycle water using a "blackwater" (water from toilets) or "greywater" (water from sinks) recycling system as well as meeting fixture and appliance efficiency requirements. One year later the qualifications for the rate were expanded to buildings which recycle blackwater or combinations of greywater and stormwater or greywater.

State and Local Guidance

The New York City Department of Buildings Plumbing Code dictates the requirements for water conservation systems and water recycling (reuse) systems. The "blackwater" and "greywater" systems requirements are outlined for installation, storage, filtration, disinfection, make-up water, overflow, drainage, venting, coloring, and identification. This code is currently under revision by an interagency committee.

At the State level, the New York State Department of Environmental Conservation is expected to release a report to guide regulatory decisions on reuse in the near future. New York City would work within the State's comprehensive standards to encourage reuse, remove barriers in local building codes, conduct cost/benefit analysis, establish long-term compliance management and maintenance requirements, and provide incentives where appropriate.

New Water Use Rules

Keeping the water use rules relevant by updating technical and procedural aspects is an important aspect of the Conservation Program. DEP completed revisions in Rules of the City of

New York (RCNY) Title 15 Chapter 20, "Rules Governing the Supply and Use of Water" which took effect in 2009. The changes related to water conservation and water quality include rules intended to replace (rather than repair) pipes, elimination of lead in water pipes and meters, automatic shutoffs in public fountains, and the mandatory disconnection of water to vacant buildings after one year.

In addition, DEP began internal study for a new round of rule changes. While most of the likely changes concern technical specifications related to water meters and the new AMR system, expansion of the requirement for individual metering of new condominiums and optional individual metering of larger condominiums is a conservation-related issue raised for discussion.

Education Programs

In order to help educate the public and raise awareness about water conservation, DEP has an ongoing comprehensive public education and outreach program including public events, publications, seminars, and online resources. The ongoing program has several integrated components that address a wide range of topics through multiple media outlets, as described below. Furthermore, any future programs to reduce water demand and use would be tied to a major public information campaign to reiterate and emphasize the value of water and water infrastructure so that any inconveniences, costs, and sacrifices can be seen in the context of their overall benefit.

Programs, Events, and Publications

DEP continues to develop and implement education programs to help make young people and adults aware of the importance of New York City's water resources. DEP provides opportunities to learn about water supply, wastewater treatment, and stewardship activities at the new Visitor Center at Newtown Creek. Other learning opportunities occur through inquiry-based lessons, staff development workshops for teachers and administrators, printed materials, assistance for curriculum development, and student research projects. DEP continues to administer its annual Water Resources Art and Poetry contest for K-12 students.

DEP and the Department of Housing Preservation and Development, as well as other organizations co-sponsor a series of three-hour seminars on water conservation, water/sewer billing and the transition to metered billing. The classes are free.

The seminars cover the basics of water/sewer billing (flat-rate and metered billing), how to transition to metered billing, measure and account for water/sewer costs, information on toilets, showers, boilers, hot water heaters and other water-saving equipment, and managing and account for water use.

The Newtown Creek Visitor Center is another important resource for young people and adults to learn about New York City's water systems. DEP also hosts professional development workshops for formal and non-formal educators through the Summer Science Discovery Institute, Bronx River Alliance, and the Queens Museum of Art. At these events, educators learn

about creative ways to incorporate the study of water resources into their curriculum using activities focusing on the New York City water supply system and the importance of conserving water.

The wide array of DEP environmental education related material would continue to be produced and updated, as necessary, for distribution to students and teachers at public events, and on the DEP website.

Online Resources

The DEP website provides information on water conservation through institutional, regulatory, and public education programs for regulators, students and adults alike. The public education component of the website enhances DEP public education programs by providing easy internet access to event schedules, educational materials for teachers and students, downloadable promotional information such as flyers and posters, reading lists, project descriptions, and the host of information associated with DEP Public Education Programs. A direct link to Conservation outreach materials and water saving tips can also be found on DEP's website.

DEP has also opened Facebook, Twitter, and Flickr accounts to communicate with the general public about New York City water related news and issues.

Upcoming Projects

DEP is working to implement additional projects to reduce the demand and consumption of water during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. They include replacing large meters to ensure that all water is accounted for, vouchers to subsidize the cost of upgrading to water-efficient toilets, replacing toilets and other fixtures in city-owned buildings, and ending the practice of frontage billing.

Public Building Fixture Replacements

This program would replace toilets, urinals and possibly other fixtures in city-owned buildings. Since government agencies pay a fixed amount independent of their water consumption, this program is highly cost effective since there are no revenue losses. In addition, this initiative would be consistent with PLANYC Water Conservation Initiative 13.

Large Meter Replacements

The goal is to replace or rebuild meters three inches and larger to recover lost revenues. DEP has begun a systematic effort to replace the city's 30,000 largest meters on regular industry recommended cycles over the next 10 years. This effort would increase the number of large customers on metered billing and does not necessarily translate to direct water savings, but would yield additional revenue and more accurate reporting. Accurate billed water readings could send price signals to encourage more efficient use of water.

End of Frontage Billing
The New York City Water Board currently plans to end traditional flat-rate water and sewer billing on July 1, 2012. On that day, as many as 20,000 apartment buildings (half of which are New York City Housing Authority (NYCHA) developments) will be granted an option to move to metered billing or to the Multifamily Conservation Program (MCP) rate. The MCP rate is still a fixed rate, but carries specific water conservation requirements such as fixture replacements installation of a meter, and required leak detection.

Voucher-Based Fixture Incentive Program
Beginning in 2014, DEP is planning a short-term program to provide vouchers for EPA WaterSense certified, water-efficient toilet replacements. At 1.28 gallons per flush, these toilets use significantly less water than some of the older installations, which range from 3 to 7 gallons per flush.

The program will be administered in two phases. Phase I will be open to frontage customers transitioning to MCP rate or metered billing. Phase II of the program would be open to all other residential properties in need of fixture replacements.

Water for the Future Grant Program
DEP issued a Request for Expressions of Interest (RFEI) in 2007 and received some conceptual support and comments from engineers and developers. As part of the grant program, DEP is in the process of researching the extent to which reuse, alternate use, and other alternatives can be cost effective and how best to incentivize proposals of this nature which are generally costly.

3.2-3 ACTIONS AND APPROVALS

No new actions or approvals are required for ongoing programs to improve water metering, identify trends in water usage, promote efficiency through special rates or credits, or to advocate for increased education and outreach programs.

However, there is currently a study underway to evaluate changes to the city's drought rules which would include operational flexibility to reduce consumption during the aqueduct shutdown.

3.2-4 PROJECT PHASING AND IMPLEMENTATION

Many of the programs designed to reduce consumption have already been implemented and are ongoing. However, there are several components that will be phased in over the coming years. Those include, but are not limited to, the replacement of fixtures in government buildings, the replacement of large meters within the water supply system, and ending flat-rate, or frontage, billing.

On January 1, 2012, the City Building Code will require a reduction of the maximum water consumption flow rate for certain plumbing fixtures, and require drinking fountains in commercial buildings to have a faucet designed to fill a reusable water container. DEP would also implement voucher or grant programs to encourage toilet replacements and water reuse programs.

3.2-5 POTENTIAL IMPACTS

There are no adverse impacts associated with the current Drought Rules or other demand reduction programs DEP is undertaking at this time. As stated previously, however, the city is currently studying changes related to operational flexibility in the Drought Rules. Since the scope of changes is not yet known, no generic assessment can be provided at this time. However, a detailed assessment of potential impacts associated with this rule change will be provided as part of the second EIS. ✷

3.3-1 INTRODUCTION

This section of Chapter 3 generically discusses the Upper Catskill Aqueduct Optimization, one of several proposed projects to supplement water supply during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. A more detailed discussion of the project and its potential impacts will be presented in a separate EIS that will be completed to analyze impacts associated with components of the Program that do not have sufficient levels of design to support a full evaluation at this time.

This chapter presents details on the Upper Catskill Aqueduct Optimization to restore the Aqueduct to its original hydraulic capacity. The information below presents the current project understanding and basic concepts; however, all details are subject to change as design progresses. At this time, the proposed project components include cleaning or lining the existing Aqueduct, installation of chemical addition facilities, and constructing or replacing air vents at various locations along the Aqueduct.

Chapter 3.3 is organized as follows:

- Section 3.3-2, “Project Description”
- Section 3.3-3, “Actions and Approvals”
- Section 3.3-4, “Project Phasing and Implementation”
- Section 3.3-5, “Potential Impacts”
- Section 3.3-6, “Conclusions”

3.3-2 PROJECT DESCRIPTION

The Upper Catskill Aqueduct Optimization project includes improvements to restore the capacity of the Upper Catskill Aqueduct to its original design capacity. The Upper Catskill Aqueduct extends approximately 74 miles, from Ashokan Reservoir to Kensico Reservoir (see **Figure 3.3-1**), and operates by gravity to transport untreated drinking water. Water enters the Aqueduct at Ashokan Reservoir where the flow is controlled by valves. There is currently no chemical addition or other treatment at Ashokan Reservoir. Outside communities draw water from connections located along the length of the Upper Catskill Aqueduct between the Ashokan and

Kensico Reservoirs. The Kensico Reservoir serves as a holding and balancing reservoir for the city's Catskill and Delaware water supply systems.

The Catskill Aqueduct is made up of four types of tunnel segments: cut-and-cover, grade tunnels, steel pipe siphons, and pressure tunnels. Cut-and-cover sections are horseshoe-shaped, unreinforced concrete arches, 17' in height and 17'6" at their widest, and run just a few feet below the ground's surface. Cut-and-cover sections generally follow local topography and were constructed by excavating a trench, constructing the aqueduct, and replacing material to cover the aqueduct. Under most flow conditions, there is a gap between the water level in the Aqueduct and the top of the cut-and-cover arch, leaving a free water surface. This means that water in the 41.5 miles of cut-and-cover sections of the Upper Catskill Aqueduct is considered to be unpressurized.

Grade tunnels are located where the aqueduct crosses under hills or mountains and it was determined to be preferable to build through, rather than around, the high ground. Grade tunnel sections are horseshoe-shaped concrete structures with dimensions of 17 feet high and just over 13 feet wide, which is somewhat narrower than cut-and-cover tunnel sections. The slope of the grade tunnels are steeper than the cut and cover tunnel sections in order to maintain the same flow through the smaller cross-section. As with the cut-and-cover sections, flow through the grade tunnels is unpressurized. There are 11.5 miles of grade tunnels along the Upper Catskill Aqueduct.

Finally, in areas where topography did not permit the construction of a free flowing cut-and-cover or grade tunnel section, siphons or pressure tunnels were used. Siphons are designed to cross small valleys or to pass under railroads or waterways that are a few to several hundred feet in width. Steel pipe siphons consist of three cement and mortar-lined steel pipes that run parallel to one another and are circular in construction. Flow in the siphons is full, meaning there is not a free-water surface and the water is pressurized. This pressure helps water in the siphons to flow back uphill to the cut-and-cover sections downstream of the obstruction or valley. In general, the center siphon has a diameter of 9 to 9.5 feet while the outer siphon pipes are 7 to 8.5 feet in diameter. There are 4.5 miles of siphons in the Upper Catskill Aqueduct.

Pressure tunnels constitute 16.1 miles of the Aqueduct length and are made up of the Rondout, Wallkill, Moodna-Hudson-Breakneck, and Croton Lake Pressure Tunnels. Pressure tunnels were constructed deep beneath the ground surface in sound rock to sustain the heavy outward pressure from water in the tunnel. They are circular at 14 to 14.5 feet in diameter and lined with concrete, providing a smooth interior surface and additional support to the bedrock encasing the tunnel. Like the siphons, flow in the pressure tunnels is full and the water is pressurized. Vertical shafts are located at each end of the pressure tunnel to connect the tunnel with cut-and-cover or grade tunnel segments. Water flows down the upstream shaft and into the pressure tunnel and on the other end water pressure in the tunnel is used to push water up the downstream shaft and back into the cut-and-cover sections.

Over time, wall deposits have formed on the interior surface of the various Aqueduct segments as a result of naturally occurring elements in the water, specifically iron and manganese. Although the presence of these elements does not result in adverse health effects for downstream users, it is believed that these elements are promoting the growth of bacteria by providing a food source. The growth of the bacteria, combined with their ability to capture particulate iron and manganese from the water results in the buildup of rough deposits along the Aqueduct walls. These wall deposits increase friction between the water and interior tunnel surface, reducing the speed at which water can flow through the Aqueduct and the Aqueduct's overall flow capacity. Recent investigations estimate that current capacity of the Upper Catskill Aqueduct is approximately 590 mgd. However, historical accounts describe the Aqueduct as having a capacity as high as 660 mgd, and DEP records indicate that the Aqueduct has operated at flow rates in excess of 600 mgd for extended periods in the past.

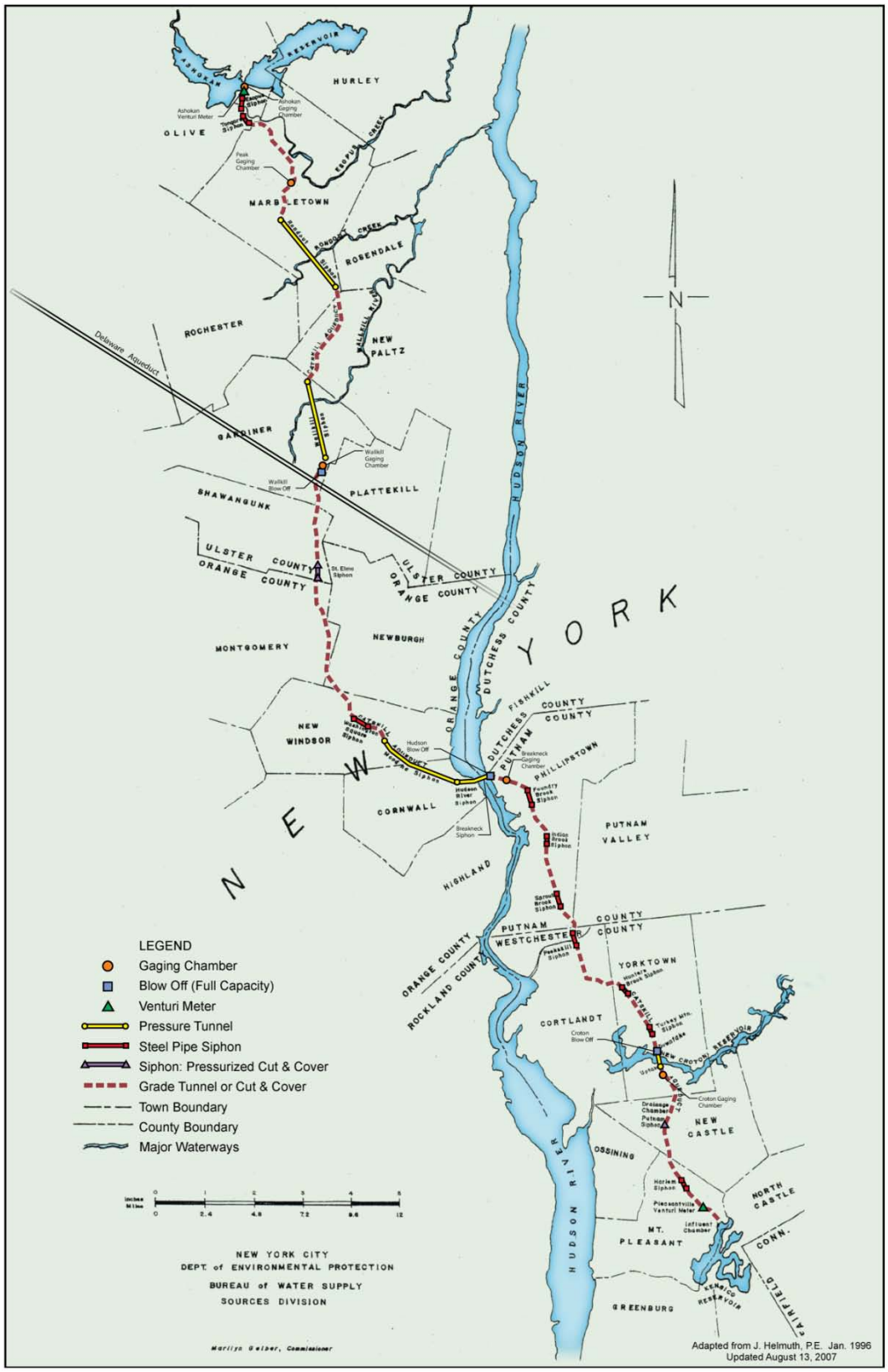
In addition to the wall deposits, inadequate venting can prevent the Aqueduct from operating at full capacity by slowing the flow of water. During flow changes, typically initiated by DEP to manage supply and downstream water demand, large volumes of air need to enter or exit the Aqueduct to prevent pressurization or vacuum conditions in the Aqueduct. During a flow increase, air is displaced by rising water levels. Inadequate ventilation at unpressurized Aqueduct sections can trap air during a flow increase and cause increased air pressure in that section. Differing air pressure in the Aqueduct can lead to wave effects and create turbulence within the Aqueduct. Additionally, increased air pressure in a downstream section can back up Aqueduct flow. These two effects together limit Aqueduct capacity. Providing adequate air venting is good engineering practice and prevents inadvertent pressurization of the Aqueduct.

The Upper Catskill Aqueduct Optimization project would help to restore the Aqueduct to its design capacity. The proposed project consists of three main components:

- Cleaning or lining the Aqueduct;
- Chemical addition; and
- Constructing additional air vents.

These project components would be implemented at various locations along the Upper Catskill Aqueduct between Ashokan and Kensico Reservoirs. Either individually or combined, they could help to increase the hydraulic capacity of this portion of the Aqueduct.

Figure 3.3-1: Map of Catskill Aqueduct



back

3.3-2.1 KEY COMPONENTS

CLEANING OR LINING

Under the Upper Catskill Aqueduct Optimization project, cleaning or lining would be employed as a method to reduce friction between the water and Aqueduct interior surface caused by the wall deposits in an effort to improve Aqueduct capacity. It is anticipated that either cleaning or lining would be limited to the cut-and-cover, grade tunnel and steel pipe siphon sections of the Aqueduct. Removing the deep-rock pressure tunnels from service and providing access to them for cleaning or lining would be expected to raise similar concerns, and incur similar risks, to those associated with draining the Delaware Aqueduct's Rondout-West Branch Tunnel. Additionally, the deep-rock tunnels do not appear to be limiting the capacity of the Aqueduct.

The cleaning process would be employed for 51 miles of the Aqueduct and would require either a single extended shutdown or series of Aqueduct shutdowns. During the shutdowns, teams of workers would enter the Aqueduct and clean it, removing the existing deposits that have adhered to the interior walls through either manual pressure washing or by utilizing a semi-automated washing device. The portions of the Upper Catskill Aqueduct not identified as candidates for cleaning are either too difficult to access, as is the case of the pressure tunnels, or would result in negligible improvements to overall Aqueduct capacity.

As an alternative, following cleaning, lining of the Aqueduct walls with an epoxy coating could be completed along approximately 47 miles of the cut-and-cover, grade tunnel, and steel pipe siphon sections. The lining process involves removal of wall deposits and preparation of the aqueduct surface for application of low-friction epoxy lining. Lining provides greater capacity benefits than cleaning because the properties of the epoxy coating would reduce the amount of friction between the Aqueduct walls beyond that achieved through cleaning. Similar to cleaning, lining is not proposed for areas that are too difficult to access or would result in negligible improvements to capacity.

While lining can provide superior friction improvement in the cut-and-cover, grade tunnel, and steel pipe siphon sections of the aqueduct and exceed the cleaning capacity improvement, lining the Aqueduct is significantly more challenging to schedule and requires longer shutdown durations compared to cleaning as it necessitates additional time for surface preparation, liner application, and curing. The feasibility of lining Aqueduct sections depends on the DEP's ability to shutdown segments of the Aqueduct for a longer period of time than under the cleaning alternative. For the steel pipe siphon sections, it is possible that the siphon pipes could be lined individually, isolating each siphon pipe in series while flow is maintained through the adjacent pipes. This could provide greater operational flexibility and reduce the overall number of shutdowns.

CHEMICAL ADDITION

Historical records show that chlorine was routinely added to the Ashokan headwaters in part to reduce the thickness of wall deposits and maintain Aqueduct capacity. The chemical addition program proposed for the Upper Catskill Aqueduct Optimization project would consist of reintroducing a program of chemical addition to the water as it enters the Catskill Aqueduct at Ashokan Reservoir. The addition of chemicals to prevent the regrowth of wall deposits would be critical to maintain the otherwise short-lived improvements achieved by cleaning or lining. In addition, it is possible that chemical addition alone could provide a capacity increase even without cleaning or lining of the Aqueduct. Establishing early and effective chemical addition could also provide opportunities to reduce the scope and cost of cleaning or lining programs. However, the development and timing required to realize the maximum benefit of chemical addition alone is uncertain at this time.

Chemical addition is often applied to disinfect and eliminate pathogenic organisms and bacteria in the water supply. There are two mechanisms by which the addition of chemicals, specifically various forms of chlorine, would improve the capacity of the Catskill Aqueduct. These mechanisms include:

1. Chemical addition would oxidize manganese and iron to a form not readily used by the bacteria, therefore reducing the bacteria's food source and significantly reducing the growth, re-growth, or accumulation of bacteria within the Aqueduct deposit; and/or
2. Chemical addition would control new growth, and potentially reduce the extent of existing bacterial populations within the deposits by inactivating the organisms through disinfection. For existing deposits this could result in shrinking or sloughing off the wall deposits which would result in a cleaner surface and therefore reduce friction between the water and interior tunnel surface.

The application of water treatment chemicals, specifically those that are chlorine based, to control the concentration of metals and bacterial growth in water supplies is common and in many cases it is a necessary form of effective water treatment. However, the addition of chlorine-based chemicals to the water supply has the potential to create byproducts when the chemical reacts with naturally occurring material, such as organic matter from plants and algae, found in the source water. The safe levels of byproducts in drinking water supplies are limited by the US Environmental Protection Agency under Stage 2 of the Long Term Enhanced Surface Water Treatment Rule (LT2ESWTR or LT2). Therefore the concentration of byproducts in the water can influence or limit the allowable dosage of chemicals that can be added to the system. Limiting the addition of chemicals may alter the total available hydraulic benefit of a stand-alone chemical addition program.

In addition to the formation of byproducts, chemical added to the water that does not react with the biofilm, iron and manganese or other naturally occurring material would remain in the water as a residual. Because water from the Upper Catskill Aqueduct discharges to an open, untreated

surface water system, Kensico Reservoir, any chlorine-based chemical residuals would have to be removed as water leaves the Aqueduct and discharges to the Reservoir. This would involve application of a de-chlorination chemical. Prior to the addition of water treatment chemicals, DEP would initiate communication and coordination with those communities having taps along the Upper Catskill Aqueduct to ensure that their treatment processes could properly handle any chlorine residual that would be introduced or byproducts that may be formed between Ashokan Reservoir and their connection to the Aqueduct. In addition, DEP would obtain approvals or permits and, as necessary, identify methods to properly handle or treat potential discharge of treated water to adjacent wetlands or streams via any leakage in the Aqueduct.

Chemical addition would require chemical bulk storage, the construction of a permanent chemical addition facility at Ashokan Reservoir that may involve the generation of chemicals onsite, and a de-chlorination facility most likely at DEP's Pleasantville Alum Plant near Kensico Reservoir. Two options for construction of the chemical addition facility have been suggested; one design consists of a separate (newly constructed) facility to house the storage tanks and associated equipment, with adjacent truck offload facility. An estimated facility footprint based on preliminary designs is approximately 7,500 square feet to allow for bulk storage tanks, transfer pumps, hose pumps associated electrical and control equipment, and an adjacent truck offload area. The alternative design consists of housing the entire system, including bulk storage in an existing 9,000 square foot structure located near the Ashokan Reservoir. Uncertainties with each of these alternatives designs exist; further investigation is required to confirm the final design. In addition to the chemical addition facility, a dechlorination facility of comparable size to the chemical addition facility would be required at the Pleasantville Alum Plant and would house bulk storage of chemical and transfer and metering pumps.

VENTING

As stated previously, the Catskill Aqueduct is a closed, concrete or cement mortar-lined conduit that conveys water by gravity, without the need for pumping or energy addition. Water flows as open channel or free-surface flow within most portions of the Aqueduct, with the exception of those segments that travel under rivers or small valleys where pressure tunnels or siphons are used. As water flows through the Aqueduct, air can become trapped at the crown which puts pressure on the water and can reduce flow and capacity. The air venting portion of the Upper Catskill Optimization project would involve the installation of air vents in areas of the Aqueduct where air vents are not present or where the existing vents are inadequate. Adequate ventilation is necessary for proper flow of water and to allow unrestricted movement of air in and out of the Aqueduct. Changes in the amount of water flowing through the Aqueduct are a result in changes in water depth. As the amount of water increases, water elevation rises and air is displaced. Alternatively, as the amount of water in the Aqueduct decreases, water elevation drops and air is drawn into the Aqueduct. Adequate ventilation allows air to move more easily and prevents pressurization or vacuum conditions in the Aqueduct. Therefore, vent addition is anticipated to improve Aqueduct capacity. Installation and construction of the proposed vents would take place

at existing structures on DEP property and is not anticipated to require work within the Aqueduct or interrupt Aqueduct operation. Details on installation and construction would vary depending on the existing conditions at each proposed ventilation site.

ANTICIPATED WATER SUPPLY BENEFIT

The Upper Catskill Aqueduct Optimization project would provide additional water during Project 2B by improving the delivery capacity of the Catskill Aqueduct. Each of the proposed components, especially when implemented together, has the potential to provide an increase in water supply capacity in the Catskill Aqueduct.

Cleaning or lining offers the potential for increased water supply capacity because both would physically remove wall deposits from the Aqueduct that currently reduce the Aqueduct's water supply capacity. Chemical addition alone has the potential to reduce the extent of the wall deposits and, when combined with cleaning or lining, it would prevent or reduce the rate of re-growth and maintain the increased water supply capacity. The installation of additional air vents in the Aqueduct would improve air flow through the structure, thereby improving the ease with which water travels throughout the Aqueduct. By increasing the Aqueduct capacity through each of the proposed project components, the Upper Catskill Aqueduct Optimization project would increase the system's flexibility to handle additional flow and provide supplemental water during Project 2B, when the Delaware Aqueduct is shut down.

More work is required to determine exactly how much additional water supply would be realized through the proposed project, especially when the various components are combined. This would be accomplished through additional evaluations and testing. For example, lab and field testing would be undertaken to determine the length of time required for chemical addition to have maximum benefit. Project component feasibility must also be determined to account for constraints of regulatory limits and availability of backup supply sources for communities served by the Upper Catskill Aqueduct.

3.3-3 ACTIONS AND APPROVALS

The Upper Catskill Aqueduct Optimization project would require a number of permits and approvals. The list of agencies that would be consulted and may potentially supply permits or approvals is included in Table 3.3-1. This table should not be considered comprehensive; the intent is to present the current understanding of which agency approvals would be required to implement this augmentation project. As design advances, the permits and approvals may change; updates to the involved agencies listed below would be modified as required.

Table 3.3-1
Summary of Agencies to Coordinate with on Permits and Approvals for the Catskill Aqueduct Optimization

Upper Catskill Optimization Involved Regulatory Agencies
U.S. Fish and Wildlife Service
New York State Department of Environmental Conservation
New York State Department of Transportation
New Your Sate Office of Parks, Recreation, & Historic Preservation
New York State Department of Health
Orange County
Ulster County
Putnam County
Westchester County
Village of New Paltz
City of Newburgh
Village of Cornwall-on-Hudson
Town of New Windsor
Village of Cold Spring
Town of Putnam Valley
Continental Village
City of Peekskill
Town of Cortlandt
Village of Buchanan
Town of Yorktown
Town of New Castle
Village of Pleasantville
Town of Mount Pleasant
New York City Department of Health and Mental Hygiene
New York City Department of Environmental Protection

3.3-4 PROJECT PHASING AND IMPLEMENTATION

This project must be completed in advance of Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. This shutdown is currently scheduled for fall 2020. To meet this deadline, the cleaning, lining, and venting projects would need to be completed sufficiently before Project 2B to allow for testing to verify capacity gains. Analysis and field studies of chemical addition should be conducted as early as possible in order to analyze the benefits of chemical addition alone (e.g. before cleaning or lining occurs). To meet this deadline, the project would need to be in operation by the end of 2019.

In order to meet the schedule goals, outside community back up water supply capacity would need to be considered. The project may require a mix of shutdown strategies to minimize supply interruptions to outside communities.

The ability to perform Aqueduct rehabilitation in fewer shutdowns would be preferable to multiple, segment-by-segment shutdowns, and would reduce overall program duration and cost. DEP is working with outside communities to ensure adequate back up supplies exist.

3.3-5 POTENTIAL IMPACTS

The Upper Catskill Aqueduct Optimization project would potentially allow for additional flow through the Catskill Aqueduct and add flexibility to management of the DEP water supply system. Evaluations are needed to investigate the actual achievable increase in water supply and the best implementation alternatives for minimizing service disruptions. This chapter provides a high-level description of potential impacts based on the current project design; a detailed assessment of potential impacts would be provided as part of a second EIS. The following section is a summary of the potential impacts based on the conceptual design of the overall program.

3.3-3.1 NATURAL RESOURCES

The application of chemicals to the Aqueduct under the Upper Catskill Aqueduct Optimization project could potentially impact natural and water resources through the release of the chemicals to the environment. As described previously, it is anticipated that a dechlorination facility would be required at Kensico Reservoir to remove any chemical disinfectant remaining in the water. The potential for chemical or disinfection byproducts to leak from the Aqueduct into surrounding streams or ecosystems upstream of the dechlorination facility would be further analyzed as the project progresses to identify possible impacts to natural resources and necessary steps would be taken to minimize any impacts associated with chemical addition to the environment through aqueduct leaks to the greatest extent practicable. In the event that the potential for leakage is identified, prior to implementation of the project DEP would put measures in place to handle and treat the leakage in order to protect the environment.

3.3-3.2 HAZARDOUS MATERIALS

Chemical addition has been identified as the single most important capacity improvement measure since it could provide a stand-alone water supply benefit and would be essential to maintaining improvements achieved by cleaning or lining. To implement the chemical addition program, a chemical addition facility would need to be constructed and would require the bulk storage of chemicals. In addition, a dechlorination facility with additional storage of chemicals would potentially be required at Kensico Reservoir.

The use and storage of chemicals presents a concern due to the potential for leaks or spills of chemicals into surrounding areas or adjacent surface water bodies. In addition, some of the disinfection alternatives involve the onsite generation of a chlorine-based chemical. The methods available for minimizing risk associated with conducting chemical reactions on site would need to be further considered as the chemical reactions generated may pose additional risks to those

from chemical delivery and storage. To minimize potential impacts associated with the storage and use of potentially hazardous chemicals, facilities would be designed in accordance with New York State Department of Health and New York State Department of Environmental Conservation regulatory requirements for allowable chemical storage capacity, chemical transfer, and secondary containment to protect against potential spills.

3.3-3.3 TRANSPORTATION

In order to facilitate the Catskill Optimization program, it is anticipated regular deliveries of chemicals would be necessary. Further work is required to determine the frequency of these deliveries and whether they would impact traffic in the vicinity of the chemical facilities.

3.3-3.4 PUBLIC HEALTH

DEPOSIT REMOVAL/ SLOUGHING AND POTENTIAL WATER QUALITY EFFECTS

The removal of the biofilm through cleaning, lining or chemical addition would result in the gradual removal, sloughing, or dissolution of wall deposits within the Aqueduct. Based on prior Catskill operating experience and experience reported elsewhere, this may produce short-term impacts to Aqueduct water quality.

For example, after an eight-day shutdown in 1924, it was reported that when the Aqueduct was returned to service, suspended solids were present in the water for several weeks, impairing water clarity by increasing cloudiness and reducing transparency. The post-shutdown increase in suspended solids was thought to be due to drying out of the wall deposits and disturbance of sediment.[1]

Another case history describing the addition of chemicals at a non-DEP water treatment plant in Groton, CT reports a slight increase in the cloudiness of the water and presence of small particles as a result of an increased concentration of suspended solids during the first week of chemical addition. This increase was attributed to removal of biofilm deposits previously adhering to the plant's piping, settling basin, and filters.[2]

Based on these reports, short-term increases in turbidity of Catskill Aqueduct water entering Kensico Reservoir after extended shutdowns for cleaning or lining may occur, and are possible for some time after initiating chemical addition. Provisions to mitigate any adverse impacts of short-term changes in turbidity would be investigated and put in place in association with the proposed project in order to reduce potential impacts to the maximum extent practicable.

---

[1] Source: *NYC DWSGE, Annual Report for 1923-1924*, pg 14.

[2] Source: A Case History Review of Purate®-Based Chlorine Dioxide When Used to Eliminate Manganese and Color Problems From a Municipal Drinking Water Application. Published by Water Solutions, A Division of Azure Water Services, LLC. Accessed March 2011 at http://www.watersolutions.us/wp-content/PDFs/11_WS_Case_History-Purate_Groton.pdf

It is important to note that potential changes in water quality would also be carefully communicated with those communities that use the Catskill Aqueduct as their primary source of supply to ensure the changes could be effectively handled at the individual community water treatment plants. In all cases, the potential impacts of the proposed solutions must be further analyzed in order to select the mitigation measure that minimizes impacts to the greatest extent possible.

FORMATION OF DISINFECTION BYPRODUCTS

Chemical addition could also lead to the formation of disinfection byproducts, which could potentially affect the concentration of these byproducts in water supplies of the communities that use the Upper Catskill Aqueduct as their primary source of drinking water and in the city's distribution system. As stated previously, the amount of these disinfection byproducts permitted in drinking water distribution systems is regulated by federal and state agencies. The potential for formation of disinfection byproducts and propagation to the communities that use the Upper Catskill Aqueduct water or the city's distribution system would be tested prior to establishing a chemical addition program. As a result of these studies, the amount of chemical that could be applied would be appropriately established in order to maintain limits below permitted maximums. In addition, DEP would discuss the potential for slight increases in byproducts to exist at locations where downstream communities draw water supply from the Aqueduct to ensure that these byproducts could be properly handled through their treatment systems to minimize impacts to all users.

3.3-3.5 CONSTRUCTION

It is anticipated that construction of the Upper Catskill Aqueduct Optimization project, primarily cleaning or lining and the installation of vents could result in temporary construction impacts to natural resources, water and sewer infrastructure, transportation and noise.

NATURAL RESOURCES

Proposed work areas (cleaning or lining; new venting structures, etc.) are assumed to be contained within the DEP right of way along the Aqueduct. These boundaries typically span 100 feet on either side from the centerline of the Aqueduct or center siphon pipe and the Aqueduct's path is generally characterized as an open corridor without trees or shrubs. However, temporary impacts to natural resources from construction activities are possible and would be further evaluated as part of the second EIS prior to implementing the project.

In addition, in order to effectively remove wall deposits or prepare the Aqueduct for lining under a cleaning or lining program, the use of wash water would be necessary to facilitate either manual pressure washing or the use of a semi-automated washing device. Based on the current conceptual design, wash water may be obtained from various sources. Wash water may be obtained from sections of the Aqueduct that are not dewatered, or from a tanker truck above grade. The various sources of water and their impact on the surrounding groundwater table or

communities would be further evaluated as the project planning continues and presented in the second EIS. Recycling of wash water would also be evaluated as a mechanism to reduce the required volume of water needed in the cleaning or lining processes.

Based on the likelihood that the washing process would remove, slough, or dissolute deposits from the walls of the Aqueduct, the water produced as waste from the washing process may require special disposal or treatment. Mechanisms of disposing of wash water would need to be considered but one example of a disposal method includes hauling away the water for offsite treatment and disposal. Water would need to be collected and tested for contaminants prior to disposal to determine the appropriate disposal methods. As an alternative to offsite disposal, the water could be treated onsite to appropriate state effluent limits and discharged to local surface water bodies. Prior to discharge, evaluations of local surface water bodies would also be required. This would include assessments of seasonal water levels, the ability for the water bodies to accept drainage water from the Aqueduct, the potential for flooding and the potential for impacts to existing habitats.

It is anticipated that the chemical addition and dechlorination facility would be located in previously disturbed areas adjacent to existing structures. The areas identified to date are currently lawn areas, the loss of which would not be anticipated to result in an impact to natural resources.

WATER AND SEWER INFRASTRUCTURE

Implementing the cleaning and lining projects in the Upper Catskill Aqueduct would necessitate draining and shutdown of portions of the aqueduct to provide temporary access for personnel and equipment. Any required service suspensions would take place before shutdowns associated with Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing were initiated. During the shutdowns, communities that rely on water from the Upper Catskill Aqueduct would need to utilize backup supplies. Uncertainty exists regarding the reliability of existing backup supplies and additional backup capacity may be needed in the communities served by the Aqueduct during the Upper Catskill Aqueduct service suspension.

Given this uncertainty, DEP is currently coordinating with communities to develop a shutdown schedule and qualify available backup supplies to ensure communities are not left without water. Based on the importance of adequate shutdowns to facilitate the Upper Catskill Aqueduct Optimization project, DEP would continue to closely coordinate planned shutdowns with affected communities and to establish whether there are constraints on the shutdown durations for the proposed work and the project schedule. In order to help alleviate the potential effects of an Aqueduct shutdown, DEP would explore potential mitigation solutions. The use of stop shutters in the Aqueduct is an example of one such mitigation measure since they provide a mechanism to store water within the Aqueduct that can be utilized to provide water to affected communities while work takes place in downstream sections of the Aqueduct.

TRANSPORTATION

Construction impacts related to transportation would be temporary and dependent on the portion of the project under construction, cleaning or lining, the construction of chemical addition facilities or the installation of new Aqueduct vents. The need to access the Aqueduct at various locations in order to facilitate implementation of the different Upper Catskill Aqueduct Optimization alternatives may result in temporary increased traffic or changes in traffic patterns through local communities.

NOISE

In addition to traffic impacts, the rehabilitation work could be conducted 24 hours/day, 7 days/week during a scheduled Aqueduct shutdown. In locations where the work would be adjacent to neighboring properties, mitigation measures may be implemented to minimize potential noise impacts.

3.3-6 CONCLUSION

Implementing the Upper Catskill Aqueduct Optimization project would provide DEP and the city with a viable potential supply of water during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. In order to advance the project, additional work must be completed to identify whether to implement a cleaning or lining program, the maximum benefit that may be achieved by a chemical addition program, and the locations where repair or replacement of Aqueduct vents would be most beneficial. At this stage, potential impacts to natural resources, hazardous materials, transportation and public health have been identified in association with the proposed project. In addition, it is anticipated there would be temporary impacts associated with construction. However, it is also anticipated that through additional analyses and careful consideration of design alternatives, many of these impacts could be reduced or eliminated. As design for the proposed project advances, further technical analyses would be conducted and the details of these investigations will be described as part of the second EIS. ✷

3.4-1 INTRODUCTION

This section of Chapter 3 generically discusses the Queens Groundwater Reactivation project, one of several proposed projects to supplement water supply during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. A more detailed discussion of the project and its potential impacts will be presented in a separate EIS that will be completed to analyze impacts associated with components of the Program that do not have sufficient levels of design to support a full evaluation at this time.

This chapter presents details on the Queens Groundwater Reactivation project to restore DEP's existing groundwater supply in Queens, NY. The information below presents the current project understanding and basic concepts, however all details are subject to change as design progresses. At this time, the proposed project components include the rehabilitation of existing wells, the installation of treatment facilities such as granular activated carbon vessels and caustic tanks, and rehabilitation and/or installation of iron removal facilities, plus the upgrade or addition of chlorination and fluoridation facilities.

Chapter 3.4 is organized as follows:

- Section 3.4-2, "Project Description"
- Section 3.4-3, "Actions and Approvals"
- Section 3.4-4, "Project Phasing and Implementation"
- Section 3.4-5, "Potential Impacts"
- Section 3.4-6, "Conclusions"

3.4-2 PROJECT DESCRIPTION

The Queens Groundwater Reactivation project involves the reactivation of DEP's existing groundwater supply system in southeast Queens, NY (**Figure 3.4-1**), which withdraws water from three underground aquifers. The three aquifers present in Queens from shallowest to deepest, are the Upper Glacial, the Jameco/Magothy, and the Lloyd, with each separated by a 'confining layer' such as clay. The Queens groundwater wells pull water from varying depths, drawing water from each of the three aquifers.

Figure 3.4-1
Queens Groundwater System

back

Originally owned and operated by the Jamaica Water Supply Company, the groundwater system has been owned by DEP since its acquisition in 1996. The groundwater supply system (herein referred to as the Queens groundwater system) consists of 68 supply wells at 44 well stations and several water storage tanks. Many of the wells were not active when they were acquired in 1996 due to age, deterioration of the system, and water quality issues. Most of the system has not operated in more than 10 years, but the Queens groundwater system did provide water to a limited portion of the city's distribution system until 2007.

Reactivation of the Queens groundwater system is viewed as a viable potential supply of water during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing because DEP owns all of the facilities, much of the infrastructure is considered intact, though may need to be upgraded or replaced to be brought into active service, and treatment mechanisms can be implemented to ensure that water quality meets drinking water standards.

In general, well stations in the Queens groundwater system contain screened wells that are drilled into one of the three local aquifers. Each well station includes individual well pumps and motors to draw up the water. Some of the stations or wells are housed within a brick structure or well house or are enclosed by fencing. Some well stations contain multiple onsite wells and

various forms of water treatment facilities to provide fluoridation, chlorination, pH adjustment, iron sequestration, sedimentation, aeration, filtration or water storage. Typical facilities consist of chemical addition facilities, tanks, pumps, or piping. Water storage tanks (either in ground or elevated) are also present at a number of well stations.

An analysis was conducted in 2010 to assess the potential for the Queens groundwater system to provide augmentation during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. The analysis determined the well(s) that should be targeted for reactivation and also identified the measures necessary to ensure all reactivated wells would provide potable water meeting water quality standards. The evaluation identified 52 wells (34 well stations) that would be suitable for reactivation (note that multiple wells can be located at a station).

The quantity of water that can ultimately be obtained from these wells under the Queens Groundwater Reactivation project is limited by various factors, such as interference from nearby wells in the same aquifer, and deterioration of efficiency and capacity with well age. Other factors affecting the restoration of the overall system capacity include the potential for saltwater intrusion (from over pumping), and spatial or site constraints which could limit water treatment capacity at certain well locations.

3.4-2.1 KEY COMPONENTS

The reactivation of the Queens groundwater system and the system's ability to provide a sufficient augmentation supply would require improvements to well stations, well rehabilitation, and the addition of or improvements to treatment facilities. Wells would need to be repaired, and equipment upgraded and replaced to restore the well stations to reliable operation and achieve maximum water production capacity. In addition, water treatment facilities ranging from chemical addition facilities to more advanced treatment methods would be required to meet water quality standards (note that all potable water requires some type of treatment prior to distribution to customers).

3.4-2.2 WELL REHABILITATION

Most wells would require rehabilitation to restore capacity. As a result of the wells being idle for many years, it is likely that the current capacity would be much less than the original installed capacity and parts of the well structures could be corroded or otherwise degraded. Over time, a well can become clogged, minerals build up, and metal coatings can form inside the well, reducing its ability to supply water. In order to remove any of these particles that may have built up inside the well, rehabilitation could be performed using mechanical or chemical methods. In instances where sections of the well structure have been corroded, repair or replacement of the wells may be necessary.

The rehabilitation process would be conducted at all wells, but the extent to which it is conducted would vary based on the condition of the individual well. Overall, the rehabilitation process could involve a number of steps:

- An initial pump test would be performed to determine how much water the well could produce in its current condition, and the aquifer constraints or the drop in water level inside the well at varying flow rates. Based on the results of the pump test, chemical and/ or mechanical rehabilitation may be required. During this time water would also be sampled from the wells to analyze its water quality and determine treatment methods required to provide water that meets drinking water standards. Pump testing would be conducted for a defined time period and water produced from the wells during pump testing at each well site would likely require handling and disposal as waste.
- Inspections would be performed to document the physical condition of the well structure as well as to assess the extent of clogging or mineral build up on the well screens. These inspections may be performed using a submersible camera and may require the pump and motor to be removed in order to access the well.
- Based on the extent of clogging or mineral buildup, mechanical and/or chemical rehabilitation may be required. During this process, wells would be surged for a period of time to dislodge any particles within and surrounding the well screen. Water removed from the wells during cleaning would likely be handled and disposed of as waste.
- Following well rehabilitation and re-installation of well equipment, a second pump test would be performed to ensure that the rehabilitation was successful and to flush out the wells of sediments and minerals.

Before connection to the distribution system and as each new well would be brought online for the first time, the initial discharge water has an elevated concentration of suspended sediment and minerals. This water would likely be handled as waste and properly disposed until it is has met all applicable state and federal drinking water standards. Under existing well and piping arrangements, initial discharge water and water produced from pump testing during the rehabilitation process would be discharged to waste either through a drywell, recharge basin at the well station, or a sewer connection. Drywells and recharge basins are designed to capture and temporarily store stormwater or runoff, allowing it to infiltrate though the ground back into the groundwater aquifer. Wells that are connected to a sewer connection are either connected to a sanitary/combined sewer, in which discharge is routed to a wastewater treatment plant, or to a storm sewer in which the water is routed to an outfall that discharges offshore. Water quality samples would be collected to verify the discharge water meets permit standards for discharge into the sewer, dry well, recharge basin, or outfall (depending on design or site considerations). If the wastewater is determined to exceed regulatory discharge requirements for water quality, temporary onsite treatment of the wastewater streams or storage tanks may be required during the pump testing and well rehabilitation processes. Selecting methods for handling this

wastewater discharge would be an essential part of rehabilitating the well system, established during design and addressed in greater detail within the second EIS.

3.4-2.3 WATER QUALITY ISSUES AND TREATMENT METHODS

Potential water quality issues are a concern with re-activating and operating the Queens groundwater system—primarily related to high iron and manganese concentrations, nitrate, and the presence of volatile organic contaminants (VOCs), which are toxic compounds often found in cleaning products such as chemicals used in dry cleaning, degreasers and gasoline. However, proven treatment mechanisms that have been in use for decades are available to address these issues and would be implemented to ensure water from the Queens groundwater system would meet drinking water standards. Historically, all groundwater entering New York City's distribution system was treated with chlorine for disinfection, fluoride for public health, and food grade phosphoric acid, or, in some cases, sodium hydroxide to maintain pH and control corrosion, while others required more extensive treatment. It is anticipated that some of the reactivated wells would also require more advanced treatment in addition to the methods used historically. Therefore, in addition to identifying potential wells for rehabilitation during the 2010 analysis, the DEP reviewed the existing treatment capabilities at each well station and evaluated the treatment needs based on the most recent water quality data.

One potential treatment mechanism includes methods to control or remove iron and manganese concentrations in the water supply. Iron and manganese are common in groundwater, as they are naturally occurring within the aquifer and dissolve into the water as it seeps through soil and rock into the aquifer. Iron and manganese have been a concern at some wells since they were originally put into service and in some locations treatment was installed to remove these minerals. The minerals do not pose a public health risk, but are limited under drinking water standards due to aesthetics as elevated concentrations can lead to discoloration of the water and alter its taste. Past treatment methods for iron and manganese included filtration to physically remove the minerals or sequestration to meet aesthetic requirements. Filtration is a treatment method applied when concentrations are too high for simple sequestration. Filtration involves the use of a media such as sand to separate contaminants from the water while sequestration is a treatment method whereby treatment chemicals are used to bind up the metals to keep them in the dissolved phase and prevent the reactions that would normally allow them to alter water quality.

VOCs are also a concern in the Queens groundwater system and similar to iron and manganese, treatment was in place at some well locations during the system's original operation. VOCs are common in aquifers across the country, albeit over a large range of concentrations. Some VOCs occur naturally in the environment, while other VOC compounds occur only as a result of manmade activities, and some compounds have both origins. Common VOCs in water are most often associated with cleaning products, such as chemicals used in dry cleaning, degreasers, and gasoline or oil spills on the ground surface that seep into shallow aquifers or from leaking fuel

tanks. As a result, sampling of groundwater is necessary, especially in developed areas that may be vulnerable to a spill. Drinking water standards are in place for VOCs and in locations where VOCs are detected, treatment can be implemented to effectively remove VOCs and meet the standards. Treatment methods anticipated to be utilized in the Queen groundwater system include air stripping facilities and granular activated carbon (GAC) adsorption. Air strippers remove VOCs by transferring the contaminant from the water into the vapor phase (air). The GAC removes the VOCs through a chemical reaction that transfers the VOCs from the water being treated onto a solid media which is then disposed. GAC adsorption was identified as the recommended treatment for well stations where VOCs were detected and no existing treatment method (i.e. air stripper) is in place. Where existing GAC units or air stripping facilities are already present on site, these facilities would likely be rehabilitated and used to treat water from the wells. It should be noted that GAC is a standard water treatment method used in many supply systems.

Nitrate (NO_3) was also determined to be a concern in the system. Infrequently, elevated nitrate concentrations have been measured at some wells. Nitrate is a naturally occurring form of nitrogen found in soil but is also found in groundwater due to overuse of fertilizers, leaking septic systems, or discharge from municipal wastewater facilities. Wells that pump groundwater which contain nitrate levels in excess of water quality standards would require treatment.

Additional forms of treatment may be necessary to adjust the pH levels. Treatment would also include the addition of chemicals to prevent corrosion, disinfect and fluoridate in a similar manner to how the city currently treats their surface water supplies to meet all applicable drinking water regulations.

Installation of treatment equipment and potential rehabilitation of wells may be restricted by the location of the wells, the site's parcel size, and accessibility to the site. Furthermore, the surrounding land use and site access, including driveways and other hindrances to chemical and/ or carbon delivery would be considered.

3.4-2.4 ANTICIPATED WATER SUPPLY BENEFIT

The reactivation of the Queens groundwater supply system presents an option for the city to utilize existing facilities owned by DEP to augment their overall water supply during the RWBT shutdown. Additionally, the project has the potential to offer an in-city supply of water that could be important beyond the RWBT project in providing a source of water under emergency situations, including extensive periods of drought and have the potential to help alleviate pressure on existing infrastructure and allow it to be taken offline for maintenance. An added benefit could also be realized by neighboring Nassau County water purveyors whereby the interconnections discussed in Section 3.6 could function to allow water pumped from the Queens groundwater system to enter adjoining water districts during periods of drought or well rehabilitation.

3.4-3 ACTIONS AND APPROVALS

The Queens Groundwater Reactivation project would require a number of permits and approvals from several agencies. The list of agencies that would be consulted and may potentially supply permits or approvals is included in **Table 3.4-1**. This table should not be considered comprehensive; the intent is to present the current understanding of which agencies approvals would be required to implement this augmentation project. As design advances, the permits and approvals may change; updates to the involved agencies listed below would be modified as required.

Table 3.4-1
Summary of Agencies to Coordinate with on Permits and Approvals for the Catskill Aqueduct Optimization

Queens Groundwater Reactivation—Involved Regulatory Agencies
U.S. Environmental Protection Agency
New York State Department of Environmental Conservation
New York State Department of Health
New York State Department of Transportation
New York State Office of Parks, Recreation, & Historic Preservation
New York City Council
New York City Department of Health and Mental Hygiene
New York City Department of Transportation
New York City Department of City Planning
New York City Landmarks Preservation Commission
New York City Department of Parks and Recreation
New York City Department of Environmental Protection
New York City Design Commission
NYC Community Boards
NYC Borough Presidents

3.4-4 PROJECT PHASING AND IMPLEMENTATION

The Queens Groundwater Reactivation project must be complete in advance of the Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing, which is scheduled to commence in the fall of 2020. To meet this deadline, the project would need to be in operation by the end of 2019.

In order to meet schedule goals, the Queens Groundwater Reactivation project could be completed in a phased manner. Construction at individual stations could be completed at varying times to allow for flexibility in the overall project schedule.

In addition, coordination would be critical with the potential for several contractors to be working at various well sites simultaneously. In order to ensure the public's acceptance of the project DEP would coordinate extensive public outreach during the project's design, environmental review, approval, and construction process. This effort may include public meetings and coordination with community boards.

3.4-5 POTENTIAL IMPACTS

This chapter provides a high-level description of potential impacts associated with the Queens Groundwater Reactivation project based on the current project design; a detailed assessment of potential impacts will be provided as part of a second EIS. The following section is a summary of the potential impacts based on the conceptual design of the overall program.

3.4-5.1 LAND USE, ZONING, AND PUBLIC POLICY

The groundwater supply system would utilize existing DEP-owned wells and water supply equipment located on DEP property. The wells that would be reactivated as part of the project are located throughout southeastern Queens, mainly in residential zoning districts. Although these sites have been used in the past for groundwater supply, there is the potential that installation of new treatment facilities may impact land use or potentially require zoning changes. In association with the project, any land use approvals necessary to operate the wells and establish onsite treatment facilities would be obtained as part of the proposed project. In addition, zoning variances may be needed at some sites to accommodate additional forms of treatment, as installation of treatment facilities at many of the well locations would be limited by site constraints.

3.4-5.2 URBAN DESIGN AND VISUAL RESOURCES

Treatment of groundwater is a key to rehabilitating the Queens groundwater system and providing safe drinking water meeting applicable standards; therefore treatment facilities would be required at many well stations to ensure water quality meets State and Federal drinking water quality standards and is protective of public health. A proposed form of treatment includes the construction of new GAC vessels for the treatment of VOCs. The proposed vessels could extend up to 18 to 26 feet tall. The well sites are located in residential areas, as such the construction or addition of treatment facilities at the well site could result in a change in the appearance of the well sites. The new equipment would be designed in such a way as to minimize their visual impact on the surrounding community.

3.4-5.3 NATURAL RESOURCES

The work areas included in the proposed Queens groundwater project are assumed to be contained within existing DEP property that was used for groundwater treatment and distribution in the past. The project sites are predominately located in residentially developed areas where the resulting ecology is patchy or fragmented wooded areas intermixed with lawns.

The well stations range in size and vary in composition depending on the types of structures present onsite. Some well stations contain areas with trees or grasses, while others consist of well structures such as a storage tanks with the remaining lot area cleared. Based on the location of the wells the rehabilitation process and the design of the treatment facility does have the potential to require cutting, pruning, or clearing of trees, shrubs, or lawn areas present onsite.

Overall, the rehabilitation and operation of the well sites is not expected to create a large disturbance to flora or fauna in the area. Further analysis will be conducted at the proposed well rehabilitation locations to identify the vegetation present and to further analyze any potential impact to wildlife.

Finally, pumping of groundwater could potentially result in drawdown of the water table. This drawdown could impact wetlands that may exist in the vicinity of the wells. Further analysis is required to better understand the current water table conditions and whether the proposed project would have any impact on area water levels and adjacent wetlands.

3.4-5.4 HAZARDOUS MATERIALS

The wastewater discharge from well rehabilitation and the initial startup of wells may create an impact associated with the introduction of potential impurities to receiving water bodies. Furthermore, some of the treatment options may produce waste streams during operation that would require proper disposal/treatment. As with contaminated soils, all potentially hazardous water or materials extracted from the wells would be properly handled and disposed.

All wells would require some treatment to ensure regulatory requirements are met and water supplied is protective of public health (i.e. chlorination for disinfection). In order to provide this treatment it is likely that bulk storage of chemicals would be required at the well stations. The storage of bulk chemicals presents a hazard related to the potential exposure of the neighboring residents or surrounding environment to these chemicals. To minimize the hazard associated with the chemicals and reduce the potential of a chemical leak or spill, proper chemical storage and containment, in accordance with state regulations for bulk chemical storage, would be implemented at the facilities.

3.4-5.5 TRANSPORTATION

In addition to storage of water treatment chemicals, potential impacts are also associated with the transport and delivery of the various chemicals and GAC media needed at the proposed reactivated well stations. Chemical delivery trucks would be making regular deliveries at these well stations, many of which are within residential areas. These deliveries could be a nuisance to those who live within the immediate vicinity of the well station. Measures would be taken to coordinate these deliveries and minimize them to the greatest extent practicable. Routine maintenance will also require staff to regularly visit the well stations. It is not anticipated that the stations would be staffed continuously and therefore are not expected to influence traffic patterns.

3.4-5.6 AIR QUALITY

Air strippers are a form of treatment used in the removal of VOCs that presently exist at 11 wells. Air strippers transfer the volatile impurities (VOCs) from the water into the vapor phase

(air), commonly referred to as “off-gas.” The air would be treated before being emitted into the atmosphere, through a process called scrubbing.

3.4-5.7 NOISE

The pumping and treatment facilities associated with the Queens Groundwater Reactivation project would operate 24 hours/day, 7 days/week during the duration of the Queens Groundwater Reactivation project. These operations would be conducted within enclosed buildings or within designed treatment vessels and should not result in additional levels of noise above present standards, however depending on the treatment method selected this may need to be further evaluated.

3.4-5.8 NEIGHBORHOOD CHARACTER

In construction and design of treatment units and rehabilitating of wells and associated equipment, DEP would look to integrate landscape and design principals in an effort to minimize the potential visual impact or effect of these facilities on neighborhood character. Some of the treatment facilities would be temporary, while others may be implemented to provide a permanent emergency or back-up source water supply. The intended life span of the treatment facility would be further evaluated as design progresses as it would determine the potential impact on the surrounding neighborhood and the need for integrated design.

3.4-5.9 CONSTRUCTION

Implementing the Queens Groundwater Reactivation project would require construction at several well sites. The proposed work areas would be contained within DEP property, although work or equipment staging areas may need to be located offsite during the rehabilitation and testing process. Excavation during construction could expose contaminated soil and groundwater at the well locations. Hazardous materials present onsite or in any soils that are disturbed would be assessed to ensure that release of hazardous materials or wastes to the environment does not pose potential impacts. If uncovered, these materials will be properly handled and disposed in accordance with all applicable regulations. Overall, Construction impacts would largely be temporary and may result in short-term increased traffic and noise levels, changes in traffic patterns, or temporary closures to sidewalks.

3.4-6 CONCLUSION

Reactivation of the Queens groundwater system would provide DEP and the city with a viable potential supply of water during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. In order to advance the project, additional work must be completed to identify which wells would be included in the program and what treatment may be required to ensure water from all wells meets federal drinking water standards. At this stage of design, potential impacts to land use, zoning and public policy, urban design and visual resources, natural resources, hazardous materials, transportation, air quality and noise have been

identified in association with the proposed project. In addition, it is anticipated there would be temporary impacts associated with construction. However, it is also anticipated that through public outreach and careful consideration of design alternatives, many of these impacts could be reduced or eliminated. As design for the proposed project advances, further technical analyses would be conducted and the details of these investigations would be described as part of the second EIS. ✷

3.5-1 INTRODUCTION

This section of Chapter 3 provides a broad scope for the New Jersey Interconnection project, one of several proposed projects to supplement water supply during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. A more detailed discussion of the project and its potential impacts will be presented in a separate EIS that will be completed to analyze impacts associated with components of the Program that do not have sufficient levels of design to support a full evaluation at this time.

This section presents details on the project to establish interconnections between New York and New Jersey water supply systems. The information below presents the current project understanding and basic concepts; however, all details are subject to change as design progresses. In addition, evaluations of the interconnection potential are in early stages of development and relied upon limited public information of New Jersey water supply systems infrastructure and an estimated quantity of water that could be made available by each supplier for use by New York City. The feasibility of this project would depend on the ability to obtain regulatory approval of inter-basin transfers, as well as to negotiate acceptable water supply agreements.

Section 3.5 is organized as follows:

- Section 3.5-2, “Project Description”
- Section 3.5-3, “Actions and Approvals”
- Section 3.5-4, “Project Phasing and Implementation”
- Section 3.5-5, “Potential Impacts”
- Section 3.5-6, “Conclusion”

3.5-2 PROJECT DESCRIPTION

The New Jersey Interconnection project would include the development of up to three new water system interconnections between certain New Jersey water suppliers and the New York City distribution system. The following sections describe the existing water supply of the region, how

water is distributed, and details related to the proposed interconnections between New Jersey and Staten Island.

3.5-2.1 NEW JERSEY WATER SUPPLY

New Jersey's water supply is owned or operated by a host of different entities: the State, municipalities, public commissions, or investor-owned utility companies. In all cases, the various systems are subject to rules and regulations enforced by the New Jersey Department of Environmental Protection (NJDEP) and the United States Environmental Protection Agency (USEPA). The NJDEP enforces the Safe Drinking Water Act regulations and the withdrawal of water from both surface and groundwater resources. Similar to New York City, most of the major, regional water systems in northern and central New Jersey utilize surface water supply to meet the majority of their water system demand. In addition, many of the New Jersey systems are already interconnected or future interconnection points have been identified. The potential candidates for interconnection with New York's distribution system include suppliers from within the Passaic River Basin (PRB) and Raritan River Basin (RRB), as shown in **Figure 3.5-1**.

The PRB includes a glacially-derived aquifer tapped by over 100 production wells and five surface water reservoirs. The Basin receives about 40 percent of its water through the New Jersey's Highlands that drain to the Central Passaic Basin through the Ramapo, Pompton, Pequannock, Rockaway, and Whippany Rivers[1].

The North Jersey District Water Supply Commission (NJDWSC) operates the largest water supply system in New Jersey drawing water from the PRB. NJDWSC is an independent authority of the State and serves as a trustee representing the joint interests in the "North Jersey District" defined as the 12 northernmost counties of New Jersey. The NJDWSC is responsible for more than 95-square-miles of watershed area in the PRB, two major reservoirs, two river-diversion pumping stations, and a 210-million gallon per day (mgd) water filtration plant. At peak capacity, the NJDWSC's facilities can supply over 200-mgd of water to its contracting municipalities, thereby serving the water needs of more than 3 million people in Northern New Jersey.[2]

New Jersey American Water (NJAW) and the Middlesex Water Company (MWC) are both investor-owned water companies in the RRB. NJAW provides water services to portions of Union, Somerset, Hunterdon, Middlesex, and Mercer counties; whereas, MWC provides water to residents throughout Middlesex County. Both NJAW and MWC receive surface water from the New Jersey Water Supply Authority (NJWSA) which can draw water from the Upper Raritan

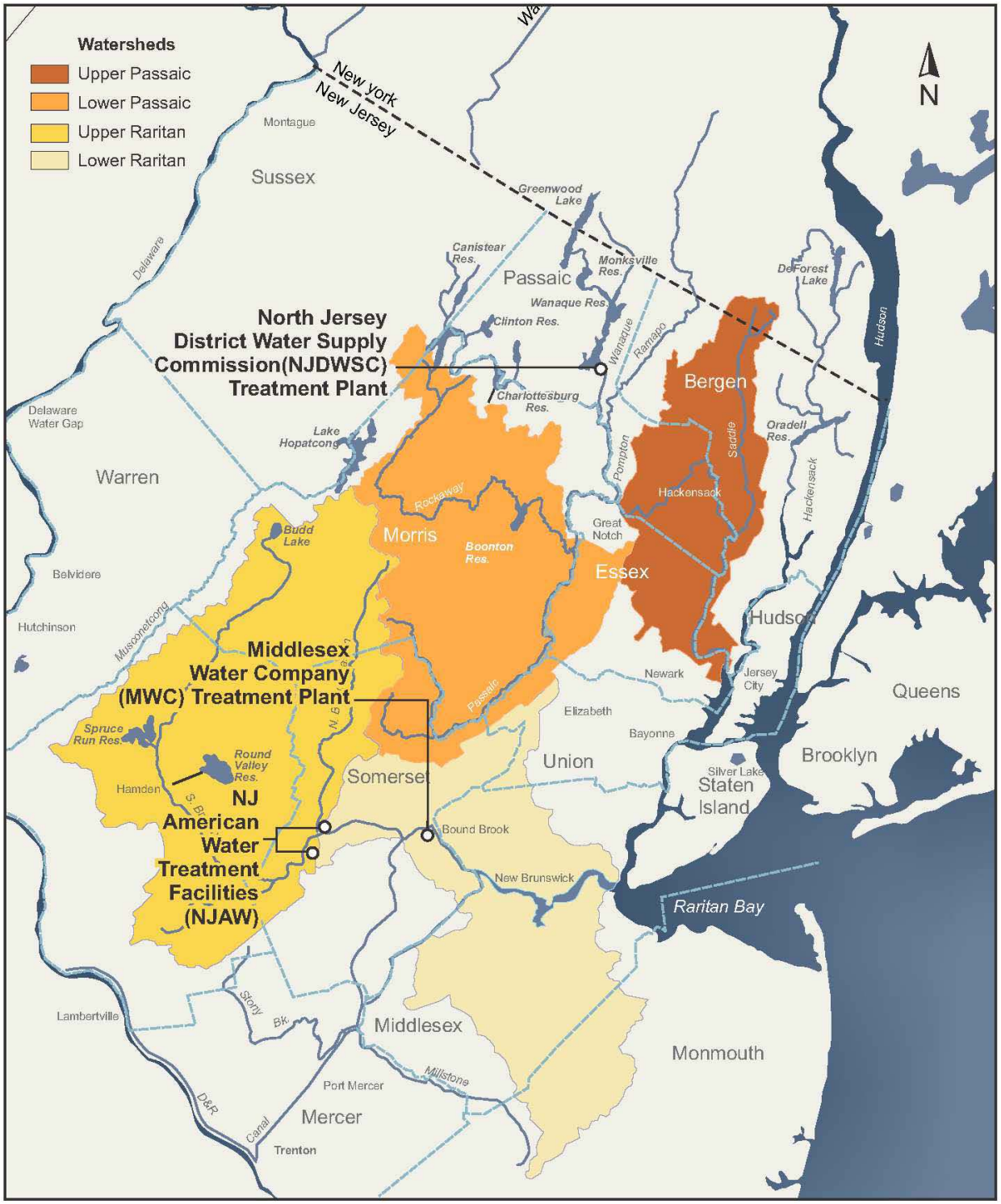
---

[1] New Jersey's Central Passaic Basin, Prehistoric Glacial Lake, Present-Day Wetland Treasure, 2007, US Fish & Wildlife Service, http://www.fws.gov/northeast/njfieldoffice/pdf/Fact%20Sheets%20PDF%20holding/Cent_Passaic_basin_.pdf/ (Accessed September 12, 2011).

[2] North Jersey District Water Supply Commission, "About NJDWSC," 2011, http://www.njdwsc.com/ (Accessed September 12, 2011).

River Basin via the Spruce Run and Round Valley Reservoirs and can also supplement supply by diverting water from the Delaware River into the Raritan River Basin via the Delaware and

Figure 3.5-1:
Water Treatment Facilities Within the Passaic and Raritan Watersheds



back

Raritan (D&R) Canal system, which originates at Bulls Island in Hunterdon County, New Jersey and discharges to the Raritan River. The Upper and Lower Raritan River Basins are located in north central New Jersey, and cover approximately 1,100 square miles that ultimately drain to the Raritan Bay through the Raritan River. The major waterways in the Basin include the North Branch and South Branch of the Raritan River (known collectively as the Upper Raritan River Basin), and the Lower Raritan River, South River, Green Brook, Lawrence Brook and the Millstone River (known collectively as the Lower Raritan River Basin), along with their many feeder streams (Figure 3.5-1).

Both the Passaic Basin and Raritan Basin are susceptible to flooding, drought, and pollution from surrounding land use. In addition to the Passaic and Raritan Basins providing a key water source for New Jersey, the Basins are also home to important wetland ecosystems and provide natural habitat for a large variety of flora and fauna. As a result, the quantity of water that can be diverted from both basins is limited by safe yield requirements, water allocation permits, and in some cases, contracts with member municipalities. Therefore, interconnections with these systems will be carefully developed and planned. It should be noted, however, that additional water may be available to be transferred to the RRB through the D&R Canal during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing, reducing the risk of drought conditions.

3.5-2.2 PROPOSED INTERCONNECTIONS

At the present time, there are several interconnection options under evaluation as part of the New Jersey Interconnection project. One option would be to interconnect New Jersey and Staten Island. Staten Island is currently connected to New York City's distribution system via three interconnection points from Brooklyn with a new interconnection under development to replace two of the three older connections. Because Staten Island is at the far end of the city's distribution system, the chlorine residual here can be low. Chlorine is sometimes boosted locally to provide additional disinfection to control bacteria growth in Staten Island's distribution system and meet regulatory requirements to maintain minimum disinfectant residuals. The chlorine is added to the distribution system at a chlorination facility located on the eastern shore of Staten Island. A new chlorination facility is being constructed in association with the new interconnection to Brooklyn to replace two of the three older connections.

Based on this arrangement, there are two primary scenarios for supplying water to Staten Island under the proposed New Jersey Interconnection project. The preferred scenario involves supplying water from New Jersey to Staten Island through transmission lines that would need to be constructed under the Arthur Kill, connecting infrastructure owned by New Jersey water suppliers with DEP infrastructure within Staten Island. The existing connections between Staten Island and Brooklyn would need to be maintained to allow for flow in both directions. To allow for potential conveyance from Staten Island to the city's distribution system, equipment and operating practices may need to be upgraded, including the installation of chemical facilities to

be used for treatment, ensuring water quality goals are achieve after mixing water between New Jersey and the city's distribution system

The second scenario would be to interconnect the New Jersey water supplies to Staten Island and isolating Staten Island from the rest of the city's distribution system to prevent back-feeding (water could only flow into Staten Island from New Jersey). Staten Island would be solely dependent on the New Jersey supply without connection to the city's distribution system during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. In this scenario, excess New Jersey water from Staten Island would not be distributed to Brooklyn. As under the first scenario, it is anticipated that equipment and operating practices may need to be altered or upgraded in order to provide adequate water supply and proper functioning of the proposed interconnection. New treatment facilities for the addition of corrosion control chemicals may also be needed.

Other interconnection opportunities, including those with the NJDWSC are currently under review and may provide additional augmentation supply during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing.

3.5-2.3 KEY COMPONENTS

Overall, the establishment of the interconnection between New Jersey and New York would require the installation of transmission mains to transport water from New Jersey, booster pumping stations, and water treatment facilities to manage water quality. For water transfer scenarios involving Staten Island, it is anticipated that interconnections from New Jersey would cross the Arthur Kill through transmission mains installed using trenchless crossing methodologies to connect with the NYC distribution system on Staten Island.

3.5-2.4 TRANSMISSION MAIN INSTALLATION

DEP is currently in discussions with the New Jersey suppliers to determine how water would be supplied from New Jersey to the NYC distribution system. Under current designs it is likely that a transmission main would be constructed to cross the Arthur Kill. Depending on the quantity of flow available from New Jersey suppliers, backfeeding capabilities to Brooklyn from Staten Island will be evaluated.

3.5-2.5 BOOSTER PUMPING STATION

In order to facilitate the connections and ensure adequate delivery of water to New York City, it may be necessary to construct new booster pump stations, one for each connection. The stations would help to increase the flow capacity of the water traveling from New Jersey to New York. The locations of any necessary booster pump stations have not yet been determined but it is likely that buildings would be constructed to house the pump systems.

3.5-2.6 TREATMENT

In addition to transport of water, consideration would also need to be given to treatment that may be necessary prior to the water entering the New York City distribution system. Since different treatment methods are in use by the proposed New Jersey water suppliers, additional disinfection facilities may need to be constructed to achieve consistency in water treatment. Any treatment regime selected as part of the proposed project would be in full compliance with federal and New York State drinking water requirements. Also, as a result of the different treatment methods utilized within the NYC and New Jersey water supply systems, mixing the supplies would be carefully coordinated to protect public health.

3.5-2.7 ANTICIPATED WATER SUPPLY BENEFIT

It is anticipated the New Jersey Interconnection project would supply water continuously during the off-peak seasonal water demand period from September to May, with some potential availability in the peak season.

The interconnection project would also provide long-term benefit to New Jersey water purveyors by providing additional transmission capacity to New Jersey; interconnections could make NYC water supply available to New Jersey as an emergency source. In addition, it is anticipated New Jersey suppliers would benefit from revenue generated through water sales to NYC and provide possible options for the New Jersey systems to purchase water from NYC to alleviate drought or reduce energy consumption.

3.5-3 ACTIONS AND APPROVALS

As detailed in **Table 3.5-1**, the New Jersey Interconnection project would require permits and approvals from a number of agencies. The list of agencies that would be consulted and may potentially supply permits or approvals is included in Table 3.5-1. This table should not be considered comprehensive; the intent is to present the current understanding of which agencies' approvals would be required to implement this augmentation project. As design advances, the permits and approvals may change; updates to the involved agencies listed below would be modified as required.

3.5-4 PROJECT PHASING AND IMPLEMENTATION

This project must be completed in advance of Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. This shutdown is currently scheduled for fall 2020. To meet this deadline, it would be necessary to design, construct and place the New Jersey interconnections into operation by the end of 2019.

In order to meet the schedule goals, advancing the New Jersey Interconnection project would require coordination with appropriate New Jersey water purveyors and regulatory officials, to determine supply capacity and negotiate interconnection agreements.

Table 3.5-1
Anticipated Agencies to Coordinate with for Permits and Approvals for Proposed New Jersey Interconnection

New Jersey Interconnection Regulatory Agencies
Federal Emergency Management Agency
U.S. Army Corp of Engineers
U.S. Fish and Wildlife Services
Delaware River Basin Commission
Office of the Governor- New Jersey
New Jersey Department of Environmental Protection
New Jersey Department of Transportation
NJ State Historic Preservation Office
New York State Department of Environmental Conservation
New York State Department of State
New York State Department of Transportation
New York State Office of General Services
New York State Office of Parks, Recreation, & Historic Preservation
New York City Council
New York City Department of Health and Mental Hygiene
New York City Department of Transportation
New York City Department of City Planning
New York City Department of Parks and Recreation
New York City Department of Small Business Services
NYC Community Boards
NYC Borough Presidents

3.5-5 POTENTIAL IMPACTS

This chapter provides a high-level description of potential impacts associated with the New Jersey Interconnection project based on the current project design; a detailed assessment of potential impacts would be provided as part of the second EIS. The following section is a summary of the potential impacts based on the conceptual design of the overall program.

3.5-5.1 LAND USE, ZONING, AND PUBLIC POLICY

The New Jersey Interconnection project may require the construction of a transmission main and potential establishment of treatment or pump station facilities. Property in both New Jersey and Staten Island may be required for the installation of new facilities or for temporary use during construction. Any land use approvals or zoning variances necessary to operate and establish onsite treatment facilities would be obtained as part of the proposed project.

3.5-5.2 NATURAL RESOURCES

An interconnection main between New Jersey and Staten Island would require the construction and installation of transmission mains to transport water across the Arthur Kill, between New Jersey and Staten Island. This construction could present both permanent and temporary impacts on tidal wetland areas and coastal habitats. Depending on the exact location of the transmission main, the construction could potentially lead to the alienation of or impacts to existing park land,

specifically in New Jersey. Constructing the transmission main across the Arthur Kill and its potential effect on tidal wetland areas would be further evaluated as part of the proposed project. Potential temporary or permanent impacts to natural resources would also be further evaluated prior to implementing the project. The results of these analyses would be presented in the second EIS.

3.5-5.3 HAZARDOUS MATERIALS

A potential treatment option to facilitate interconnection includes the construction of a treatment facility on Staten Island. This treatment facility would require the bulk storage and use of potentially hazardous chemicals. The treatment chemicals would be those typically used by water systems prior to delivery of water to the distribution system. For example, the treatment facility may include storage and use of chlorine and fluoride at part of the proposed project. The bulk storage, use, and delivery of chemicals present a potential for exposure or release of chemicals that could impact public health or the environment. To minimize potential impacts associated with the storage and use of potentially hazardous chemicals, facilities would be designed in accordance with New York State Department of Health and New York State Department of Environmental Conservation regulatory requirements for allowable chemical storage capacity, chemical transfer, and secondary containment to protect against potential spills. Additional analyses related to the storage, generation and transport of potentially hazardous disinfection chemicals would be conducted and presented in the second EIS.

3.5-5.4 PUBLIC HEALTH: WATER QUALITY AND TREATMENT

Based on the varying methods of water treatment used by the New Jersey systems and the city's system, it is anticipated water treatment facilities would be required under the proposed project to maintain water quality. Exact water treatment methods are unknown at this time. However, to ensure that all applicable water quality standards are met, a consistent method of treatment would be determined and implemented in association with the proposed project. Potential impacts associated with the planned treatment plant upgrades would be presented in the second EIS.

3.5-5.5 CONSTRUCTION

It is anticipated that construction of transmission mains, pump stations and treatment facilities would be required as part of the proposed project. In general, construction impacts would be temporary in nature. The installation of the transmission mains (land-side) would utilize traditional open-cut construction methods (an open trench is constructed, the transmission main would be laid and then the trench is backfilled) within existing asphalt roadways. Trenchless technology (the transmission main would be pulled through the ground with a tunneling device to eliminate surface disturbance) would be used when crossing waterways such as the Arthur Kill. Therefore, construction may result in potential impacts to current traffic patterns as a result of lane closures or other construction related effects. In addition, the construction would require

the disposal of excavated material, which could consist of potentially contaminated fill. Environmental soil analysis would need to be conducted along the proposed transmission main routes to identify potential soil contaminants that may need to be remediated or require adherence to proper management and disposal requirements. Construction of mains, pumping stations, and treatment facilities in the vicinity of neighborhoods or other areas may also generate air quality and noise impacts. Analyses of all construction-related impacts would be evaluated as part of the second EIS.

3.5-6 CONCLUSION

The New Jersey Interconnection project would provide DEP and the city with a viable potential supply of water during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. Additional work must be completed to identify the amount of supply available from New Jersey water supply purveyors, select the best means to connect the New Jersey system with the city's system, and identify the treatment facilities required to ensure uniform water quality that meets regulatory standards for all systems. At this stage of project planning, potential impacts to natural resources, hazardous materials, and public health have been identified in association with the proposed project. In addition, it is anticipated there would be temporary impacts associated with construction. However, it is also anticipated that through additional analyses and careful consideration of design alternatives, many of these impacts could be reduced or eliminated. As design for the proposed project advances, further technical analyses would be conducted and the details of these investigations would be described as part of the second EIS. ✷

3.6-1 INTRODUCTION

This section of Chapter 3 generically discusses the Nassau County Interconnection project, one of several proposed projects to supplement water supply during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing. A more detailed discussion of the project and its potential impacts will be presented in a separate EIS that will be completed to analyze impacts associated with components of the Program that do not have sufficient levels of design to support a full evaluation at this time.

This chapter presents a description of the Nassau County Interconnection project that includes the restoration and/or construction of new interconnections between western Nassau County, New York, water districts and neighboring Queens County. The information below presents the current project understanding and basic concepts, however all details are subject to change as design progresses. In addition, evaluations of the interconnection potential are in the early stages of project development and the text that follows relies upon existing limited public information of Nassau County water supply infrastructure. This augmentation project is in the preliminary stages of development; discussions between DEP and the western Nassau County water purveyors were recently initiated. As a result of these initial discussions and the review of available information, it is anticipated that several components would be required to advance this augmentation project including negotiating acceptable water supply agreements between the Nassau County water suppliers and New York City and the ability to obtain regulatory approvals. Section 3.6 is organized as follows;

- Section 3.6-2, “Project Description”
- Section 3.6-3, “Actions and Approvals”
- Section 3.6-4, “Project Phasing and Implementation”
- Section 3.6-5, “Potential Impacts”
- Section 3.6-6, “Conclusions”

3.6-2 PROJECT DESCRIPTION

The Nassau County Interconnection project would establish new water system connections and/or use existing connections between DEP's distribution pipelines in Queens and Nassau County water suppliers. The system would connect Queens and Nassau suppliers to allow for a transfer of water from Nassau County wells to the distribution system in Queens. Groundwater in the region (Nassau County and Queens County) is withdrawn from three underlying aquifers. These aquifers, from shallowest to deepest, are the Upper Glacial, the Jameco/Magothy, and the Lloyd, with each separated by a 'confining layer' such as clay. The aquifer from which water is supplied depends on the depth of the wells. All water withdrawals from Long Island's groundwater supply are subject to regulations enforced by the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) as well as the county health departments.

3.6-2.1 NASSAU COUNTY WATER SUPPLY

Nassau County water suppliers whose water service areas border Queens County were identified as potential candidates for interconnection. Based on some initial discussions, two suppliers were identified as potential interconnection sources: Water Authority of Western Nassau County (WAWN) and Long Island American Water (LIAW) (see **Figure 3.6-1**).The WAWN provides water to approximately 28,000 customers in 11 communities on Long Island. The LIAW is an investor owned water utility that provides water to approximately 74,000 customers on Long Island.

3.6-2.2 PROPOSED INTERCONNECTIONS

Water system connections currently exist between DEP's distribution system and WAWN, as well as with LIAW. The functionality of these existing connections is not known. These existing connections could require repair or replacement depending on their current condition in order to be used for augmentation. In addition, as the design of this augmentation project advances, it is possible that other connection locations may also be explored beyond those already established for WAWN and LIAW or to other systems.

The WAWN system and the existing New York City groundwater system were previously consolidated as the former Jamaica Water Supply Company. Water pumped from wells in Nassau County (the WAWN system) fed the Queens distribution system. These interconnections were kept in-place so that water could be supplied between the two Counties during the event of an emergency. It is currently understood that there are existing WAWN interconnections with the DEP system at multiple locations. In addition to its connections with the NYC distribution system in Queens, the WAWN system is also interconnected with other bordering Nassau County water purveyors at multiple locations. These Nassau County interconnections allow for the movement of water between the districts either on an emergency basis or per a prescribed

agreement between the water districts, and would need to be considered when determining the amount of water that may be available to the City under the proposed project. In addition to the WAWN connection, there is currently one interconnection between the Queens distribution system and LIAW.

Figure 3.6-1
Location of Nassau County Water Districts Bordering Queens County

back

The NYSDEC allocates water to all New York state water suppliers through the Water Supply Permit process as administered under 6NYCRR Part 601 and for well systems, enforces pumping limits or caps on each permit issued. These permits and limits are put in-place to prevent over-pumping of the aquifer and negative interference effects on nearby wells. Under the Nassau County Interconnection project, agreements with each of the suppliers would be required and the actual quantity of water that could be made available to NYC would have to be determined following a review of the Nassau County water systems' current water production permit conditions and constraints of the existing well infrastructure.

It is anticipated that during Project 2B, the quantity of water available from the Nassau County systems may be limited by seasonal needs, periodic shutdown of the water supply wells practiced

as part of each system's normal operating procedures, and/or well maintenance. Furthermore, water quality, aquifer and piping capacities, and operating pressures would need to be further investigated to confirm the quantity and quality of water supplied to NYC would be compatible with existing water quality and pressure conditions. Upgrades to, or installation of, treatment facilities may be necessary to ensure uniformity of water quality and to minimize impacts associated with mixing water between the City and Nassau County suppliers, which could have slightly different water treatment practices.

3.6-2.3 KEY COMPONENTS

As stated above, the proposed Nassau County Interconnection would include the restoration or construction of new interconnections between western Nassau County water districts and neighboring Queens County. Two key components would be required to advance this augmentation project: (1) negotiation of acceptable water supply agreements; and (2) securing regulatory approval from the NYSDEC and NCDOH.

Assuming these agreements and approvals could be obtained, the Nassau County Interconnection project would require evaluation and possible repair or replacement of existing interconnections and selection and construction of new interconnections. The installation of treatment facilities to manage water quality or the addition of pumping capacity may also be required depending on the existing treatment methods and pressures used and available at the various Nassau County suppliers.

ESTABLISH AND REPAIR INTERCONNECTIONS

One component of the project would be to evaluate existing interconnections between the NYC distribution system in Queens and the WAWN and LIAW distribution systems. In order to utilize water from WAWN's groundwater supply system, the condition of the existing interconnections would need to be assessed. Additional investigation would also be necessary to confirm specific interconnection locations. Studies would be conducted to understand the daily operating pattern of the WAWN and LIAW supply wells and the time of year when there is water available for supply. This information would be used to confirm the quantity of water that can be obtained from the system. In the event that water pressures or travel distances associated with the interconnections require additional pumping capacity, the addition of a pump station would be investigated as part of the proposed project. Finally, to determine the condition of existing or proposed interconnections and to evaluate water quality concerns, short-term pilot tests may be conducted. Testing of the existing interconnections may result in the need to discharge water (wastewater) to the sanitary system, a storm sewer, or temporary holding tank. Water quality testing of the wastewater would be conducted prior to discharge and, based on water quality results, appropriate methods of disposal or temporary treatment could be required.

WATER QUALITY

Potential impacts to water quality may occur with interconnecting the Nassau and Queens distribution systems—primarily related to salt water intrusion and the mixing of different water sources. The quality of water that can ultimately be pumped from a well is limited by factors including interference impacts from nearby wells drilled in the same aquifer and deterioration of the efficiency and capacity as the well ages. Other factors affect the restoration of the overall system capacity including the potential for saltwater intrusion, contamination, and individual site or permit limitations. Saltwater intrusion is of particular concern for shallow wells located in the Upper Glacial Aquifer. Over-pumping of a well (or wells) can result in salt water movement into the freshwater portions of the aquifer, disrupting water quality.

Volatile organic compounds (VOCs) are also a potential concern. Found in some groundwater supplies, VOCs are toxic compounds commonly found in cleaning products, such as chemicals used in dry cleaning, degreasers, gasoline or oil that can seep into groundwater supplies in areas prone to spills or leaks of these substances. It is estimated that across Nassau County approximately 23% of the public supply wells are treated to remove VOCs.[1]

Finally, different treatment methods are used by various water supply purveyors in Nassau County. In implementing this project, parameters such as pH and disinfection would be evaluated and measures identified to maintain compatible water quality between the Nassau and City's systems. Fluoride addition or additional treatment for iron removal may also be required to ensure compliance with NYC water quality standards. It is important to note that both the NYC and the Nassau systems provide water to customers that meet all required treatment and potable water quality standards; however, mixing the supplies would be carefully coordinated to ensure treatment differences would not lead to potential water quality differences or impacts such as discoloration or a change in taste.

ANTICIPATED WATER SUPPLY BENEFIT

The benefit to NYC from implementation of the Nassau County Interconnection project would be an augmented potable water supply to a portion of NYC during the Rondout-West Branch outage. The Nassau County Interconnection project could provide a mutual benefit to Nassau County water purveyors by potentially repairing existing interconnections that could possibly allow Nassau County water purveyors access to NYC water in the future under emergency conditions.

---

[1] Groundwater quality data in Nassau County is monitored by the Nassau County Department of Public Works (NCDPW) through the use of specific monitoring wells and the use of data collected from the various water purveyors. NCDPW periodically issues reports summarizing the groundwater quality data collected.

3.6-3 ACTIONS AND APPROVALS

As shown in **Table 3.6-1**, the Nassau County Interconnection project would require a number of permits and approvals from several agencies. The table includes a list of agencies that DEP would consult with on permits and approvals. The list included in this table should not be considered comprehensive; the intent is to present the current understanding of which agencies approvals would be required to implement this augmentation project. As design advances, the list of agencies that would provide permits and approvals would be modified as required.

Table 3.6-1
Anticipated Permits and Approvals for Proposed Nassau County Interconnection

Nassau County Interconnection—Involved Regulatory Agencies
Federal Emergency Management Agency
New York State Department of Environmental Conservation
New York State Department of Health
New York State Department of State
New York State Department of Transportation
New York State Office of Parks, Recreation & Historic Preservation
Nassau County
New York City Council
New York City Department of Health and Mental Hygiene
New York City Department of Transportation
New York City Department of City Planning
New York City Department of Parks and Recreation
New York City Department of Small Business Services
NYC Community Boards
NYC Borough Presidents

3.6-4 PROJECT PHASING AND IMPLEMENTATION

This augmentation project must be complete in advance of the Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing, which is scheduled to commence in the fall of 2020. To meet this deadline, the Nassau County Interconnection project would need to be in operation by the end of 2019.

In order to meet the 2019 schedule goal, the project would involve outreach between DEP and Nassau County purveyors to gather data on the current condition of existing infrastructure, develop a water-sharing agreement and, finally, establish interconnections. To establish interconnections, facility planning, engineering procurement and project design would be conducted in parallel with the outreach effort. Permitting activities and the preparation of a second EIS would also be performed in conjunction with the preparation of facility planning and design documents. Early planning activities would focus on data collection including an evaluation of the existing connections between NYC and WAWN and NYC and LIAW.

Following the facility planning, final designs would be completed to be followed by acquisition of permits and regulatory approvals, construction procurement as required (booster pump stations, interconnection piping, additional or replacement infrastructure, etc.) and commencement of construction.

3.6-5 POTENTIAL IMPACTS

This chapter provides a high-level description of potential impacts associated with the Nassau County Interconnection project; a detailed assessment of potential impacts would be provided as part of the second EIS. The following section is a summary of the potential impacts based on the conceptual understanding of the overall project.

3.6-5.1 LAND USE, ZONING, AND PUBLIC POLICY

The Nassau County Interconnection project would maximize the use of existing interconnection and water supply equipment. It is possible that additional infrastructure would be required and would likely be located on DEP property. These areas are mainly in residential zoning districts. In addition, there is the potential that installation of new treatment facilities would be needed and so may impact land use or potentially require zoning changes. In association with the project, any land use approvals necessary to operate the interconnections and establish onsite treatment facilities would be obtained as part of the proposed project. In addition, zoning variances that may be needed at some sites to accommodate treatment, as installation of treatment facilities at many locations could be limited by site constraints.

3.6-5.2 HAZARDOUS MATERIALS

In order to implement the proposed project, the use of water treatment chemicals may be necessary. The bulk storage, use, and delivery of chemicals present a potential for exposure or release of chemicals that could impact public health or the environment. To minimize potential impacts associated with the storage and use of potentially hazardous chemicals, facilities would be designed in accordance with New York State Department of Health and New York State Department of Environmental Conservation regulatory requirements for allowable chemical storage capacity, chemical transfer, and secondary containment to protect against potential spills. Additional analyses related to the storage, handling and transport of potentially hazardous water treatment chemicals will be conducted and presented in a second EIS.

3.6-5.3 PUBLIC HEALTH

The Nassau County Interconnection project would rely on existing groundwater supplies. Using groundwater may present limitations on the quantity and quality of the water available. Augmentation supply may potentially only be available on a seasonal basis from September to May, and the availability of water from the Nassau County purveyors could be affected by a

variety of water supply shortages that may occur. Furthermore, water quality impacts are a potential concern including impacts as a result from the mixing of supplies.

Additional studies would be needed as well as discussions with the NYSDEC to determine the quantity of water that could reasonably be provided to the NYC distribution system by the Nassau County water purveyors without creating adverse impact to the local aquifers. If necessary, treatment systems or booster pumping stations may need to be constructed to allow the transfer of water from Nassau County suppliers into the NYC distribution system and provide a consistent method of treatment. These potential impacts and any proposed mitigation measures associated with the additional draw of groundwater from Nassau County and potential treatment requirements would be presented in a second EIS.

3.6-5.4 CONSTRUCTION

The Nassau County Interconnection project would maximize the use of existing interconnections to the WAWN and LIAW distribution systems to the greatest extent practicable and include construction of new water system connections if needed. The project may require the construction and installation of transmission mains to convey the water from these Nassau County systems to the NYC Queens distribution network, as well as treatment systems and pumping stations (as required). The proposed work areas would likely occur near the border between the Nassau County water systems and the distribution system in Queens County. If possible, transmission mains would be constructed within or parallel to existing roadways to minimize impacts to the surrounding areas. The construction impacts would largely be temporary and may include disruption of traffic patterns, and noise impacts.

TRAFFIC

Construction impacts related to transportation would largely be temporary and result from the installation of the transmission main(s) and underground interconnection vaults. The construction of transmission mains in existing roadways, for example, may result in increased traffic or changes in traffic patterns which would be analyzed and presented in a second EIS.

NOISE

The construction activity would likely occur during normal work hours. In general, locations where construction work is adjacent to neighboring properties, mitigation measures would be implemented to minimize potential noise impacts should they be identified as part of the proposed project. Noise levels during construction would be evaluated as part of a second EIS.

3.6-6 CONCLUSIONS

The Nassau County Interconnection project would provide DEP and the City with a viable potential supply of water during Project 2B, Bypass Tunnel Connection and RWBT Inspection

and Repair, including Wawarsing. In order to advance the project, additional work must be completed to identify the amount of supply available from Nassau County water supply purveyors, establish and/or repair connections and determine what treatment facilities would be required to ensure uniform water quality that meets regulatory standards for all systems. At this stage of design, potential impacts related to land use, public health, and construction have been identified in association with the proposed project. In addition, it is anticipated there would be temporary impacts associated with construction. However, it is also anticipated that through additional analyses and careful consideration of design alternatives, many of these impacts could be reduced or eliminated. As design for the proposed project advances, further technical analyses would be conducted and the details of these investigations would be described as part of a second EIS. ✷