The New York City Department of Environmental Protection (DEP) is issuing this Draft Environmental Impact Statement (DEIS), pursuant to the State Environmental Quality Review Act (SEQRA) and the City Environmental Quality Review (CEQR). SEQRA and CEQR require DEP to examine the potential for environmental impacts that could occur as a result of the proposed Water for the Future: Upstate Water Supply Resiliency, analyzed herein.

1.1 OVERVIEW OF WATER FOR THE FUTURE

DEP is responsible for supplying clean drinking water to more than 8 million New York City (City) residents and 1 million upstate customers in sufficient quantity to meet present water demands, and to maintain the water supply system to meet future water demand. This is achieved through careful and coordinated management of the City's three surface water supply systems: the Catskill, Delaware, and Croton systems (see **Figure 1.1-1**). Recognizing the need to protect the long-term viability and overall resilience of the water supply system, the City continues to make systematic and sustained investments in the critical infrastructure that provides water to approximately 9 million people each day.

DEP developed Water for the Future (WFF) to address significant leakage in one of its most critical pieces of water supply infrastructure: the Delaware Aqueduct. The Delaware Aqueduct has been in operation since the 1940s and transports water a distance of approximately 85 miles from the Delaware water supply system (Delaware System). The Delaware System is the source of approximately 50 percent of the City's water supply and provides water supply for two upstate municipalities. The Delaware System consists of four primary supply reservoirs (Pepacton, Cannonsville, Neversink, and Rondout), two shared reservoirs with the Croton water supply system (Boyd's Corners and West Branch), and two shared reservoirs with the Catskill water supply system (Kensico and Hillview). The Delaware System is wholly located within New York State (State).

The Delaware Aqueduct is composed of several segments, the longest of which is the Rondout-West Branch Tunnel (RWBT) that connects the Delaware System's Rondout Reservoir, located in Ulster and Sullivan counties, New York, to West Branch Reservoir in Putnam County, New York (see **Figure 1.1-2**). Repairing the RWBT is necessary for the City to continue to meet its water supply obligations, because it is the City's only direct conduit from the source waters of the Delaware System west of the Hudson River.[1]

[1] In addition to the RWBT, critical segments of the Delaware Aqueduct include those between West Branch and Kensico reservoirs, and between Kensico Reservoir and the City's distribution system.

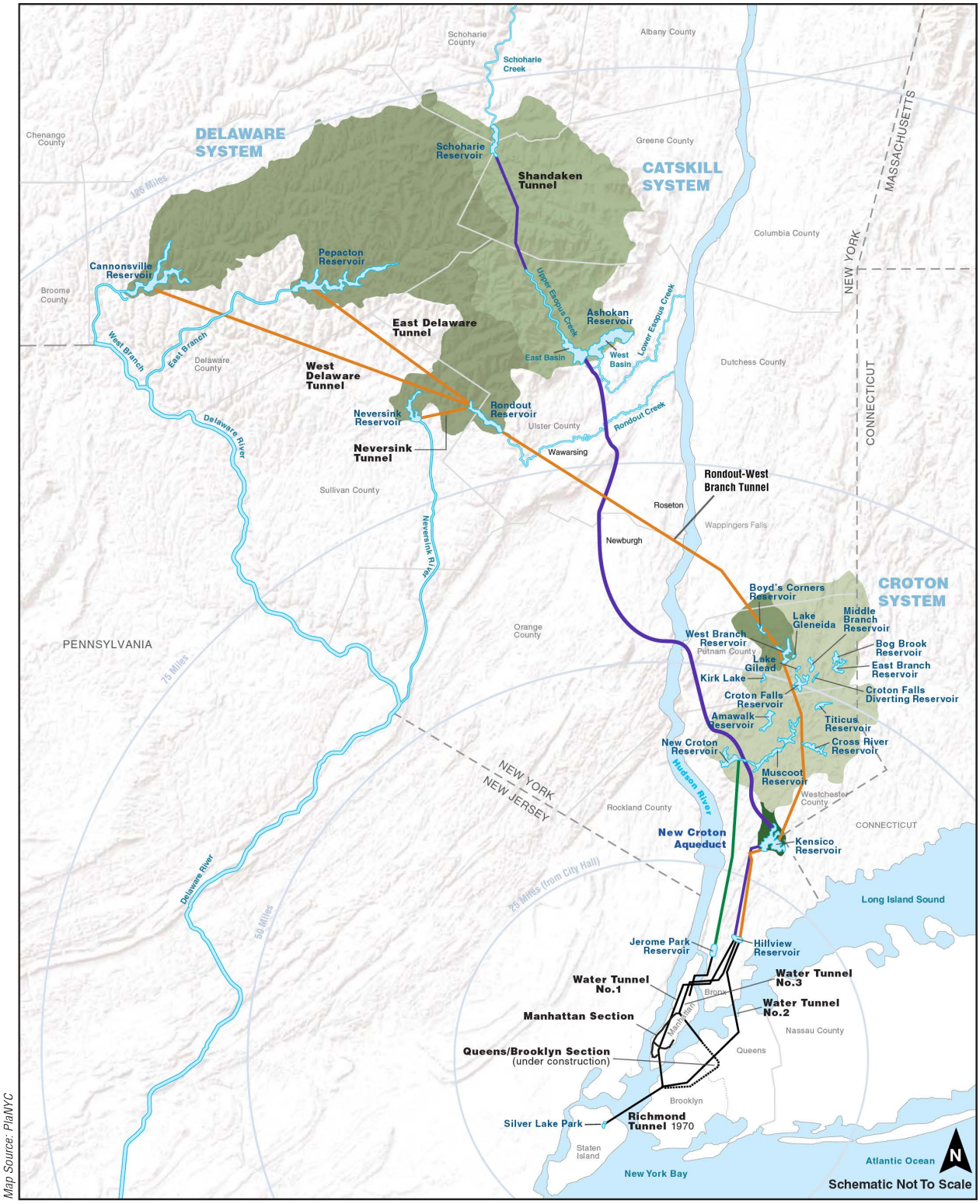


Figure 1.1-1: New York City Surface Water Supply System Map

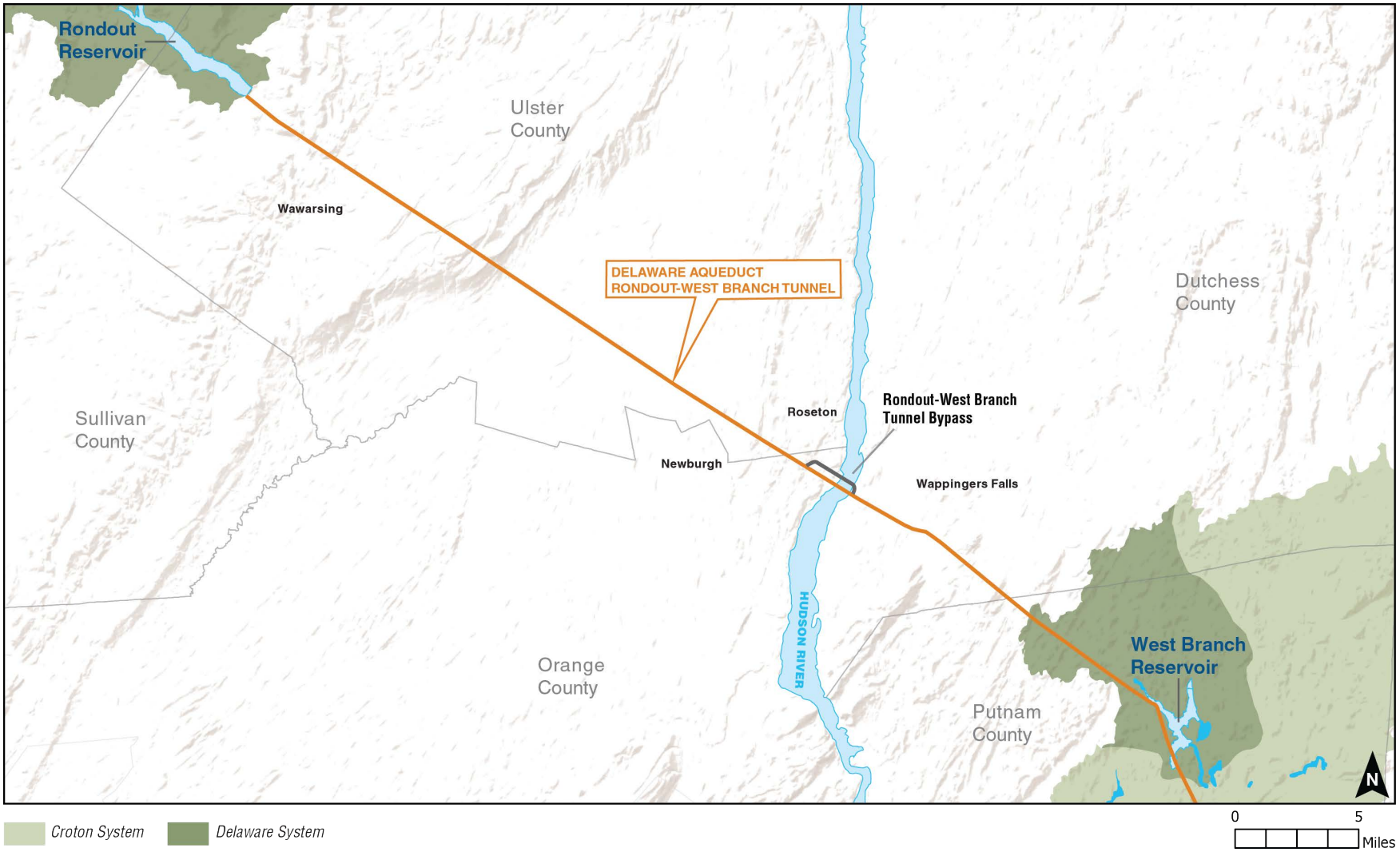


Figure 1.1-2: Delaware Aqueduct Rondout-West Branch Tunnel Location and Bypass

The RWBT segment of the Delaware Aqueduct is leaking up to approximately 35 million gallons per day (mgd), primarily in the area known as the Roseton crossing under the Town of Newburgh, Orange County, New York. A second leaking section is located near the Town of Wawarsing, Ulster County.

To address the RWBT leaks, DEP undertook an iterative planning process involving complex modeling and considerations for water supply availability and potential environmental impacts to determine the optimal method of repair, as described in Chapter 4, "Water for the Future Background and Planning." As a result of this planning process, DEP elected to construct a bypass tunnel and two associated shafts to permanently circumvent the leaking section at the Roseton crossing, and to conduct internal repairs to the leaking section near Wawarsing. This project, referred to as "RWBT Bypass," was previously evaluated in a Final Environmental Impact Statement issued on May 18, 2012 (previous EIS), and work has commenced.[2]

Once the RWBT Bypass is completed in 2022, the RWBT would be temporarily shut down and unwatered. This temporary shutdown would allow two activities to be performed:

(1) Connection of the bypass tunnel to the existing RWBT; and

(2) Internal repairs to the leaking section of the existing RWBT near Wawarsing.

DEP estimates that the maximum temporary shutdown duration would be approximately 8 months. During this temporary shutdown of the RWBT, water from the Delaware System west of the Hudson River would be unavailable to the City and its upstate customers.

DEP is proposing Upstate Water Supply Resiliency as part of WFF to ensure the continued supply of clean drinking water during the RWBT temporary shutdown. Upstate Water Supply Resiliency is comprised of three main components.

(1) Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation), including a chlorination facility at the Ashokan Screen Chamber and a dechlorination facility at the Pleasantville Alum Plant;

(2) WFF Shutdown System Operations (WSSO), including siphons at Rondout Reservoir; and

(3) RWBT Inspection and Repair (inspection and repair), including decommissioning of the bypassed section of the RWBT (decommissioning).

DEP's WFF and Upstate Water Supply Resiliency components are shown on **Figure 1.1-3**.

During the RWBT temporary shutdown, water supply would be augmented by the repair and rehabilitation of the upper Catskill Aqueduct. The repair and rehabilitation would carry out repairs necessary as a result of age-related deterioration of the aqueduct, including repair or

[2] The previous EIS is available here: http://www.nyc.gov/html/dep/html/environmental_reviews/rwb_tunnel_repair_project.shtml

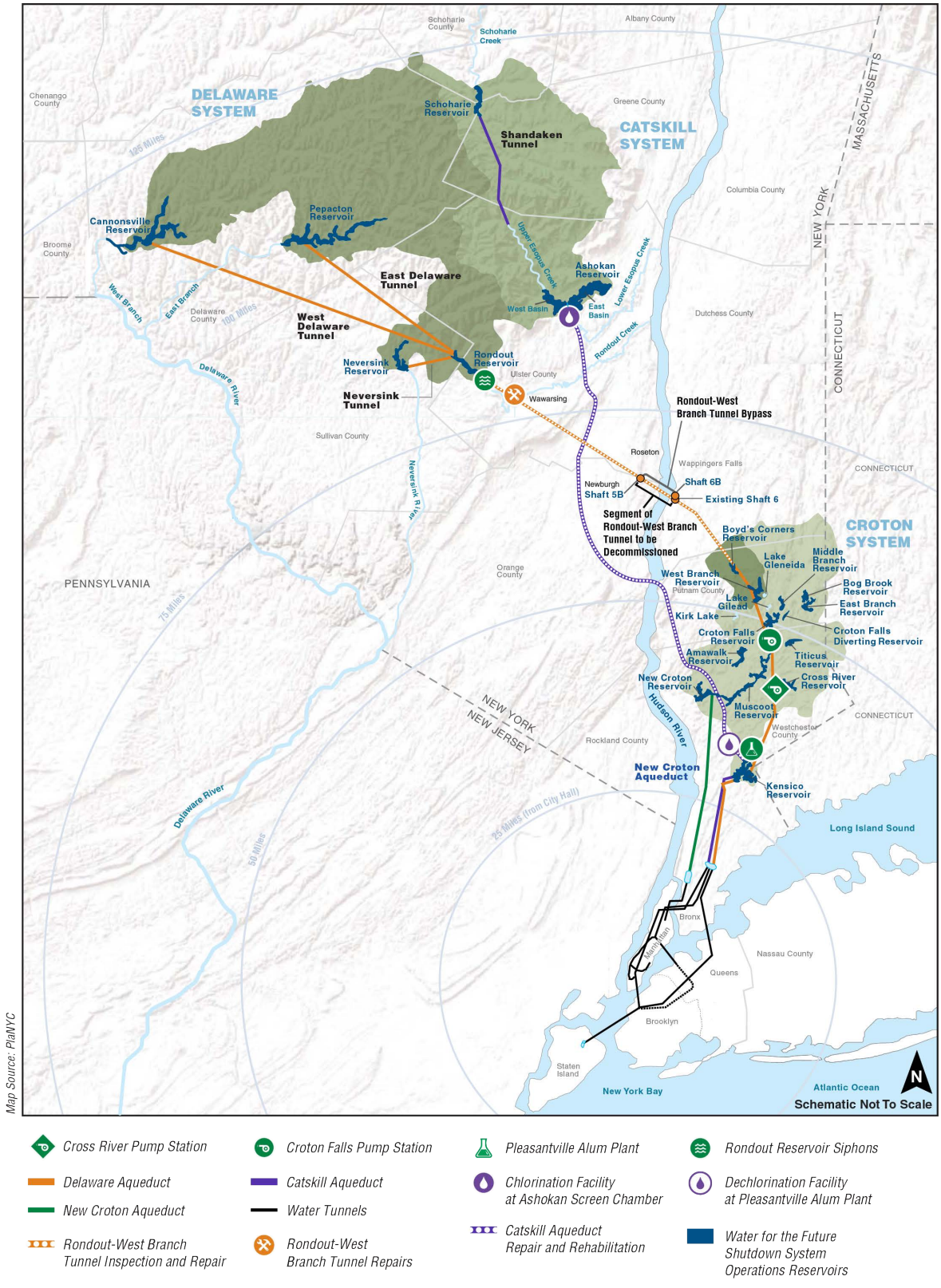


Figure 1.1-3: Water for the Future Overview

treatment of minor leaks and replacement of aging mechanical components. The repair and rehabilitation would restore historical capacity to the upper portion of the Catskill Aqueduct between Ashokan and Kensico reservoirs (see **Figure 1.1-4**) and would extend its useful life for many years to come.

Prior to, during, and just following the RWBT temporary shutdown, DEP would implement WSSO, a specific and substantially different temporary operating protocol that is designed to maintain reliability of the water supply system during an extended shutdown of the RWBT, as shown on **Figure 1.1-5**.[3] The purpose of WSSO is to:

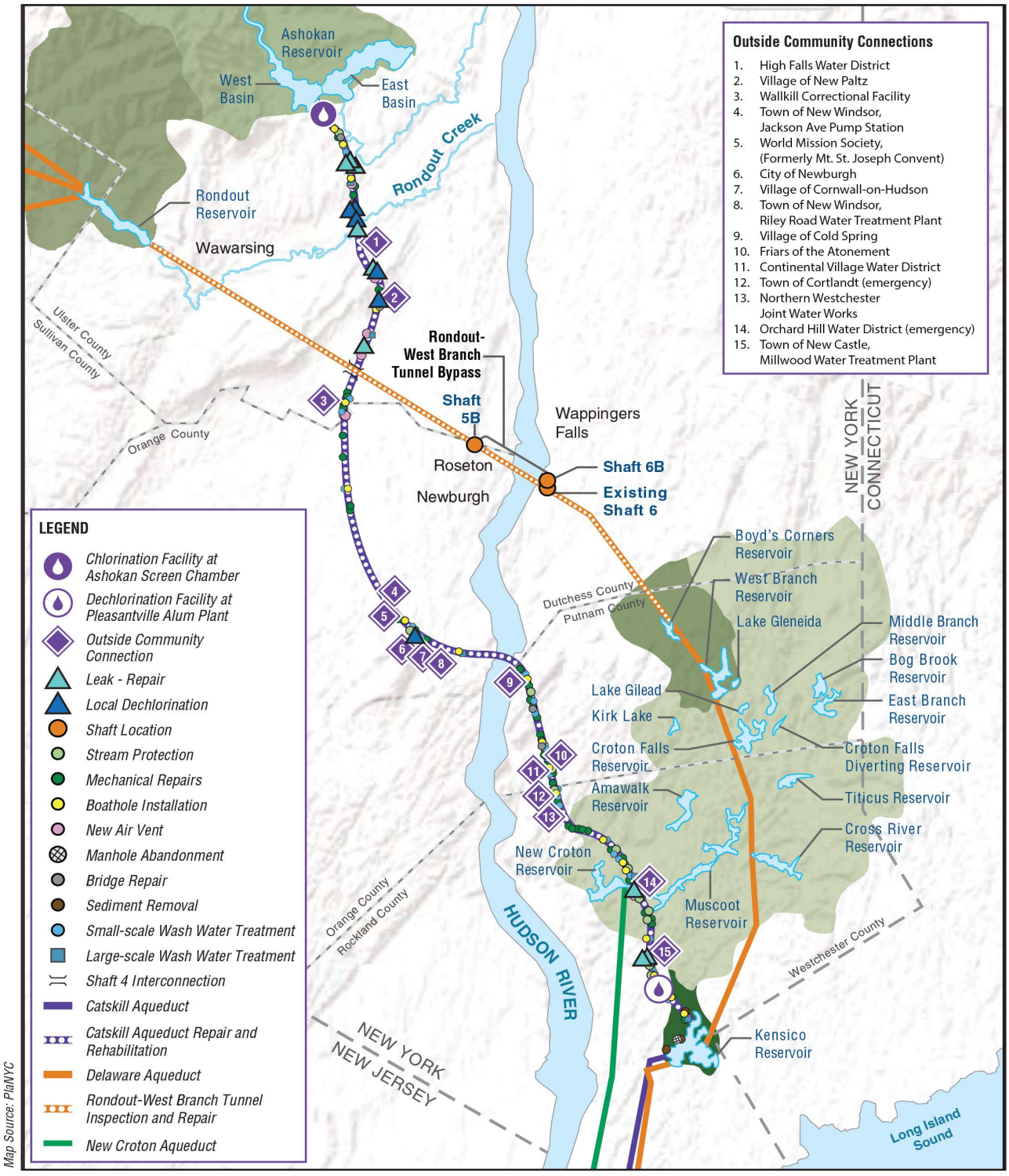
(1) Prepare the water supply for the RWBT temporary shutdown by relying more heavily on the Delaware System prior to the temporary shutdown;

(2) Continue to provide water to upstate and in-City customers while the Delaware System is temporarily unavailable by relying on the Catskill and Croton systems during the temporary shutdown; and

(3) Return the system to typical operating conditions by allowing for system rebalancing for a short time once the bypass tunnel connection is complete and the Delaware System is available again.

In addition to supporting the connection of the bypass tunnel to the RWBT, WSSO would allow DEP to unwater and inspect the approximately 45-mile length of the RWBT between Rondout and West Branch reservoirs. During the temporary shutdown, DEP would make necessary repairs to the tunnel, as shown on **Figure 1.1-6**. Once inspection and repair is completed and the bypass tunnel is connected, decommissioning would occur, and the bypassed section of the RWBT that passes under the Hudson River would be taken out of service permanently. As a result, leaks from the RWBT would be expected to cease permanently. Following a short period to allow the water supply system to equilibrate to typical reservoir conditions, the water supply system would return to baseline conditions.

[3] DEP frequently modifies its operation of the water supply system for many reasons and in response to a variety of conditions. These operational modifications are considered routine management activities that would not be subject to environmental review under SEQRA or CEQR. In contrast, WSSO, as analyzed in this DEIS, refers to a specific and substantially different protocol for operating the system than is currently in place and which is designed solely for purposes of Upstate Water Supply Resiliency in connection with WFF.



Map Source: PlaNYC

Note: Fourteen identified leaks are located along the upper Catskill Aqueduct. Should any additional leaks be identified along the Catskill Aqueduct, DEP will repair the leak or provide local dechlorination.
Biofilm removal is proposed along the interior of the aqueduct within cut-and-cover tunnels, grade tunnels, and steel pipe siphons. Access to the aqueduct would be provided by access manholes, new and existing boatholes, downtake chambers, and other locations that allow entry into the aqueduct. No biofilm removal sites are shown on this figure for clarity.

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Not To Scale
For Illustrative Purposes Only

NYC Environmental Protection

Figure 1.1-4: Proposed Catskill Aqueduct Repair and Rehabilitation

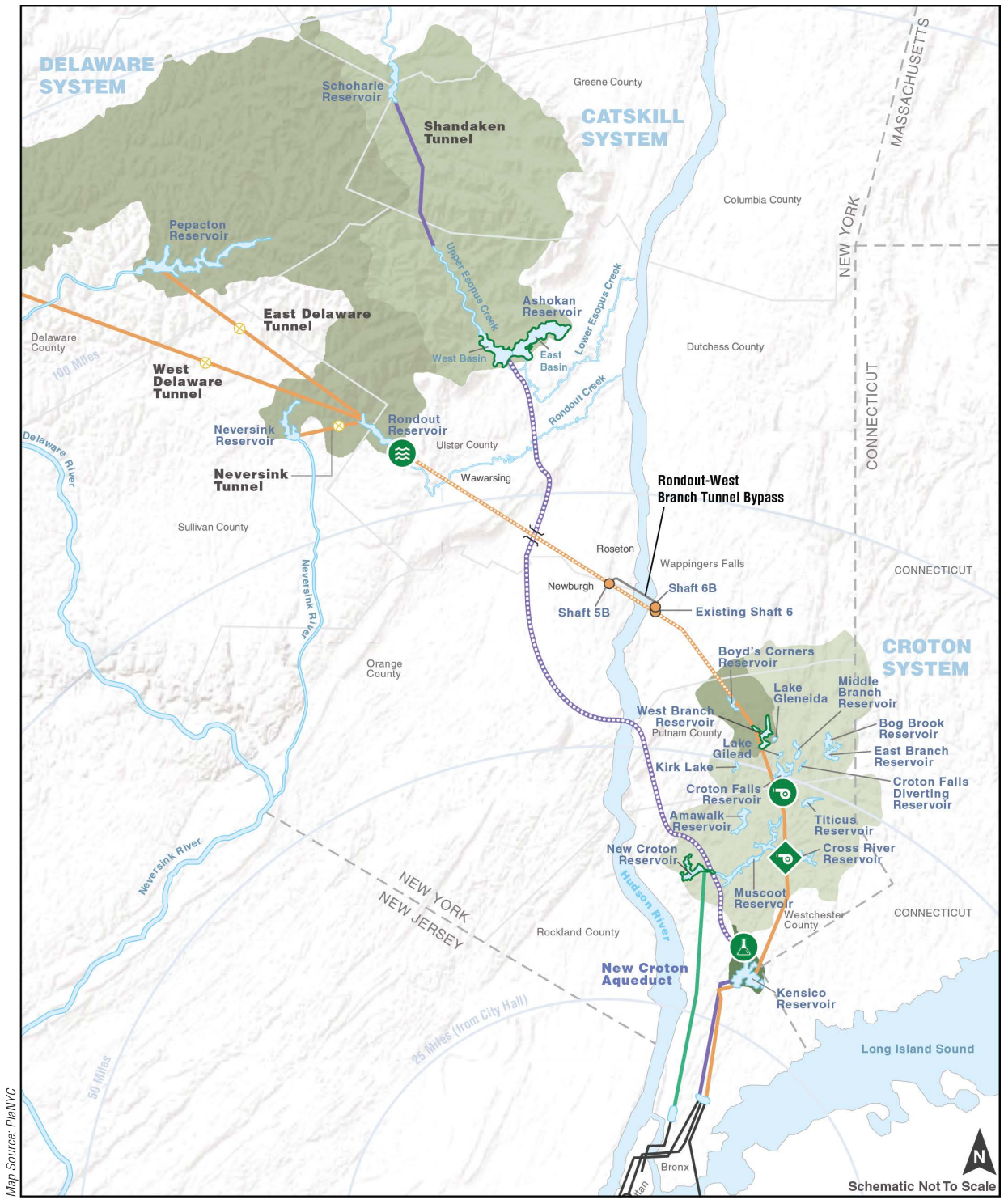

Figure 1.1-5: Proposed Water for the Future Shutdown System Operations

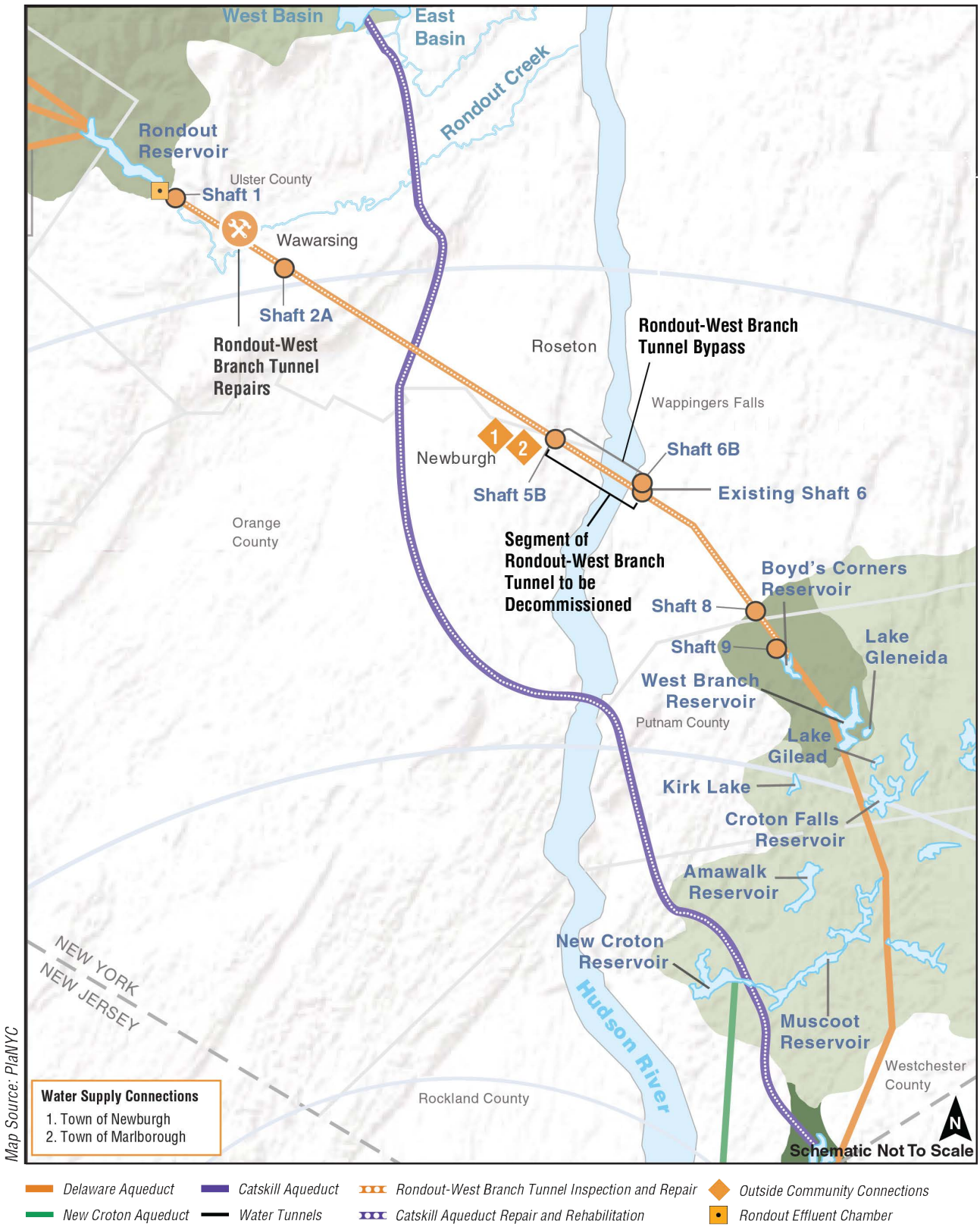

Figure 1.1-6: Proposed Rondout-West Branch Tunnel Inspection and Repair

1.2 ORGANIZATION OF THIS DRAFT ENVIRONMENTAL IMPACT STATEMENT

This DEIS is organized into multiple chapters to describe the purpose and need for Upstate Water Supply Resiliency; provide context by describing the water supply system and planning background; and provide a description of WFF and Upstate Water Supply Resiliency. The DEIS includes the following chapters:

- **Chapter 2: Purpose and Need for Upstate Water Supply Resiliency.** As required by CEQR, this chapter presents the purpose of and need for the project and why it is being undertaken.

- **Chapter 3: Overview of the City's Water Supply System.** This chapter provides an overview of the City's surface water supply system.

- **Chapter 4: Water for the Future Background and Planning.** This chapter describes the background and planning context undertaken by DEP for Upstate Water Supply Resiliency.

- **Chapter 5: Program Description.** This chapter describes and defines WFF, providing additional context for Upstate Water Supply Resiliency components and describing other DEP projects already underway or completed that support WFF.

- **Chapter 6: Project Descriptions.** This chapter describes and defines each of the Upstate Water Supply Resiliency components, including an overview of the proposed activities.

- **Chapter 7: Potential Major Discretionary Permits, Approvals, and Consultations.** This chapter describes the potential major discretionary permits, approvals, and consultations with regulatory authorities associated with Upstate Water Supply Resiliency.

- **Chapter 8: Analytical Framework.** This chapter describes the analytical framework, including defining assessment conditions, analysis years, impact analysis categories, and analysis thresholds, used to determine the potential for impacts associated with Upstate Water Supply Resiliency.

- **Chapter 9: Proposed Catskill Aqueduct Repair and Rehabilitation.** This chapter provides a detailed project description and describes the screening assessments and impact analyses methodologies, study areas, impact analyses, and commitments for the repair and rehabilitation.

- **Chapter 10: Proposed Water for the Future Shutdown System Operations.** This chapter provides a detailed project description and describes the impact analyses methodologies, study areas, impact analyses, and commitments for WSSO.

- **Chapter 11: Proposed Rondout-West Branch Tunnel Inspection and Repair.** This chapter provides a detailed project description and describes the screening assessments and impact analyses methodologies, study areas, impact analyses, commitments, and mitigation for the inspection and repair.

- **Chapter 12: Cumulative Impacts.** This chapter provides an overview of the analysis for potential cumulative impacts from the multiple components of Upstate Water Supply Resiliency, including individually minor but potentially collectively significant effects that would take place over time. The potential for cumulative impacts across WFF is lower than presented in the previous EIS, resulting in cumulative analyses that are specific to Upstate Water Supply Resiliency for three of the four cumulative impact categories in this DEIS. The exception is the socioeconomic analysis, which is focused on WFF as a whole as it also captures updated costs of shaft and bypass tunnel construction as compared to those presented in the previous EIS.

- **Chapter 13: Commitments.** This chapter describes commitments incorporated into Upstate Water Supply Resiliency to avoid or reduce the potential for impacts to the maximum extent practicable.

- **Chapter 14: Mitigation.** This chapter describes mitigation measures developed in response to potential significant adverse impacts of Upstate Water Supply Resiliency.

- **Chapter 15: Alternatives Analysis.** This chapter describes the analysis of alternatives to Upstate Water Supply Resiliency that were considered and evaluated for the potential to reduce impacts while meeting the goals and objectives.

- **Chapter 16: Unavoidable Adverse Impacts.** This chapter describes potential significant adverse impacts from Upstate Water Supply Resiliency that would be unavoidable regardless of the commitments and mitigation employed.

- **Chapter 17: Irreversible and Irretrievable Commitment of Resources.** This chapter summarizes Upstate Water Supply Resiliency and its impacts on the loss of environmental resources, both natural and man-made, in the immediate future, and in the long term.

- **Chapter 18: References.** This chapter provides a comprehensive list of references used to develop this DEIS.

- **Chapter 19: List of Preparers.** This chapter provides the preparers of this DEIS.

WFF was developed to respond to the need to repair and improve resiliency in the RWBT, a vital piece of the City's overall water supply system. WFF would ensure continued water supply service for current and future generations of DEP customers. Implementation of WFF would allow the City to continue to meet and respond to variable water supply and demand conditions. Cessation of leaks along the RWBT would reduce water losses in the Delaware System, thus contributing to its long-term sustainability.

WFF is demonstrative of the initiatives detailed in the 2015 Mayor's Office of Sustainability's *One New York: The Plan for a Strong and Just City* (*OneNYC*) report, which sets several goals for the City and its development along four key visions.[1] WFF supports Goal 7, Infrastructure Planning under the "Our Growing, Thriving City" vision, which is focused on "achieving a state of good repair for (the City's) infrastructure assets while also prioritizing projects that are socially, fiscally, and environmentally advantageous." It also supports Goal 3, Infrastructure and Service, under the "A Resilient City" vision, which is focused on adapting infrastructure systems in the City and region "to withstand the impacts of climate change, to ensure the continuity of critical services in an emergency, and to recover more quickly from service outages." WFF supports these visions and goals by enhancing the reliability of the City's water supply and maintaining flexibility during typical operations.

The Catskill Aqueduct Repair and Rehabilitation and WSSO would allow DEP to continue to meet water demand during the approximately 8-month temporary shutdown, and would support the RWBT Inspection and Repair. Each of these components was carefully selected to optimize existing City water resources and to enhance key infrastructure while managing the cost of WFF. Chapter 4, "Water for the Future Background and Planning," explains how these components were selected. Chapter 15, "Alternatives Analysis" presents the alternatives to these project components that were considered by DEP, but are no longer being pursued.

[1] The *OneNYC* report is available here: http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf http://www1.nyc.gov/html/onenyc//index.html

This chapter presents a summary of the three discrete but interconnected reservoir systems that comprise the surface water component of the City's overall drinking water supply system (water supply system). The surface water portion of the City's water supply system consists of 19 reservoirs and 3 controlled lakes. On average, more than 1.1 billion gallons of this water flows each day, predominantly by gravity from upstate New York, to meet the water supply needs of more than 8 million City customers, 1 million residents north of the City, and the millions of commuters and tourists who visit the City each day. In addition to surface water, the City's water supply system includes groundwater wells in southeastern Queens that can draw water from underlying aquifers and are available during droughts and emergencies; however, these wells will not be used during the RWBT temporary shutdown.

Given the importance and complexity of the water supply system, which is key to understanding the need for and development of WFF, this section also provides a summary of the typical operational protocols DEP currently uses to manage its three surface water supply systems. These descriptions provide necessary background and context for understanding the development of WFF, as well as further context for its project components.

3.1 SURFACE WATER SUPPLY SYSTEM OVERVIEW

Multiple reservoirs and lakes located in upstate New York make up the City's three surface water supply systems: the Catskill, Delaware, and Croton systems (see **Figure 3.1-1** and **Figure 3.1-2**). Historically, approximately 40 percent of the City's average drinking water demand is provided by the Catskill System, 50 percent by the Delaware System, and 10 percent by the Croton System. The Catskill and Delaware systems together can provide up to 100 percent of the City's daily water supply when the Croton System is not available.[1] During drought conditions, the Croton System yield is sufficient to meet roughly up to 30 percent of the City's demand. The Catskill and Delaware watersheds together cover approximately 1,600 square miles, while the Croton watershed covers approximately 400 square miles, for a combined total area of approximately 2,000 square miles.

3.1.1 CATSKILL WATER SUPPLY SYSTEM OVERVIEW

Completed in 1928, the Catskill System consists of two reservoirs: Schoharie Reservoir, located in Schoharie, Greene, and Delaware counties, New York, and Ashokan Reservoir, located in Ulster County (see **Figure 3.1-1**). The Catskill System also shares two reservoirs with the Delaware System, Kensico and Hillview reservoirs, located south of the Croton Water Supply System (see **Figure 3.1-2**).

[1] The Catskill and Delaware systems are operated as one unfiltered water supply during typical system operations, referred to as the Catskill/Delaware System.

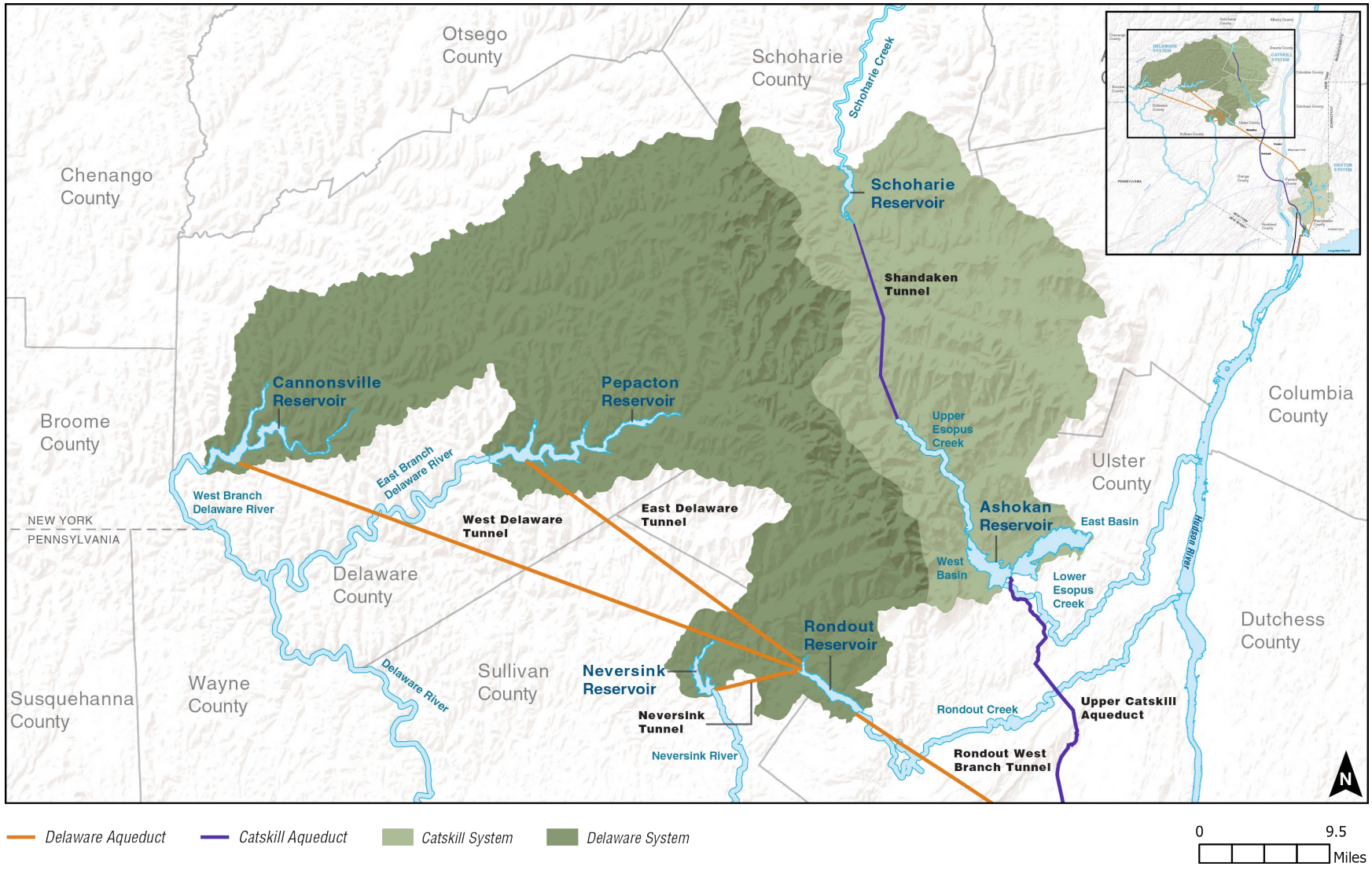

Figure 3.1-1: Catskill and Delaware Water Supply Systems

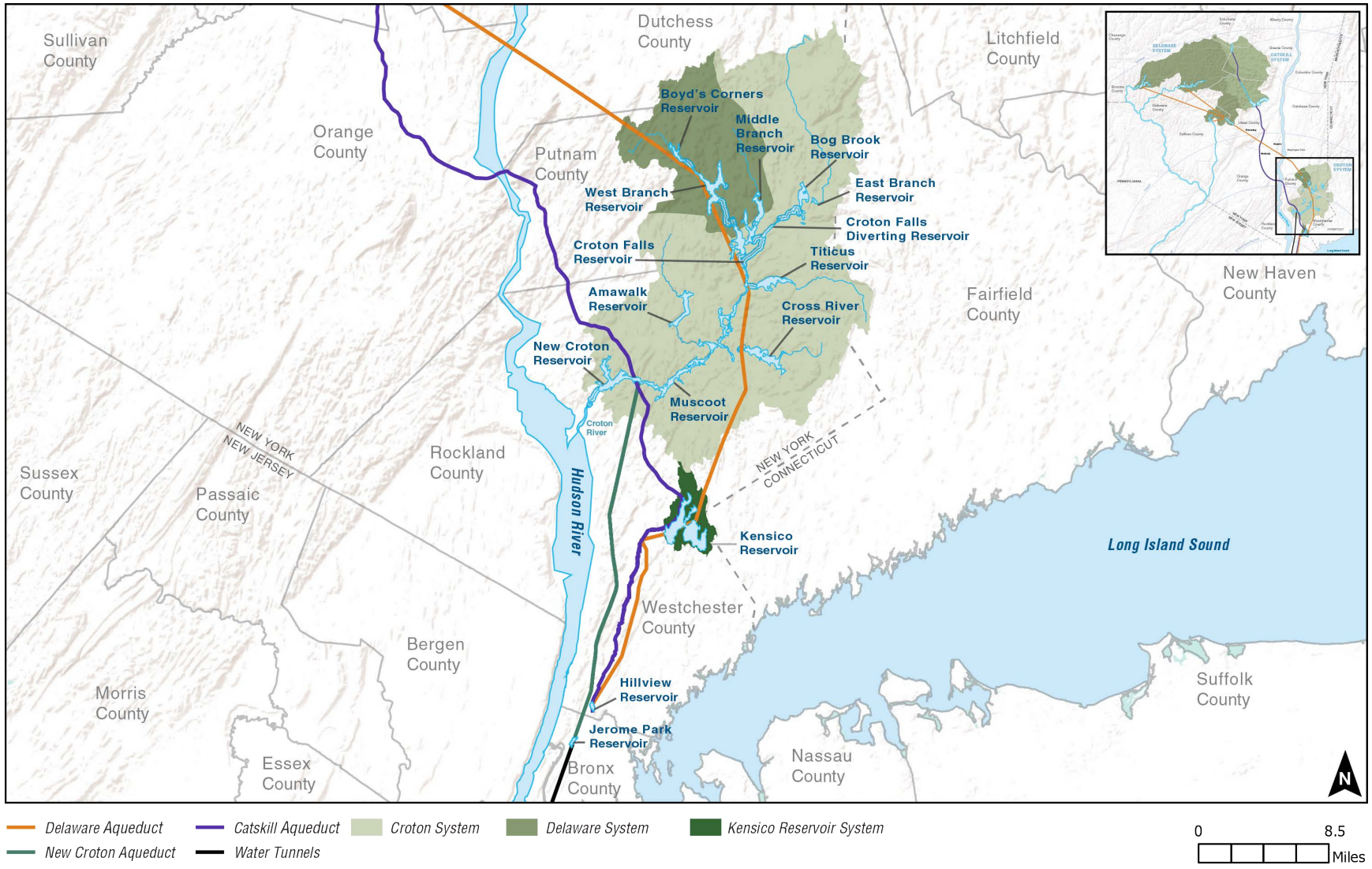

Figure 3.1-2: Croton Water Supply System

Schoharie Reservoir diverts water to the upper Esopus Creek via the Shandaken Tunnel (see **Figure 3.1-1**). The upper Esopus Creek subsequently flows into Ashokan Reservoir. From there, water flows through the upper Catskill Aqueduct, which is located to the east of the Delaware System. The upper Catskill Aqueduct extends approximately 74 miles between Ashokan and Kensico reservoirs and has a current capacity of up to 590 mgd. It ends at Kensico Reservoir in Westchester County (see **Figure 3.1-2**), which has its own small watershed that adds flow to the system. Water leaving Kensico Reservoir is disinfected prior to distribution to City and upstate customers. In addition to the City, approximately 20 communities are supplied with water via the upper Catskill Aqueduct through 15 water supply connections.

Ashokan Reservoir was designed with a west and east basin (see **Figure 3.1-1**). In addition to providing increased storage, this two-basin design helps to manage episodic turbidity events that sometimes occur within the Catskill System.[2] Water enters the West Basin and particles causing turbidity are allowed to settle before water is transferred to the East Basin and then diverted to the upper Catskill Aqueduct. Large storm events sometimes overwhelm the natural settling process of Ashokan Reservoir, sending turbid water into the upper Catskill Aqueduct which flows to Kensico Reservoir. When this occurs, aluminum sulfate (alum) can be applied at Kensico Reservoir, with New York State Department of Health (NYSDOH) and New York State Department of Environmental Conservation (NYSDEC) approval, to treat any turbid water diverted from the Catskill System.

In addition, DEP is required under State law to make certain releases from its reservoirs to protect downstream recreational uses. For the Catskill System, releases under this law are required from Schoharie Reservoir to protect and enhance the upper Esopus Creek's recreational use, as codified in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 670. Releases from Ashokan Reservoir are subject to an Interim Ashokan Release Protocol (IRP), pursuant to an October 2013 Order on Consent between NYSDEC and DEP. The IRP governs the management of releases from Ashokan Reservoir to lower Esopus Creek (downstream of the Ashokan Reservoir) and is currently being analyzed as part of a separate environmental review to support modification of the City's New York State Pollutant Discharge Elimination System (SPDES) permit for alum treatment at the Kensico Reservoir. The IRP includes a community release requirement to provide environmental, recreational, and economic benefits to the lower Esopus Creek in a manner that would not adversely impact water supply.

3.1.2 DELAWARE WATER SUPPLY SYSTEM OVERVIEW

Constructed between 1936 and 1964, the Delaware System extends approximately 125 miles northwest of the City. Water from the Cannonsville, Pepacton, and Neversink reservoirs is

[2] Turbidity is an optical property of water influenced by the presence of higher concentrations of suspended particles that make water opaque or cloudy. These particles normally consist of suspended clay, silt, organic and inorganic material, and microscopic organisms. Turbidity is of concern primarily due to its potential effects on public health, as the cloudiness could interfere with chlorine and ultraviolet-light disinfection, rendering disinfection less effective. Further, contaminants may adhere to or be encapsulated by the suspended particles. Alum application helps to consolidate suspended particles. These larger, consolidated particles have sufficient mass to settle out of the water, thereby reducing turbidity.

diverted to Rondout Reservoir via the West Delaware, East Delaware, and the Neversink Tunnels, respectively (see **Figure 3.1-1**). The RWBT begins at Rondout Reservoir and extends east approximately 45 miles to West Branch Reservoir, located east of the Hudson River in Putnam County (see **Figure 3.1-2**). From West Branch Reservoir, the Delaware Aqueduct proceeds south to Kensico Reservoir. In addition to the City, two municipalities are supplied with water via the RWBT: the Town of Newburgh and the Town of Marlborough.

All water supplied to the City from the Delaware System west of the Hudson River flows through the RWBT segment of the Delaware Aqueduct. The RWBT is approximately 13.5 feet in diameter, lined with concrete, and varies in depth from approximately 300 to 2,300 feet below ground (crossing the Hudson River at approximately 600 feet below the water's surface). The tunnel is a deep rock pressurized aqueduct that operates by gravity, and has been in nearly continuous service since it was brought online in 1944. It can convey up to approximately 850 mgd of water (1 billion gallons per day when the Catskill/Delaware Interconnection at Shaft 4 is in use). The last unwatering and physical inspection of the RWBT occurred between 1957 and 1958.

The City is permitted to divert a yearly combined average of 800 mgd from the Delaware System's Cannonsville, Pepacton, and Neversink reservoirs within the framework of established legal and regulatory parameters. Specifically, DEP is required to operate the three upper Delaware System reservoirs in accordance with a 1954 U.S. Supreme Court Decree (Decree) and subsequent commitments made by the parties to that Decree and adopted by the Delaware River Basin Commission. The Delaware River Basin Commission is composed of representatives of the federal government and the states of Delaware, New York, New Jersey, and Pennsylvania. The current operations protocol agreed to by the parties of the Decree is referred to as the Flexible Flow Management Program, which is an interim reservoir management plan approved for one year to guide future multi-year agreements for the basin.[3] Both the Decree and the Flexible Flow Management Program require the City to make releases from the Cannonsville, Pepacton, and Neversink reservoirs.

In addition to meeting these requirements, DEP is required under State law to make certain releases from its reservoirs to protect downstream recreational uses. The requirements relating to the Delaware System releases are codified in 6 NYCRR Part 671 and Section 672-2.

3.1.3 CROTON WATER SUPPLY SYSTEM OVERVIEW

Constructed in the late 1800s, the Croton System is both the oldest and smallest of the City's three surface water systems. The Croton System consists of a series of interconnected reservoirs and lakes in northern Westchester and Putnam counties that terminate at New Croton Reservoir. Water is diverted from New Croton Reservoir to Jerome Park Reservoir in the Bronx via the New Croton Aqueduct. The New Croton Aqueduct is an approximately 33-mile long, 13-foot diameter, brick-lined tunnel originally placed into service in 1892 (see **Figure 3.1-2**). The Croton System was generally not used for the City between 2004 and 2015. The recent activation of the newly constructed Croton Water Filtration Plant allows for the treatment of the Croton System

[3] The Flexible Flow Management Program was first approved in 2007 and has been renewed annually since, with adjustments to the framework in some years.

water supply prior to its distribution to the City. As such, the Croton System is now available to supplement the Catskill/Delaware System. As in the Catskill/Delaware System, a number of communities in Westchester and Putnam counties are also supplied with water directly from DEP reservoirs in the Croton System.

Similar to the Catskill/Delaware System, in addition to supplying water to the City, DEP must provide minimum flows downstream from Croton System reservoirs in accordance with directives from the State, as established by 6 NYCRR Part 672-3.

3.1.4 SURFACE WATER SUPPLY SYSTEM OPERATION

The primary objective of the City's surface water supply system is to store water in sufficient quantity and with appropriate flexibility to meet demand and the regulatory requirements that dictate certain aspects of its water supply operations, such as reservoir releases and changing hydrologic conditions. In addition, the Catskill and Delaware systems operate under a Filtration Avoidance Determination (FAD). The most recent FAD was issued in 2007 and revised in 2014. NYSDOH and DEP are currently in negotiations for the 2017 FAD. To effectively balance demand with these regulatory requirements, DEP's infrastructure is designed and continually improved to enhance operational flexibility.

To that end, the City constructed an interconnection between the Catskill and Delaware systems at Shaft 4 of the RWBT (Shaft 4 Interconnection) in Gardiner, New York, which was first put into operation in 2015. The Shaft 4 Interconnection will allow water from the Delaware System to be diverted to the Catskill Aqueduct, described in greater detail in Section 5.2.2, "Catskill/Delaware Interconnection at Shaft 4." Further, to improve DEP's ability to maximize access to Croton water during times of drought or emergencies, projects to rehabilitate two Croton System pump stations, the Cross River and Croton Falls pump stations, are anticipated to be operational by 2017, prior to the RWBT temporary shutdown. These pump stations will enable DEP to move water from the Cross River and Croton Falls reservoirs in the Croton watershed to the Delaware Aqueduct, and finally to Kensico Reservoir. The ability to move water from these reservoirs will allow DEP to maximize its available water supply by diverting up to 240 mgd of additional water from the Croton System. The pump station improvements, described further in Section 5.2.5, "Cross River and Croton Falls Pump Stations," would provide a supplemental water source during the temporary shutdown and repair of the RWBT.

DEP's operational and management techniques include a combination of diversions (moving water between reservoirs or systems that would not otherwise be connected), transfers (moving water between connected reservoirs for the purpose of supplying drinking water), and releases (moving water to waterbodies that are connected to the system, but, in some cases, redirect water out of the system). In addition, water that exceeds the 100-percent storage capacity of the City's reservoirs flows over reservoir spillways (spills). Similar to releases, spills move water to waterbodies that are connected to the system. In some cases, spills redirect water out of the system. Because of the interconnected nature of the City's reservoirs, operations applied at any single reservoir must be precisely coordinated with those at other reservoirs.

3.2 GROUNDWATER SYSTEM OVERVIEW

In addition to the three surface water systems described above that are the City's primary sources of water supply, DEP has owned, maintained, and operated a groundwater supply system in southeastern Queens since 1996 (Queens groundwater system). This system was formerly owned and operated by the Jamaica Water Supply Company. The Queens groundwater system will not be utilized to support WFF (see Section 4.2, "Water Supply Augmentation Planning").

Management of the City's water supply system is a complex undertaking that balances available supply with customer demand and must meet regulatory requirements for reservoir releases and diversions. Given the three surface water supply systems and their various reservoirs, each with its own set of release requirements, the City must carefully consider and regularly reevaluate overall system operations. In parallel, DEP must prepare for and plan critical infrastructure upgrades and operational responses for unplanned events such as storms, droughts, and emergencies. The components of WFF are distinct and reflective of system management techniques used by the City to ensure water supply resiliency during temporary infrastructure outages. Planning efforts specifically associated with determining the optimal approach to address the RWBT leaks sought to identify the components of WFF that would minimize the duration of, and water supply need during, a temporary shutdown of the Delaware Aqueduct.

4.1 BACKGROUND

Over the course of a several-year-long planning process, DEP compared and selected potential projects that could be used to augment the City's existing water supplies and increase system resiliency during unplanned outages, emergencies, and planned infrastructure improvements, including repair of the RWBT. The planning process began with identification of the range of potential projects for consideration to meet DEP's water supply objectives. The list of potential projects was then evaluated to determine the optimal set of projects. The evaluation focused on projects that would: (1) maximize the use of DEP's existing infrastructure; (2) minimize the construction duration; and (3) minimize the complexity, thereby minimizing the costs, of the projects. The result of the analysis was a short list of possible water supply augmentation projects that DEP could advance with the most promise of delivering efficient and reliable water during unplanned events or planned outages of critical system infrastructure, as described further in Section 4.2, "Water Supply Augmentation Planning."

4.2 WATER SUPPLY AUGMENTATION PLANNING

To facilitate construction of the RWBT Bypass and conduct internal repairs near Wawarsing, which would preclude diversion of water from the Delaware System for some period of time, DEP evaluated the various water supply projects identified that could be advanced to augment the City's water supply during the planned RWBT temporary shutdown.

To select the best possible augmentation projects for inclusion within WFF, it was necessary for DEP to determine the amount of water required to meet system demand for the duration of the planned RWBT temporary shutdown. Estimates of future demands at the time of the temporary shutdown, including the potential for demand management, were developed by DEP and modeled using DEP's Operations Support Tool (OST). OST is a robust and system-specific computer-based model used to support water supply management decisions in response to changing hydrologic conditions. OST is also used to predict system response to planned (i.e., infrastructure outages) and unplanned (i.e., storms and drought) events. OST has been in use since 2012 and has been instrumental in managing the complex interplay between multiple objectives for the water supply system by accounting for dozens of variables such as weather forecasts, current demand for water, and daily changes to the operation of the water supply system.[1] For the purposes of this DEIS, OST was used to simulate conditions within the system that could occur with the RWBT offline to quantify the amount of required augmentation.

Maintaining operation of the water supply system to protect public health during the RWBT temporary shutdown is of utmost importance. In addition to identifying the amount of water that would be required to meet projected demand with the Delaware System offline during the temporary shutdown of the RWBT, OST was used to identify the proper timing and hydrologic conditions required to minimize the amount of augmentation and ensure completion of work activities within the RWBT.

In particular, DEP was able to identify the set of hydrological conditions associated with successful completion of the bypass tunnel connection and RWBT repairs. In addition, DEP was able to identify hydrologic conditions during the temporary shutdown that would require demobilization of the tunnel connection to bring the RWBT back online. As a result of the modeling efforts, October 1 was selected as the optimal start date for the temporary shutdown. By starting on October 1, when the system is entering a period of lower demand through the winter months, and by allowing for initiation only under favorable hydrologic conditions, OST modeling was able to help the City optimize the amount of augmentation required to support bypass tunnel connection and repairs near Wawarsing. As presented in the previous EIS, the results of system modeling led to the selection of four augmentation projects to ensure continued water delivery during an estimated 15-month shutdown of the RWBT. The four selected projects were: Nassau County Interconnection, New Jersey Interconnection, Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation), and Queens Groundwater Rehabilitation.

[1] Daily changes to system operations include those necessary to meet regulatory release requirements, support infrastructure repair, ensure system balance, and manage water quality, among others.

These projects were discussed in the previous EIS and were selected at that time based on their ability to provide the estimated water supply needed during the temporary shutdown; minimize risk to the water supply system; provide high operational reliability; achieve secondary benefits; minimize environmental impact; and be both practical and implementable. A fifth project – Leak Stabilization – was also identified in the previous EIS for evaluation as an alternative in this DEIS (see Chapter 15, "Alternatives Analysis").

However, after the previous EIS was finalized, DEP progressed with the design for the RWBT bypass connection. Based on updated constructability and duration information for the bypass tunnel connection, DEP was able to reduce the amount of time required to connect the bypass tunnel to the RWBT from up to 15 months to 8 months. As a result of this reduction in the estimated time the RWBT would be out of service, DEP has eliminated the need for three of the four originally proposed augmentation projects. DEP determined that the Queens Groundwater Rehabilitation and the Nassau County and New Jersey Interconnection projects are no longer necessary for water supply augmentation during the temporary shutdown. The New Jersey Interconnection and Leak Stabilization augmentation projects that are no longer being advanced under WFF now serve as reasonable alternatives to Upstate Water Supply Resiliency. These alternatives are discussed in Chapter 15, "Alternatives Analysis." Therefore, only the Catskill Aqueduct Repair and Rehabilitation augmentation project would be advanced as part of Upstate Water Supply Resiliency.

This chapter provides a description of DEP's Water for the Future (WFF), of which Upstate Water Supply Resiliency is an integral component. WFF is the culmination of long-term efforts to characterize and address reported leakage within the Rondout-West Branch Tunnel (RWBT), and focuses upon an approach that was ultimately determined to be the optimal method for repairing this critical piece of infrastructure to protect the long-term viability and overall resilience of the City's water supply system. The components of WFF are distinct, but reflect an interrelated planning effort to address the RWBT leaks. In addition to WFF, DEP has planned or is currently implementing several additional programs and projects that enhance operation of the water supply system. While these independent projects are not part of WFF, they support the goals of WFF by increasing flexibility to meet water supply demand during the RWBT temporary shutdown, as described in the following sections.

5.1 WATER FOR THE FUTURE PROJECT COMPONENTS

As previously discussed, WFF centers around construction of a bypass tunnel around the leaking segment of the RWBT, primarily in the area known as the Roseton crossing under the Town of Newburgh, Orange County, New York. Work on this project has commenced, namely construction of the two vertical shafts necessary to access and construct the bypass tunnel is substantially complete: one in the Town of Newburgh, Orange County, New York, and one in the Town of Wappinger, Dutchess County, New York. Construction on the approximately 2.5-mile bypass tunnel that will pass through the bedrock below the Hudson River will begin in 2017.

Once the RWBT Bypass is completed in 2022, the RWBT would be temporarily shut down and unwatered to connect the bypass tunnel to the existing RWBT, and to carry out an inspection program and conduct internal repairs to the leaking section of the existing RWBT near Wawarsing. DEP estimates that the maximum shutdown duration would be approximately 8 months. During this temporary shutdown of the RWBT, water from the Delaware System west of the Hudson River would be unavailable. Following the bypass tunnel connection, the bypassed section of the RWBT would be decommissioned, and all water in the RWBT would flow through the bypass.

DEP has developed Upstate Water Supply Resiliency as part of WFF to ensure the continued supply of clean drinking water during the temporary shutdown, which is comprised of three main components: (1) augmentation of available water supply, (2) a temporary operational protocol for the water supply system, and (3) inspection and internal repair of the RWBT. Water supply augmentation includes the repair and rehabilitation of the upper Catskill Aqueduct. This would restore the capacity of the upper Catskill Aqueduct closer to its historical capacity to support the RWBT temporary shutdown and to extend its useful life for many years to come.

The temporary operational protocol for the City's water supply system, referred to as WFF Shutdown System Operations (WSSO), would allow DEP to alter its typical operation of the surface water supply system prior to, during, and just following the temporary shutdown. Typical operations would be altered by relying more heavily on the Delaware System, then the Catskill and Croton systems and finally provide for water supply system rebalancing for a short time following bypass tunnel connection. Through implementation of WSSO, DEP substantially reduces the need for additional augmentation projects and, as a result, reduces the need for capital investment funds necessary for WFF. Work necessary to support the repair and rehabilitation and WSSO would be advanced concurrent with bypass tunnel construction. Finally, inspection and repair would consist of inspection of the RWBT and internal repair of the RWBT near Wawarsing during connection of the bypass tunnel in Roseton and decommissioning the bypassed section of the RWBT during the temporary shutdown (see **Figure 5.1-1**).

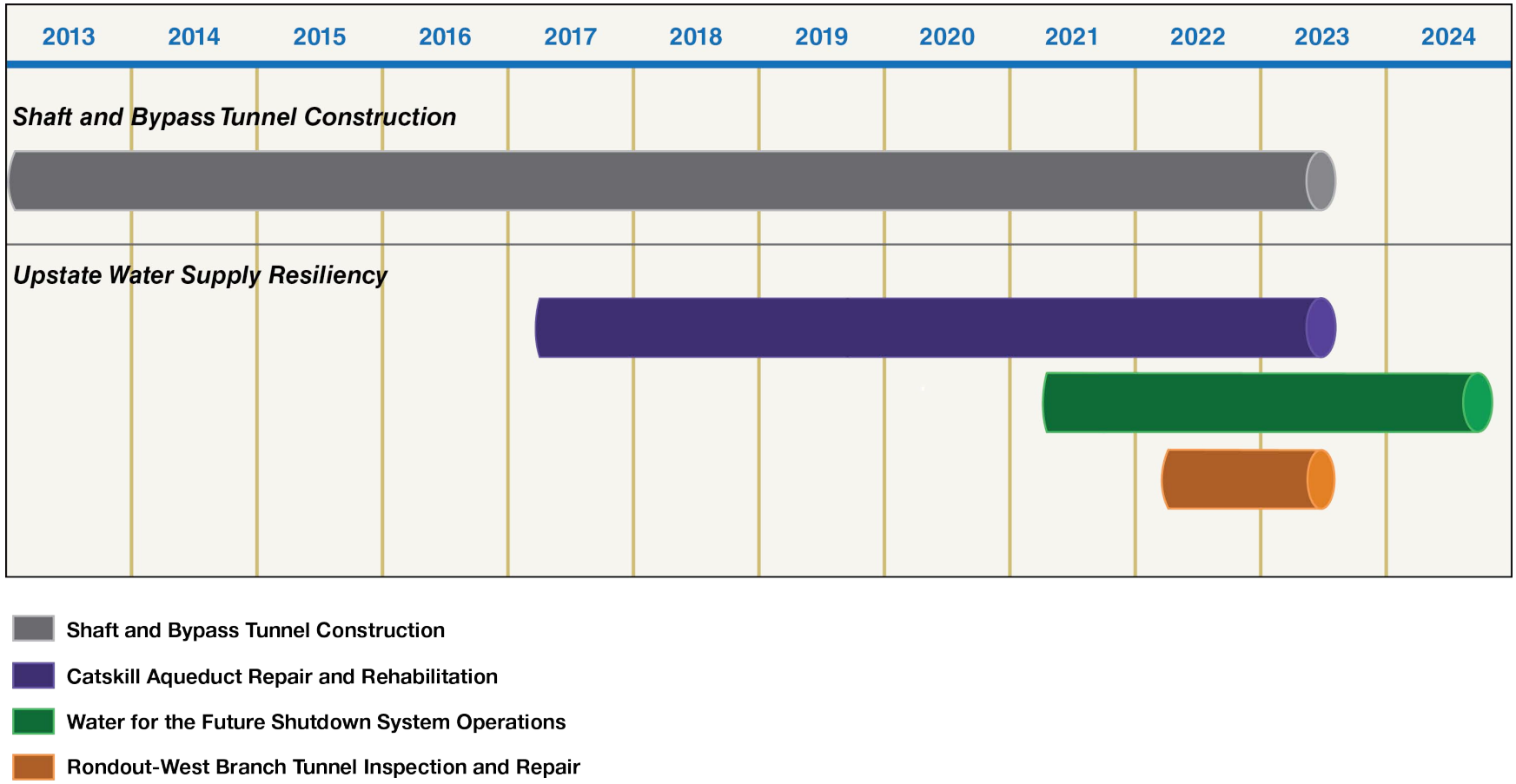

Figure 5.1-1: Overall Water for the Future Schedule

5.2 WATER FOR THE FUTURE SUPPORTING PROJECTS

Concurrent with WFF, DEP has independent programs and projects that will optimize the water supply system and support the goals of WFF. This section discusses the citywide Demand Management Plan, Catskill/Delaware Interconnection at Shaft 4, Improvements to Catskill Aqueduct Stop Shutters, Croton Water Filtration Plant, and Cross River and Croton Falls pump stations. Each project is being undertaken for independent purposes and has utility independent of WFF. However, these projects would also support the goals of WFF by enabling DEP to meet its water supply demand during the RWBT temporary shutdown. Therefore, these projects are described below to assist in an understanding of the overall WFF and planning effort.

5.2.1 DEMAND MANAGEMENT

DEP is in the process of implementing a citywide Demand Management Plan to reduce water consumption.[1] This effort is designed to better account for, manage, and protect the City's water resources, thereby contributing to the long-term sustainability of the City's water supply.

The Demand Management Plan was published by DEP in January 2014, and includes five strategies aimed at reducing City water consumption. These strategies are as follows:

(1) A municipal water efficiency program aimed at reducing water use and consumption in City-owned properties;

(2) A residential water efficiency program aimed at encouraging the adoption of low-flow toilets, a primary residential water use;

(3) A non-residential water efficiency program, which encourages private companies to match municipal water-saving goals on a voluntary basis;

(4) Water distribution system optimization, which includes a variety of measures and programs to detect and reduce waste in the water supply distribution system; and

(5) A water supply shortage management strategy for which DEP will formalize the City's approach to water supply shortages in a revision to the City's drought management plan and rule.

In addition to reducing the City's total water demand, water savings achieved through the Demand Management Plan will directly offset water needs (and, in turn, augmentation project needs and costs) during the RWBT temporary shutdown.

5.2.2 CATSKILL/DELAWARE INTERCONNECTION AT SHAFT 4

The Catskill/Delaware Interconnection at Shaft 4 (Shaft 4 Interconnection) will allow water from the Delaware System to be diverted to the Catskill Aqueduct.[2] The interconnection will allow

[1] The Demand Management Plan is available here: http://www.nyc.gov/html/dep/html/ways_to_save_water/index.shtml

delivery of a variable flow range up to 365 mgd from the Delaware Aqueduct to the Catskill Aqueduct, prior to reaching Kensico Reservoir. The interconnection will also provide DEP with system flexibility including the ability to reduce or avoid use of Catskill System water during turbidity events and other operational conditions. This project will also help ensure a sustainable, resilient water supply for the City and its customers in the long term.

This project will allow maximized usage of the Delaware System during the preparation period leading to the temporary shutdown by allowing for increased withdrawals from Rondout Reservoir. In addition, the Shaft 4 Interconnection would be used during Catskill Aqueduct Repair and Rehabilitation to allow for flexibility of construction and maintenance of consumer water supplies as part of that component of the project. However, once the RWBT is temporarily shut down, the Shaft 4 Interconnection will not be available for use until the bypass tunnel is connected and the Delaware System is brought back online.

5.2.3 IMPROVEMENTS TO CATSKILL AQUEDUCT STOP SHUTTERS

Improvements to Catskill Aqueduct stop shutters will provide DEP with greater flexibility in diversion management from Ashokan Reservoir. Due to hydraulic considerations, DEP maintains the Catskill Aqueduct operating depth at a level sufficient to supply the 15 outside communities that are served by the Catskill Aqueduct. At low flow rates, supply to these outside communities can only be maintained through the use of stop shutters, which are physical barriers that can temporarily dam water inside the aqueduct. Stop shutters will be installed at six locations along the aqueduct's length between Ashokan and Kensico reservoirs (Harlem Railroad, Hunter Brook, and Washington Square Siphon Chambers; and Croton Lake, Moodna, and Wallkill Downtakes). Improvements to stop shutter facilities will provide DEP with improved ability to reduce diversions from the Catskill System and allows DEP to isolate certain segments of the Catskill Aqueduct while continuing to meet the water supply needs of upstate communities.

5.2.4 CROTON WATER FILTRATION PLANT

The Croton Water Filtration Plant, which became operational in spring 2015, enables the City to meet its public water supply and public health needs, and to comply with federal and State drinking water standards and regulations.

The Croton Water Filtration Plant has a maximum design treatment capacity of approximately 290 mgd. It reduces reliance on the amount of water needed from the Catskill System during turbidity events and both Catskill and Delaware systems during drought conditions. The Croton Water Filtration Plant is also critical to maintaining the City's water supply during the temporary shutdown, thereby reducing the overall supply augmentation needed to support WFF.

[2] Note that operation of the Shaft 4 Interconnection would conform with the 1954 Supreme Court Decree and all Flexible-Flow Management Program parameters set forth by the Delaware River Basin Commission.

5.2.5 CROSS RIVER AND CROTON FALLS PUMP STATIONS

Another example of DEP's continued efforts to improve the resiliency of its water supply system is the rehabilitation of the Cross River and Croton Falls pump stations. It is anticipated that both pump stations will be online and operational by 2017, prior to the RWBT temporary shutdown. These pump stations will enable DEP to move up to 240 mgd of water from Cross River and Croton Falls reservoirs in the Croton System to the Delaware Aqueduct, and finally to Kensico Reservoir. The ability to move water from these reservoirs will allow DEP to maximize its available water supply by diverting this additional water from the Croton System. The pump station improvements will allow DEP to maximize access to Croton System water during times of drought or emergencies, as well as provide a supplemental water source during the temporary shutdown. Pumping is allowable with permission from the NYSDOH.

The Cross River Pump Station, located in Katonah, Westchester County, New York, pumps water from Cross River Reservoir in the Croton System to the Delaware Aqueduct. DEP completed an upgrade to the Cross River Pump Station that has more than doubled its pumping capacity from 27 to 60 mgd. The extensive rehabilitation work was completed in 2013.

Similar to the Cross River Pump Station, the Croton Falls Pump Station in the Town of Carmel, Putnam County, New York, was constructed to transfer water from Croton Falls Reservoir to the Delaware Aqueduct. DEP is planning to replace the existing hydraulically-driven pump, turbine system, and building at the Croton Falls Pump Station with a new electrically-powered pump system within a new structure on the same site. The pump replacement will increase transfer capacity from 65 to 180 mgd, resulting in more water available to transfer to the Delaware Aqueduct for water supply purposes. The project is planned to be operational in 2017.

5.3 SUMMARY OF ENVIRONMENTAL REVIEW OF WFF COMPONENTS AND SUPPORTING PROJECTS

Due to the complex nature of WFF, the use of certain DEP programs and projects that have independent utility would ensure the continued supply of drinking water to upstate and City residents to support the temporary shutdown, as described above. These independent programs do not require environmental review, because either they are part of routine operations or they have previously undergone environmental review. In addition, critical WFF program components were evaluated in the previous EIS. Therefore, the existing projects, the components of WFF that were evaluated in the previous EIS and its updates, the components that are evaluated in this DEIS, and efforts with independent utility that factor into DEP's future operations or have already undergone separate environmental reviews are shown in **Table 5.3-1**.

Table 5.3-1: Summary of Environmental Review of WFF Components and Supporting Projects

WFF COMPONENTS AND SUPPORTING PROJECTS	Described Further in this DEIS
RWBT Bypass Components Evaluated As Part of the Previous EIS[1]	
• Construction of Shaft 5B (Town of Newburgh) and Shaft 6B (Town of Wappinger) and the Bypass Tunnel • Construction of the Bypass Tunnel Connection • Operation of the Bypass Tunnel	**No**
Upstate Water Supply Resiliency Components Evaluated In this DEIS	
Water Supply Augmentation • Catskill Aqueduct Repair and Rehabilitation	**Chapter 9**
WFF Shutdown System Operations • WFF Shutdown System Operations prior to, during, and immediately following the temporary shutdown for the connection of the bypass to the RWBT • Addition of siphons to Rondout Reservoir • Changes to aluminum sulfate (alum) treatment at the Pleasantville Alum Plant	**Chapter 10**
Rondout-West Branch Tunnel Inspection and Repair • Inspection of non-bypassed segments of the RWBT • Repair of the RWBT, including internal repairs near Wawarsing • Decommissioning the bypassed section of the RWBT	**Chapter 11**
Independent DEP Program(s) with Environmental Reviews Completed or Not Required	
• Demand Management • Catskill/Delaware Interconnection at Shaft 4 • Improvements to Catskill Aqueduct Stop Shutters • Croton Water Filtration Plant • Croton and Cross River Pump Stations	**No**

Table 5.3-1: Summary of Environmental Review of WFF Components and Supporting Projects

WFF COMPONENTS AND SUPPORTING PROJECTS	Described Further in this DEIS
Related Municipal Projects with Independent Environmental Reviews	
• Water Supply District Expansions by the Towns of Wawarsing, New Paltz, and Wappinger • Water Supply Projects by the Towns of New Windsor and Newburgh (also affecting the Town of Marlborough), the Town and Village of New Paltz, and the High Falls Water District[2]	**No**

Notes:

[1] The socioeconomic analysis presented in Chapter 12 evaluates WFF as a whole, including the updated costs of the RWBT Bypass.

[2] Projects are being evaluated by these entities to augment their supplies during the 10-week shutdowns of the Catskill Aqueduct and during the RWBT temporary shutdown. These projects would be evaluated independent of WFF by each of the project sponsors.

This chapter presents high-level project descriptions of the Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation), WFF Shutdown System Operations (WSSO), and the RWBT Inspection and Repair (inspection and repair). More detailed project descriptions for each of these components of WFF can be found in Chapter 9, "Proposed Catskill Aqueduct Repair and Rehabilitation" through Chapter 11, "Proposed Rondout-West Branch Tunnel Inspection and Repair" of this DEIS.

6.1 CATSKILL AQUEDUCT REPAIR AND REHABILITATION

The original capacity of the upper portion of the Catskill Aqueduct between Ashokan and Kensico reservoirs has been reduced over time, partly because of the accumulation of biofilm (a naturally occurring layer of microorganisms within a self-produced polymer) along the aqueduct's interior surface. DEP is proposing to repair and rehabilitate the Catskill Aqueduct to restore its historical capacity. This action would provide water supply augmentation during the temporary shutdown of the RWBT. In addition, the repair and rehabilitation of the Catskill Aqueduct would extend the aqueduct's useful life for many years to come.

Biofilm removal from the interior surface of the upper Catskill Aqueduct is the primary activity that would restore the aqueduct's capacity to support the RWBT temporary shutdown. Though relatively thin, the rough surface of this biofilm layer has contributed to slowing the flow of water from a historical maximum of 660 mgd to the current capacity of 590 mgd. The repair and rehabilitation consists of removing this layer of biofilm along the unwatered upper Catskill Aqueduct, with the exception of the deep pressure tunnels which have limited accessibility. Access to the aqueduct for biofilm removal would be provided by access manholes, new and existing boatholes, downtake chambers, and other locations that allow entry into the aqueduct. Options for removal of the existing biofilm deposits include manually scraping, vacuuming, or pressure washing.

As biofilm is removed, it would be collected and wash water from the removal process would be treated at specific locations along the Catskill Aqueduct. Treatment would typically occur before the start of a pressure tunnel, directly upstream of Kensico Reservoir, or at steel pipe siphons. Biofilm solids would be hauled to a regulated, permitted, or otherwise authorized off-site facility. In addition to restoring the aqueduct's capacity during the RWBT temporary shutdown, biofilm removal would provide an opportunity to conduct a full condition assessment and, if feasible, conduct repairs that would help ensure the longevity of the aqueduct.

Adequate ventilation is critical to achieve enhanced capacity and flow in the Catskill Aqueduct because water in the aqueduct is driven by gravity. When the aqueduct is at full capacity, trapped air can create pockets that reduce the ability of the aqueduct to convey water. These air pockets reduce the aqueduct's overall flow and capacity. New air vent structures would be installed at key points along the aqueduct to promote unobstructed flow within the aqueduct and further improve the aqueduct's capacity, both during the temporary shutdown and beyond. The ventilation would consist of above-ground steel vents.

The repair and rehabilitation would include temporary chlorination at DEP's Ashokan Screen Chamber, located at the head of the Catskill Aqueduct, to reduce biofilm and to maintain increased capacity by preventing biofilm regrowth.[1] A new dechlorination facility would be constructed at the existing Pleasantville Alum Plant, located in the Village of Pleasantville, to remove sodium hypochlorite, chlorine dioxide, and/or chlorine residuals prior to discharge into Kensico Reservoir and to ensure that all water that enters Kensico Reservoir meets water quality standards (see **Figure 1.1-4**). Site improvements would be undertaken at both the Ashokan Screen Chamber and Pleasantville Alum Plant to facilitate chlorination and dechlorination operations, respectively (see **Figure 6.1-1** and **Figure 6.1-2**). DEP would work with all water suppliers who receive water from the Catskill System (Outside Community Connections) to implement measures aimed at monitoring and minimizing any potential changes to water supply characteristics as a result of temporary chlorination. These measures may include operational changes by Outside Community Connections to reduce water age or oxidant use; monitoring of pH, chlorine dioxide, and disinfectant by-products (DBPs); and addition of a corrosion inhibitor, as applicable (see Section 9.18.2.5, "Public Health").[2] Furthermore, the temporary chlorination could potentially affect groundwater at two leak locations along the Catskill Aqueduct. DEP is committed to working with well owners to implement an Action Plan for potentially affected private drinking water supply wells, if required (see Section 9.19, "Commitments").

In addition, as discussed in Section 6.2, "Water for the Future Shutdown System Operations," increased alum addition prior to Catskill Aqueduct water entering Kensico Reservoir could be necessary because of the need to rely more heavily on the Catskill System during the RWBT temporary shutdown, precluding DEP from reducing flows in the aqueduct, to manage limited occurrences of highly turbid water. Furthermore, alum may also be required to treat any temporary increases in turbidity that could result from chlorination that could remove biofilm from the interior of the aqueduct in advance of mechanical biofilm removal activities. Therefore, an additional, separate, liquid alum system would be installed at the Pleasantville Alum Plant to supplement the existing dry alum system.

Several small leaks in the Catskill Aqueduct, though substantially smaller in magnitude than the leaks along the RWBT, provide underground pathways for water from the aqueduct to the surrounding environment. These leaks include cracks, joints, or other gaps that have developed over time. At locations where leak repairs are not feasible or prove unsuccessful, local dechlorination systems would be installed. The temporary chlorination would require a State Pollutant Discharge Elimination System (SPDES) permit for discharges of treated leak water to receiving streams and from the aqueduct into Kensico Reservoir. DBPs would form in the Catskill Aqueduct water as a result of chlorination. Limited concentrations of DBPs could potentially enter the surrounding

[1] Chlorination of the Catskill Aqueduct would be achieved through addition of one of two chlorine-based chemicals: chlorine dioxide and sodium hypochlorite. To ensure that water within distribution systems is in compliance with safe drinking water standards as regulated by the New York State Department of Health (NYSDOH), the chemical added and its and corresponding dose would vary depending on seasonal and operating conditions. These doses were selected to achieve the goals of the project, while limiting the potential for effects to the City's water supply (i.e., Kensico Reservoir) and to the Outside Community Connections that rely on the Catskill Aqueduct as a primary or secondary drinking water supply. No more than one chemical would be used at a time.

[2] Water age is the term used to describe the amount of time water has been in contact with an oxidant, in this case sodium hypochlorite or chlorine dioxide.

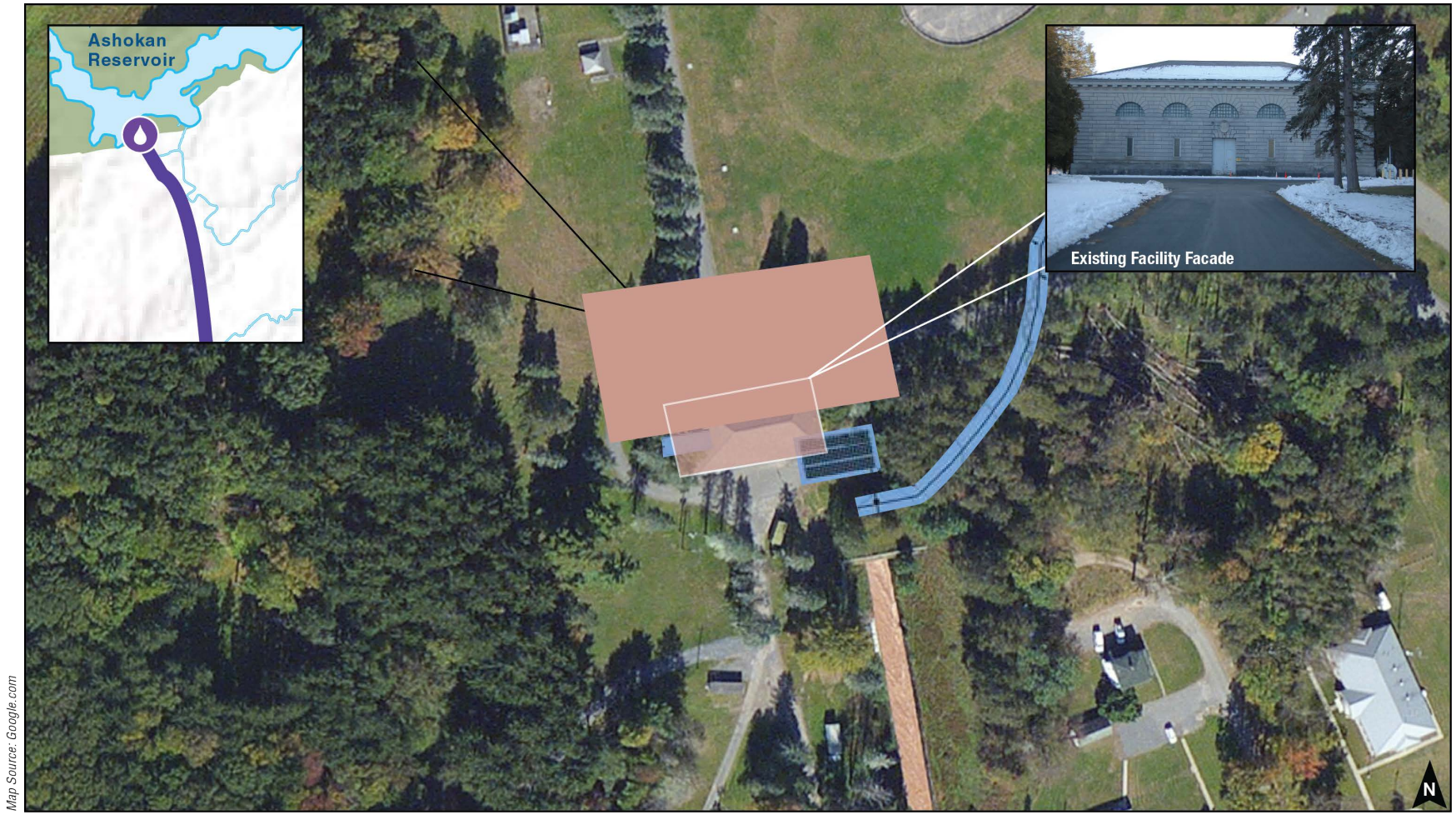

Figure 6.1-1: Proposed Chlorination Facility at Ashokan Screen Chamber

Figure 6.1-2: Proposed Dechlorination Facility at Pleasantville Alum Plant

environment, although natural resources impacts are anticipated to include minor and temporary effects on vegetation at discharge points (see Section 9.18, "Project-wide Impact Analysis").

The temporary chlorination would require a State Pollutant Discharge Elimination System (SPDES) permit for discharges from the leaks to receiving streams and from the aqueduct into Kensico Reservoir. A number of mechanical and structural repairs are proposed both to support restoring capacity to the aqueduct and to contribute to the longevity of the aqueduct and its associated systems. Air vent installation is the main mechanical repair that would restore historical capacity to the aqueduct, as described above. Bridge repairs to address structural defects, boathole installation, siphon blow-off replacement and improvements, culvert drain sluice gate improvements, and repairs at the Croton Lake Downtake Chamber, would each add to the useful life of the aqueduct and would allow DEP to fully unwater the aqueduct in support of biofilm removal and condition assessment. Coupled with these primary mechanical and structural repair activities, structural repairs of the Catskill Influent Chamber at Kensico Reservoir would further facilitate biofilm removal and condition assessment by allowing aqueduct unwatering downstream of New Croton Reservoir.

The repair and rehabilitation would also include removing sediment from the Catskill Kensico Bypass Tunnel and permanent closure of a damaged manhole in the same section to ensure long-term reliability of the Catskill System, as well as to maintain the integrity of the system's emergency back-up infrastructure.

The repair and rehabilitation activities would be performed in segments along the approximately 74 miles of the upper Catskill Aqueduct between Ashokan and Kensico reservoirs. Due to the geographic span and number of proposed work activities, multiple staging areas would be established at several locations to allow work crews to streamline execution of work activities while reducing temporary environmental effects (i.e., construction traffic) to local communities. Preparation of these staging areas may consist of construction or rehabilitation of access roads, steel pipe siphon bridge inspection and repair, tree and shrub clearing, gravel placement or fill, construction of temporary culverts or stream crossings, and grading.

Repair and rehabilitation requires a phased approach to construction and operation that would span several years. Since biofilm removal would be the key activity that would restore the aqueduct's capacity to support the RWBT temporary shutdown, much of the proposed work is phased to support this activity. The proposed repair and rehabilitation would begin in 2017 and is anticipated to be complete in 2022 in advance of the temporary shutdown.

Leaks would be repaired or local dechlorination systems installed between 2017 and 2018, prior to temporary chlorination. Chlorination would commence in 2019 and continue through 2023. To complete the proposed work activities, three shutdowns lasting up to 10 weeks each would be spaced over a period of 3 years from 2017 to 2019. These 10-week shutdowns would allow for access to the interior of the aqueduct to carry out the primary repair and rehabilitation activities, and would generally take place between October and December to coincide with the lowest water demand period of the year. Depending on time constraints and other factors, additional shutdowns may be planned.

The 10-week shutdown length is governed by the water supply needs of the City and the Outside Community Connections. However, the planned 10-week shutdowns would suspend supply to these Outside Community Connections. The Catskill Aqueduct would not be taken out of service unless the City's water supply and Outside Community Connections are able to sufficiently manage alternative supplies. Where necessary, DEP would work with Outside Community Connections who currently do not have sufficient back-up supply to confirm they would have sufficient alternate water supplies for use during the shutdown periods.

6.2 WATER FOR THE FUTURE SHUTDOWN SYSTEM OPERATIONS

As previously described, Upstate Water Supply Resiliency is intended to allow DEP to address leaks in the RWBT by enabling a temporary shutdown of the RWBT to connect the bypass tunnel, and to complete the internal repair of the RWBT near the Town of Wawarsing. Prior to, during, and just following the temporary shutdown, DEP would implement WSSO, a specific and substantially different operating protocol that is designed to maintain reliability of the water supply system during an extended shutdown of the RWBT.[1] During WSSO, DEP would remain in compliance with all regulations that govern the operation of the water supply system, unless specifically noted in the DEIS. DEP would seek exemptions from release requirements set forth in the State regulations (Title 6 of the New York Codes, Rules and Regulations Part 672.3-3) for the West Branch and New Croton reservoirs during October through May, and April and May of the RWBT temporary shutdown, respectively to maximize retention of water for water supply purposes during this time. Releases to meet the Ashokan Reservoir Combined Seasonal Storage Objective (CSSO) under the IRP would also be temporarily discontinued, while community releases would be maintained.[2] A variance from the IRP during Delaware Aqueduct repairs is permitted in the IRP as part of the October 2013 Order on Consent. This variance from the CSSO would commence during the pre-shutdown period in June to facilitate Ashokan Reservoir being full at the start of the RWBT temporary shutdown in October.[3]

Implementation of WSSO would consist of three phases with distinct operational protocols. The first, pre-shutdown phase would begin in advance of the RWBT temporary shutdown to prepare the water supply system for heavier reliance on the Catskill and Croton systems, while the Delaware System is temporarily unavailable. To ensure the Catskill and Croton systems are prepared to operate at peak capacity once the temporary shutdown begins, DEP would maximize the Delaware System diversion to the City, including the use of the Shaft 4 Interconnection, to meet demand between June 1 and September 30, 2022.[4] During this same period, DEP would reduce flow to the City from the Catskill and Croton systems, thereby increasing the amount of water stored in those systems. DEP has established real-time parameters (reservoir storage and forecasted inflows from upstream waterways) that would be measured and used in summer and

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[1] DEP frequently modifies its operation of the water supply system for many reasons and in response to a variety of conditions. These operational modifications are considered as routine management activities that would not be subject to environmental review under State Environmental Quality Review Act (SEQRA) or City Environmental Quality Review (CEQR). In contrast, WSSO, as analyzed in this DEIS, refers to a specific and substantially different protocol for operating the system than is currently in place and which is designed solely for the purposes of Upstate Water Supply Resiliency in connection with WFF.

[2] The Ashokan Reservoir storage target fluctuates seasonally and, as a result, forecast-based releases are used to control reservoir storage and meet a Combined Seasonal Storage Objective.

[3] Section 7 c. of the Interim Ashokan Release Protocol for Ashokan Reservoir states "DEC, or DEP with concurrence by DEC, determines that releases must be changed or interrupted as necessary for inspection, maintenance, testing and repairs (including Delaware Aqueduct repairs)."

[4] While diversions to the City from the Delaware System during the pre-shutdown phase would be maximized, the City would continue to make all releases required under the Supreme Court Decree and other applicable commitments (e.g., the Flexible Flow Management Program or its successor).

early fall 2022 to indicate whether supply would be adequate to support water supply needs during the temporary shutdown. Once established that sufficient supply exists to support the temporary shutdown, unwatering of the RWBT would begin on October 1, 2022.

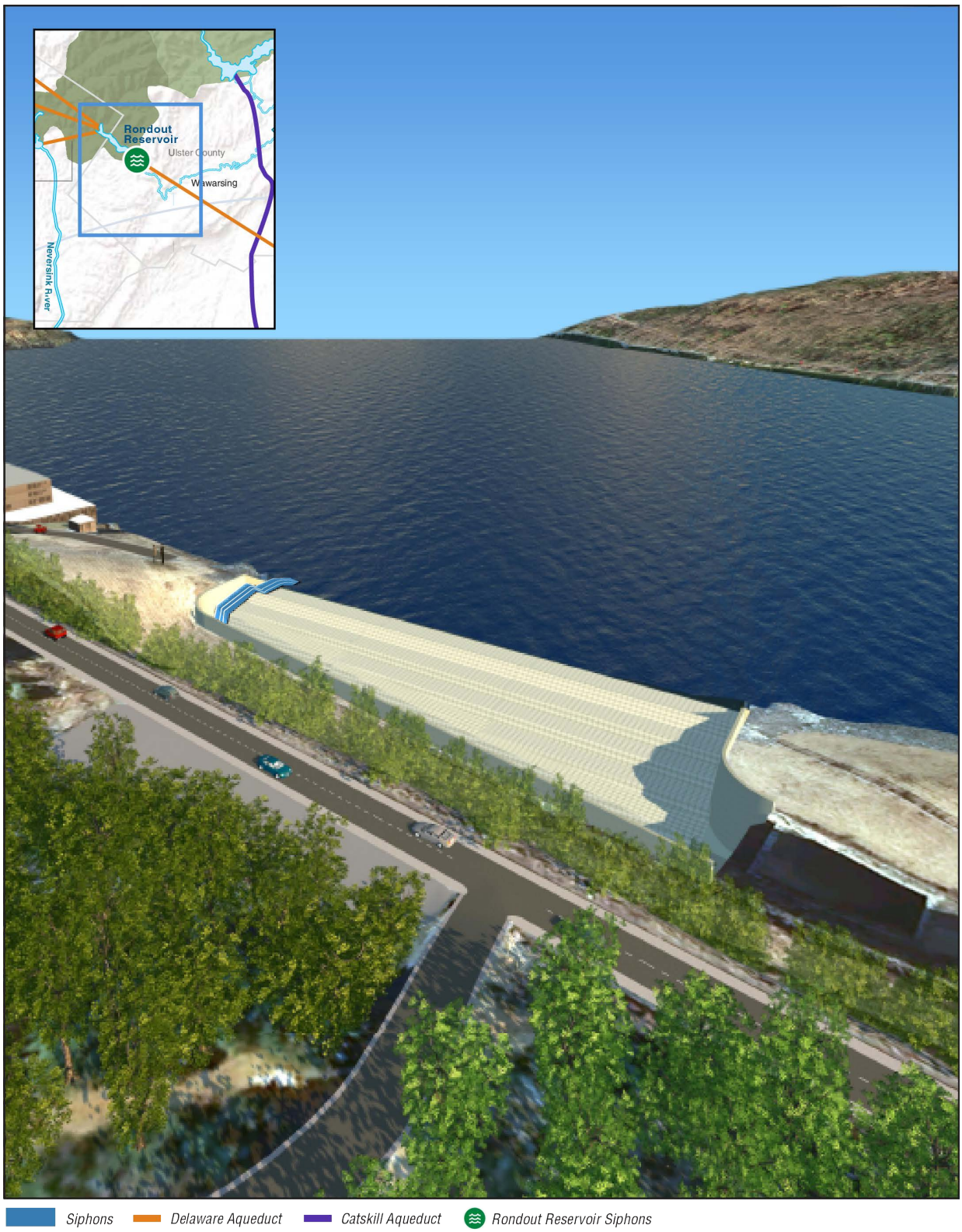
Once the temporary shutdown is initiated based on favorable hydrologic conditions, all flow through the RWBT would be stopped and the second phase would commence. The assessments in this DEIS assume a duration for the temporary shutdown of up to 8 months. During this time, WSSO for the Delaware System would focus on management of surface water that would typically be used for drinking water purposes. An increase in releases from these reservoirs would be required to maintain reservoir elevations at typical levels and reduce the likelihood of spills from extreme precipitation. In three of the four Delaware System reservoirs (Pepacton, Cannonsville, and Neversink), releases would occur within the framework of the Flexible Flow Management Program, or its successor. During this time, hydropower facilities installed within the tunnels between these reservoirs, and Rondout Reservoir, would be offline.

The fourth of the Delaware System reservoirs, Rondout Reservoir, is not governed by the same regulations and has limited release capacity (approximately 15 mgd). Therefore, three temporary siphons would be constructed at the southern end of the reservoir on Merriman Dam to release water to Rondout Creek (see **Figure 6.2-1**). The combined total release capacity for the siphons and existing release infrastructure would be approximately 260 mgd. Construction of the siphons is anticipated to begin in 2021 so that the siphons would be available for use, as necessary, at the onset of the temporary shutdown. Use of these siphons would be necessary to minimize spills from the reservoir. The use of the siphons would not be in conflict with the 1980 Stipulation of Discontinuance, which manages releases from Rondout Reservoir, since the stipulation controls how much NYSDEC can direct releases versus how much DEP can voluntarily release.

During this second phase, while the Delaware System is temporarily unavailable, the Catskill and Croton systems would be relied upon more heavily, including utilizing the Croton Falls and Cross River pump stations to deliver up to 240 mgd from the Croton System to Kensico Reservoir via the Delaware Aqueduct. As a result of this increased usage of the supply from the Catskill and Croton systems, some of the reservoirs in these two systems may be drawn down to meet demand during the temporary shutdown and, as a result, water elevations would drop. However, West Branch and Kensico reservoirs would be kept full to maintain operational flexibility during the RWBT temporary shutdown.

While natural conditions and DEP's watershed protection programs generally ensure the high quality of the City's water supply, DEP must be prepared to manage episodic water quality events associated with turbidity that may arise from major storm events.[5]

[5] Turbidity is an optical property of water influenced by the presence of higher concentrations of suspended particles that make water opaque or cloudy. These particles normally consist of suspended clay, silt, organic and inorganic material, and microscopic organisms. Turbidity is of concern primarily due to its potential effects on public health, as the cloudiness could interfere with chlorine and ultraviolet-light disinfection, rendering disinfection less effective. Further, contaminants may adhere to or be encapsulated by the suspended particles. Alum application helps to consolidate suspended particles. These larger, consolidated particles have sufficient mass to settle out of the water, thereby reducing turbidity.



Map Source: PlaNYC

Figure 6.2-1: Rondout Reservoir Siphons Rendering

The Catskill System is most vulnerable to turbidity events due to the underlying soils and clays that make up the streambeds in the Catskill region. During these typically short-term periods of turbidity, DEP has been able, in most instances, to temporarily reduce daily flows from the Catskill System to the City and, only when necessary, to treat excessive turbidity in the aqueduct with alum at their Pleasantville Alum Plant, upstream of Kensico Reservoir, until Ashokan Reservoir returns to higher water quality. However, because of the need to rely more heavily on the Catskill System during the temporary shutdown, DEP would likely be precluded from reducing flows in the Catskill Aqueduct.

As a result, DEP would need to expand the alum treatment facilities at the Pleasantville Alum Plant to accommodate the likely need to increase the rate of alum treatment during the temporary shutdown to manage water quality during limited occurrences of highly turbid water thereby ensuring compliance with drinking water quality regulations and protecting public health. Alum treatment requires approval from NYSDEC and NYSDOH, and during WSSO, DEP would comply with necessary regulatory approvals and notifications for alum treatment and other operations decisions as required under typical operations.

Throughout the RWBT temporary shutdown, DEP would continuously monitor and evaluate water supply and demand. If, at any given time, system demand exceeds predicted available supply, a demobilization from the RWBT bypass tunnel connection would be initiated. Demobilization would include bringing the RWBT back into service. The water supply systems would be allowed to return to typical conditions. The repair would be continued in a subsequent year, when the hydrologic condition of the water supply system allowed.

Following the end of the temporary shutdown, the post-shutdown phase would commence with the restarting of the RWBT. This phase of WSSO would continue for a short time period to allow the water supply system to return to typical reservoir conditions.

6.3 RONDOUT-WEST BRANCH TUNNEL INSPECTION AND REPAIR

Inspection and repair would include an initial inspection of the sections of the RWBT upstream and downstream of the bypass connection points and internal repairs to leaks in the RWBT near the Town of Wawarsing, Ulster County, New York, and the cessation of leaks over the long term with the decommissioning of the bypassed section of the RWBT (inspection and repair). Inspection and repair would take place concurrently during the RWBT temporary shutdown and with connection of the RWBT bypass tunnel. During this time, internal repairs, including crack repair and contact grouting, would be made to the leaking area near Wawarsing. Should any areas outside of the Wawarsing area be identified during the inspection as requiring repair, the appropriate repairs may also be conducted during the temporary shutdown.

The existing access shafts along the RWBT would be used to facilitate inspection and repair activities. The Rondout Effluent Chamber and Shafts 1, 2A, 8, and 9 of the Delaware Aqueduct would be used during the inspection and repair for communication, ventilation, or access to the RWBT (see **Figure 1.1-6**). Shaft 2A, located in the Town of Wawarsing, would be used for access and for conducting internal repairs of the RWBT near the Wawarsing area.

During inspection and repair, DEP customers on this segment of the Delaware Aqueduct would be required to temporarily use alternate water supplies. DEP is working with the affected customers to ensure they would have sufficient water supplies in advance of the temporary shutdown.[6]

Once inspections and repairs to the RWBT are complete and the bypass tunnel is connected to the existing RWBT, the bypass tunnel would become a permanent component of the RWBT. At that time, the leaking segment that was bypassed would be permanently decommissioned, all existing leaks are expected to cease, and DEP's water supply system would be operated in the same manner as it was prior to WFF (see **Figure 6.3-1**). When the connection and the repairs are completed, water flow would be restored to the Delaware Aqueduct. For a short time following the RWBT temporary shutdown, DEP would rely more heavily on the Delaware System to allow the Catskill and Croton systems to rebalance. Once complete, the water supply system would return to typical operating conditions.

[6] Table 5.3-1 notes the affected customers.

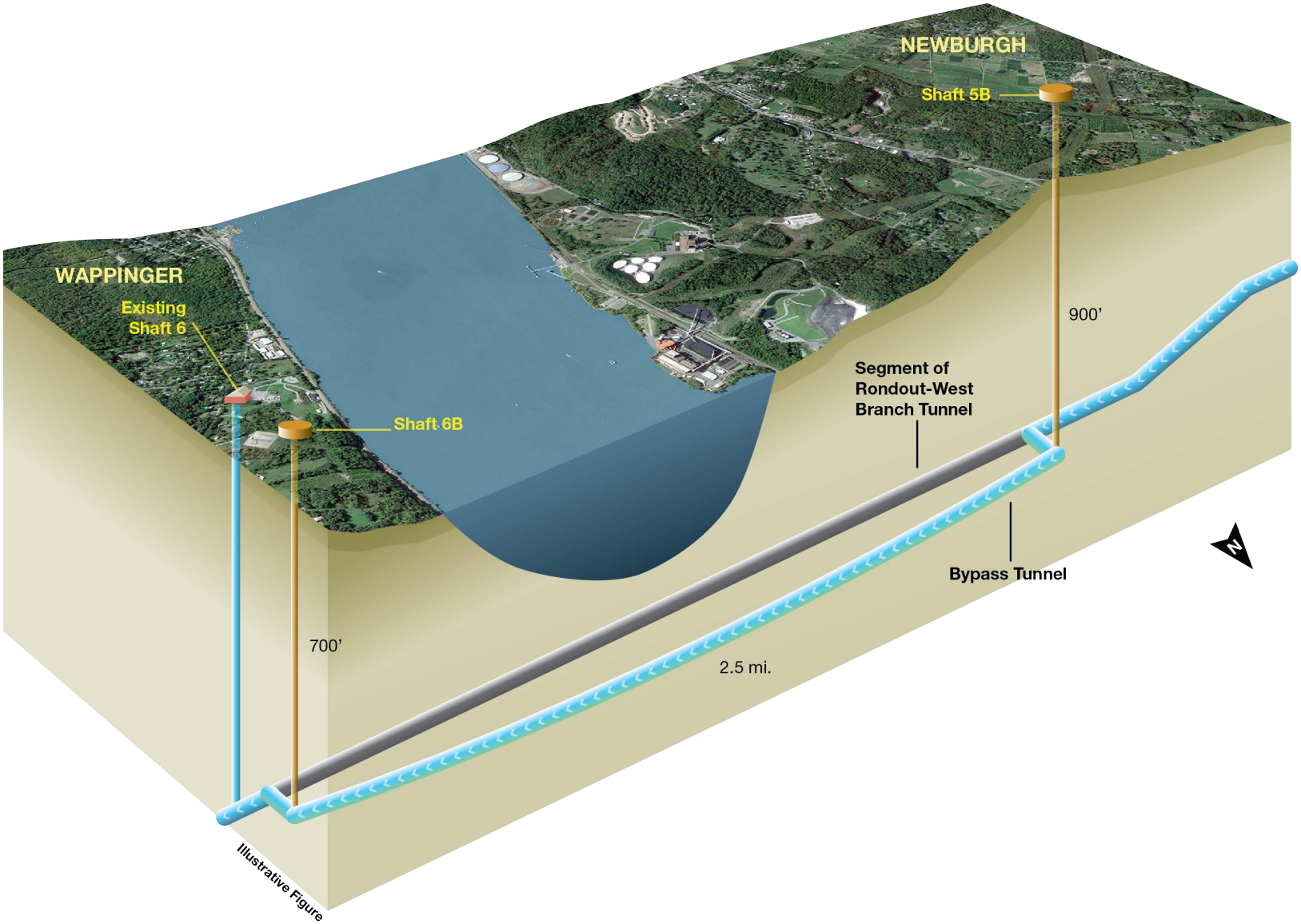


Figure 6.3-1: Rondout-West Branch Tunnel: Decommissioned Segment and Bypass Tunnel

Upstate Water Supply Resiliency would require discretionary permits, approvals, and consultations from federal, State, and local agencies. Anticipated permits, approvals, and consultations are shown in **Table 7.0-1**, and are identified for each Upstate Water Supply Resiliency component.

Table 7.0-1: Summary of Potential Discretionary Permits, Approvals, and Consultations for Upstate Water Supply Resiliency

Involved Agency	Permit/Approval/ Consultation	Proposed Catskill Aqueduct Repair and Rehabilitation	Proposed WFF Shutdown System Operations	Proposed RWBT Inspection and Repair
U.S. Army Corps of Engineers	Section 10	✓	✓	✓
	Section 404	✓	✓	✓
U.S. Fish and Wildlife Service	Consultation	✓	✓	✓
National Marine Fisheries Service	Consultation			✓
NYS Department of Environmental Conservation	Freshwater Wetlands	✓	✓	✓
	Protection of Waters for in/near water construction activities	✓	✓	-
	Section 401 Water Quality Certification	✓	✓	✓
	SPDES Permit (General Permit for Stormwater Associated with Construction Activities)	✓	-	-
	SPDES Permit (Multi-Sector General Permit for Stormwater Associated with Industrial Activities)	✓	-	-
	Individual SPDES Permit (Form NY-2C)	✓	-	-
	Air Emissions (201 Permit/Registration)	✓	-	-
	Natural Heritage Program Consultation	✓	✓	✓
New York State Department of State	Coastal Zone Consistency Assessment	✓	✓	-
New York State Department of Transportation	Roadway or Right-of-Way Use/Easement	✓	-	-
New York State Department of Health	Public Water Supply Improvement	✓	✓	✓
New York State Office of Parks, Recreation and Historic Preservation	Historic Resources Consultation	✓	✓	-
New York City Department of Health and Mental Hygiene	Water Supply Improvement Approval	✓	✓	✓
Public Design Commission	Design Review	✓	✓	-
Various Counties/Towns/Villages	These permits and approvals may include or be related to: Building Permits, Clearing and Grading, Code Variances, Floodplain Development, Highways and Facilities, Public Works, Site Plan Approvals, Stormwater Permits (including Municipal Separate Storm Sewer System [MS4] approvals), Tree Removal, Utility Consultation, Water and Sewer Connections, Water Supply or other Ministerial Permits.	✓	✓	✓

Under State Environmental Quality Review Act (SEQRA) and the City Environmental Quality Review, DEP (as Lead Agency) is required to examine the potential for environmental impacts that could occur as a result of Upstate Water Supply Resiliency. This chapter provides a description of the analytical framework that forms the basis for determination of: potential impacts associated with each component of Upstate Water Supply Resiliency (included in Chapters 9, "Proposed Catskill Aqueduct Repair and Rehabilitation" through Chapter 11, "Proposed Rondout-West Branch Tunnel Inspection and Repair" of this DEIS); and cumulative impacts, as applicable and as described in Chapter 12, "Cumulative Impacts," of this DEIS.

As previously discussed, Upstate Water Supply Resiliency is comprised of the following three components: Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation), WFF Shutdown System Operations (WSSO), and the RWBT Inspection and Repair (inspection and repair). Together, these components serve to meet the stated purpose and need for Upstate Water Supply Resiliency. However, each component of Upstate Water Supply Resiliency varies in scope, purpose, and schedule. Both repair and rehabilitation and inspection and repair involve specific activities at multiple sites prior to and during the RWBT temporary shutdown. WSSO represents a change in operations coordinated across the entire water supply system prior to, during, and just following the temporary shutdown so that changes at any given site are less well-defined and depend on hydrologic conditions at the time of the RWBT temporary shutdown. Therefore, the manner in which the potential for impacts are evaluated and described varies slightly between the components.

The impact analyses have been tailored to each Upstate Water Supply Resiliency component, and are presented separately in their respective chapters (Chapter 9, "Proposed Catskill Aqueduct Repair and Rehabilitation" through Chapter 11, "Proposed Rondout-West Branch Tunnel Inspection and Repair"). However, each of these three chapters includes: a detailed project description, including the specific purpose and need for each component relative to WFF; relevant project background; proposed activities; an identification and description of all study areas where proposed activities would occur; and a schedule for implementation of these activities. Each chapter also includes the following that are tailored for each component:

- Impact analysis methodology;
- Impact analysis section;
- Other information necessary to describe the component and its potential to result in significant adverse impacts;
- Commitments incorporated into each project to reduce the potential for impacts to the maximum extent practicable; and, if applicable
- If required, mitigation developed in response to potential significant adverse impacts.

For each component of Upstate Water Supply Resiliency, the impact analysis methodology sections first identify impact categories that do not apply (e.g., shadows, solid waste and sanitation services, and greenhouse gas (GHG) emissions and climate change). For the repair and rehabilitation and the inspection and repair components, a screening assessment is conducted to determine whether CEQR Technical Manual thresholds are met, triggering the need to conduct further analysis for a particular impact category. If the screening thresholds are exceeded and an impact analysis is warranted, a description of how the analysis is conducted is provided in each chapter. Where an impact analysis is required, impact categories are then evaluated within the appropriate impact analysis section for each study area. The evaluations are based upon the impact analysis years, analysis criteria, CEQR Technical Manual thresholds, and applicable town codes. WSSO has the potential to create unique changes at each reservoir and receiving waterbody within and downstream of the City's system. Therefore, all relevant impact categories are considered for each waterbody, and an evaluation of whether WSSO would alter the conditions at each waterbody as compared to typical operations is conducted. If so, further analysis is warranted, and the waterbody is assessed for all relevant impact categories. If not, an impact analysis is not warranted for the waterbody.

For all project components, the impact analysis considers the project activities that represent the reasonable worst-case scenario as part of Upstate Water Supply Resiliency. By doing so, the largest potential for an impact is discussed. It should be noted that specific activities or durations may be slightly different than presented in this DEIS once the work is completed. For example, a 10-week shutdown of the Catskill Aqueduct could occur as 2 5-week shutdowns.

The potential for cumulative impacts to occur as a result of implementation of Upstate Water Supply Resiliency as a whole is presented in Chapter 12, "Cumulative Impacts."

Upstate Water Supply Resiliency conditions during construction are established and disclosed for applicable impact categories based on the duration, location, magnitude, and intensity of the work activities.

Based on this organization, the following is a description of the analytical framework used for this DEIS.

Analysis Year(s). The analysis year(s) refers to future year(s) when a proposed project is likely to affect its environmental setting. The analysis year(s) is representative of the anticipated construction and/or operational years. For Upstate Water Supply Resiliency, there could be multiple analysis years, depending on the project component and impact category (see **Figure 8.0-1**).

Baseline Conditions (Existing Conditions). Baseline conditions establish a reference point against which future conditions can be compared. Generally, these conditions are based on data collected and assessed that represent existing conditions at the time of publication of this DEIS in areas that are most likely to be affected by the proposed project (study areas).

Future Conditions without the Proposed Project (No Action Condition). The Future Conditions without the Proposed Project are the conditions in the study area projected to occur in the analysis year(s) without implementation of Upstate Water Supply Resiliency.

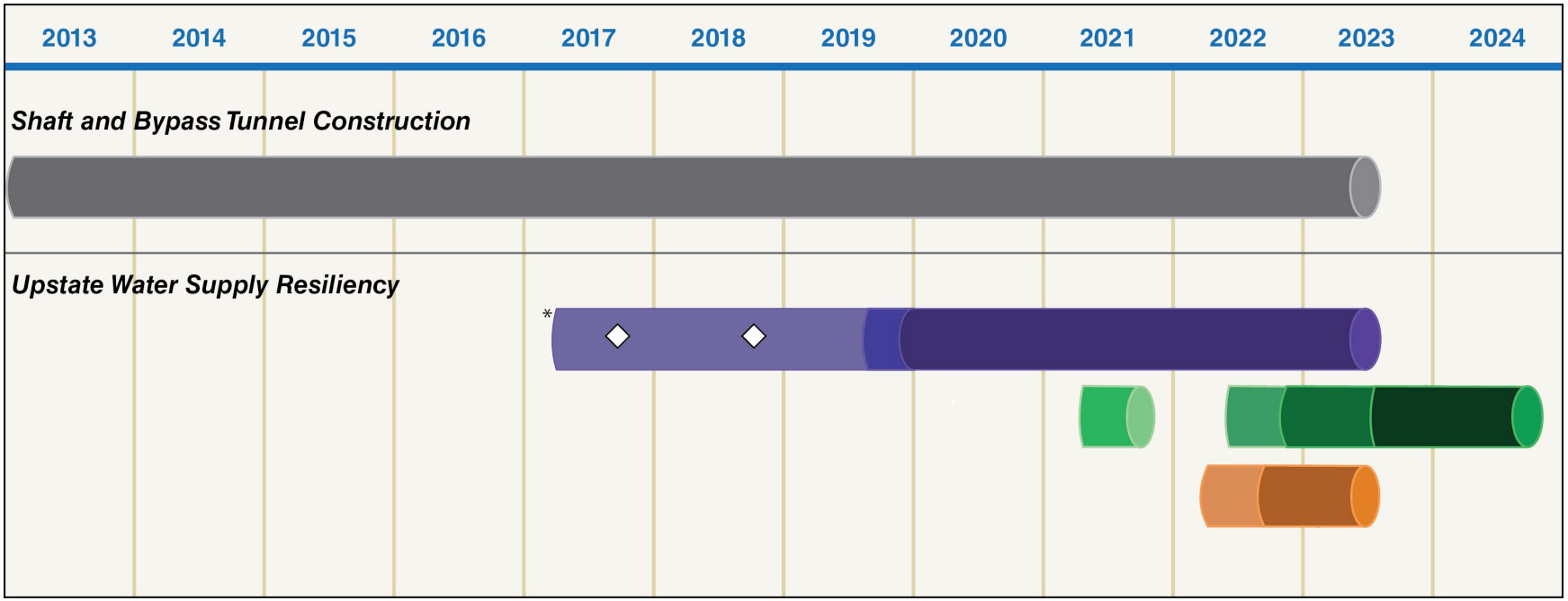


Figure 8.0-1: Water for the Future Schedule

Probable Impacts with the Proposed Project (With-Action Condition). Potential changes to the study areas resulting from construction or operation of Upstate Water Supply Resiliency were compared to the Future Condition without the Proposed Project to assess the potential for significant adverse impacts (Probable Impacts with the Proposed Project). This comparison provides for an understanding of the potential impacts that could result with implementation of Upstate Water Supply Resiliency. This comparison can be found in each component chapter's impact analysis as well as the components' cumulative analysis, for years representative of both construction and operation conditions, as applicable.

As described previously, Upstate Water Supply Resiliency is comprised of planning, procurement, and several components that would be constructed and begin operating over different years, culminating in connection of the bypass tunnel to the RWBT beginning in 2022. As such, there are several analysis years in this DEIS.

Future conditions associated with construction of Upstate Water Supply Resiliency components were evaluated for peak periods that represent a "reasonable worst-case scenario" in order to determine the probable impacts with the proposed project. Operation of Upstate Water Supply Resiliency components were evaluated for temporary operational conditions during the RWBT temporary shutdown and long-term operational conditions, described further in this DEIS in the following section.

8.1 EIS ASSESSMENT CONDITIONS AND IMPACT CATEGORIES

This DEIS contains the following conditions: an analysis of the potential impacts for construction and operation of each Upstate Water Supply Resiliency component, as applicable, and cumulative environmental impacts of Upstate Water Supply Resiliency for each of the applicable SEQRA and CEQR impact categories.

Construction: The construction assessment is based on the potential for impacts during construction of each component of Upstate Water Supply Resiliency. A description of each component's proposed construction schedule is included in Chapter 9, "Proposed Catskill Aqueduct Repair and Rehabilitation" through Chapter 11, "Proposed Rondout-West Branch Tunnel Inspection and Repair."

The construction assessment of the Catskill Aqueduct Repair and Rehabilitation focuses on activities related to:

- Construction of chlorination and dechlorination facilities at Ashokan and Pleasantville, respectively;
- Site access improvements and primary staging areas;
- Leak repair and local dechlorination;
- Mechanical and structural repairs;
- Streambank restoration and protection;
- Removal of sediment within the Catskill Kensico Bypass Tunnel, located on the western boundary of the Kensico Reservoir extending between the Catskill Influent Chamber to the Catskill Upper Effluent Chamber; and
- Surficial activities related to biofilm removal along the aqueduct.

The construction assessment of WSSO focuses on activities related to construction of the temporary siphons at Merriman Dam.

The construction assessment of the RWBT Inspection and Repair focuses on activities related to:

- Work at the RWBT Rondout Effluent Chamber and shaft sites that would occur to support inspection of the RWBT and internal repairs near Wawarsing; and
- The potential for changes in Roseton during the unwatered RWBT condition (the latter discussed as impacts during unwatering).

Temporary Operation: The temporary operational assessment is based on the potential for impacts of Upstate Water Supply Resiliency prior to and during the RWBT temporary shutdown. The temporary operational assessment of the Catskill Aqueduct Repair and Rehabilitation focuses on activities related to temporary operation of the chlorination and dechlorination facilities at Ashokan and Pleasantville, respectively, and treatment at leak sites that would not be repaired. The temporary operational assessment of WSSO focuses on activities related to operating the water supply system prior to, during, and for a short time following the RWBT temporary shutdown, temporary operation of siphons at Merriman Dam, and potential temporary increase in alum

treatment at the Pleasantville Alum Plant. Finally, there is no temporary operational assessment for RWBT Inspection and Repair since the RWBT would be offline during the temporary shutdown and inspection, repair, and decommissioning activities occurring during this time are evaluated as part of the construction analysis.

Operation: The operational assessment is based on the potential for impacts for each component of Upstate Water Supply Resiliency that would occur in 2023 after the RWBT temporary shutdown is complete, the bypass tunnel is in operation, and the water supply system has returned to typical conditions. The operational assessment of repair and rehabilitation focuses on activities related to operation of the rehabilitated Catskill Aqueduct when chlorination and dechlorination facilities at Ashokan and Pleasantville, respectively, would no longer be required, mechanical repairs are completed, biofilm is removed, treatment systems at leak sites are removed and those sites are returned to baseline conditions. The operational assessment of WSSO focuses on operation of the water supply system under typical conditions. The operational assessment of the inspection and repair focuses on conditions near Wawarsing and in Roseton once internal repairs are completed and the bypass tunnel is in operation.

For each of these conditions, where applicable and based on SEQRA and CEQR guidelines, this DEIS includes a screening assessment and/or analysis of impacts to the following impact categories:

- Land use, zoning, and public policy;
- Socioeconomic conditions;
- Community facilities and services;
- Open space and recreation;
- Critical environmental areas;
- Shadows;
- Historic and cultural resources;
- Urban design and visual resources;
- Natural resources;
- Hazardous materials;
- Water and sewer infrastructure;
- Solid waste and sanitation services;
- Energy;
- Transportation;
- Air quality;
- Greenhouse gas (GHG) emissions and climate change;
- Noise;
- Neighborhood character; and
- Public health.

These impact categories are evaluated for each component of Upstate Water Supply Resiliency, individually and cumulatively, under the construction and operational conditions described above, as applicable.

8.2 DEFINITION OF IMPACT CATEGORIES AND ANALYSIS THRESHOLDS

This section provides an overview of each of the impact categories. This section also presents the screening thresholds applied in this DEIS for each impact category that, if met, trigger the need to conduct further analysis for a given project component. These impact categories and thresholds are based on *CEQR Technical Manual* guidelines. For some categories, the SEQRA Handbook criteria are also applied, since the proposed project components are located outside of the City.[1] Analytical methods based on these categories and applicable screening thresholds used for assessment of each project component are provided at the beginning of each project component's chapter.

8.2.1 LAND USE, ZONING, AND PUBLIC POLICY

Land use refers to the activity that is occurring on a plot or area of land and within the structures that occupy it. Types of uses include residential, retail, commercial, industrial, vacant land, and parks. Land uses vary in designation by municipalities (e.g., counties, cities, towns). A land use analysis characterizes the uses and development trends in the area that may be affected by a proposed project, and determines whether a proposed project is either compatible with those conditions or may affect them.

Zoning is typically used to control the use, density, and bulk of development in a particular location. Types of zoning include residential, commercial, and manufacturing and can also be further subdivided by density (e.g., high- or low-density residential) or districts (e.g., different manufacturing districts). Similar to land use, zoning varies by municipality and the analysis considers the proposed project's compliance with, and effect on, the area's zoning and other applicable public policies.

Public policies are officially adopted and promulgated policies that describe the intended use applicable to an area or particular site. A proposed project could require evaluation against multiple policies (e.g., citywide or countywide and local).

Where a land use and zoning impact analysis is not required, a brief description of the baseline and projected land uses and zoning designations in the study area(s) informs the analyses of other impact categories. Where a public policy impact analysis is required, it focuses on applicable polices to confirm the proposed project's compatibility.

8.2.2 SOCIOECONOMIC CONDITIONS

The socioeconomic character of an area includes its population, housing, and economic activity. Socioeconomic changes may occur when a proposed project directly or indirectly changes any of

[1] The *CEQR Technical Manual* is available online at http://www.nyc.gov/html/oec/html/ceqr/technical_manual_2014.shtml
The *SEQRA Handbook* is available online at http://www.dec.ny.gov/docs/permits_ej_operations_pdf/seqrhandbook.pdf.

these elements. A socioeconomic analysis is warranted if the proposed project would:

- Directly displace residential population to the extent that the socioeconomic character of the neighborhood would be substantially altered;
- Directly displace more than 100 employees;
- Directly displace a business that is:
  - Unusually important because its products or services are uniquely dependent on its location;
  - Based on its type or location, it is the subject of other regulations or publicly adopted plans aimed at its preservation; or
  - It serves a population uniquely dependent on its services in its present location;
- Result in substantial new development that is markedly different from existing uses, development, and activities within the neighborhood;
- Add to, or create, a retail concentration that may draw a substantial amount of sales from existing businesses within the study area to the extent that certain categories of business close and vacancies in the area increase, thus resulting in a potential for disinvestment on local retail streets; or
- Affect conditions within a specific industry. For example, a regulatory change that would adversely affect the economic and operational conditions of certain types of businesses or processes may affect socioeconomic conditions in a neighborhood in two ways:
  (1) If a substantial number of residents or workers depend on the goods or services provided by the affected businesses; or
  (2) If the proposed project would result in the loss or substantial diminishment of a particularly important product or service.

A socioeconomic impact analysis also takes into consideration the fact that the City finances construction of capital improvement projects through the City's Municipal Water Finance Authority and/or the New York State Revolving Fund Program. The Municipal Water Finance Authority is authorized to issue bonds to fund the construction of capital improvement projects. Debt service for these projects is paid by DEP's ratepayers. The State Revolving Fund Program provides low-cost financing for capital improvement projects and is available to municipalities (based on EPA and State matching grants).

Therefore, the socioeconomic condition analysis for this DEIS would consider whether Upstate Water Supply Resiliency or a component would result in significant impacts due to: (1) direct residential displacement; (2) direct business displacement; (3) indirect residential displacement; (4) indirect business displacement; and (5) adverse effects on a specific industry using the above

criteria. This analysis is also performed cumulatively. It also includes an evaluation of the potential incremental costs to the City water and sewer rates and upstate water rates of customers of City-provided water and how these incremental costs could influence items (1) through (5) above.

8.2.3 COMMUNITY FACILITIES AND SERVICES

Community facilities are public or publicly funded schools, libraries, child care centers, health care facilities, and fire and police protection. A proposed project can affect facility services when it physically displaces or alters a community facility or causes a change in population that may affect the services delivered by a community facility, as might happen if a community facility is already over-utilized, or if a project is large enough to create a demand that could not be met by the existing facility. A community facilities analysis is required if there would be potential direct or indirect effects on a facility that would meet the following criteria:

- **Public Schools:** generate additional attendance of 50 or more elementary/middle school children or 150 high school children;
- **Libraries:** result in more than a 5-percent increase in the ratio of residential units to libraries in the service area;
- **Child Care Centers:** generate 20 or more children who are eligible for public day care;
- **Healthcare Facilities:** generate additional demand for these facilities; or
- **Police and Fire Protection:** require additional services from these departments.

If warranted, the community facilities analysis would assess whether Upstate Water Supply Resiliency would have the potential to affect community facilities and services due to the physical displacement or alteration of land occupied by a community facility or service, increase demands on community facilities and services, or disrupt operations of the community facility or services (i.e., from lowering of groundwater levels due to decommissioning).

8.2.4 OPEN SPACE AND RECREATION

Open space is defined as publicly or privately owned land that is publicly accessible and operates, functions, or is available for leisure, play, or sport, or is set aside for the protection and/or enhancement of the natural environment. Recreational activities include hunting, fishing, and hiking, as well as mountain biking, bird watching, photography, and recreational vehicle use. An open space and recreation analysis focuses on officially designated existing or planned public open space. A quantified analysis of potential impacts on open space is required for proposed projects that would: (1) directly alter or remove an open space resource; (2) result in more than 200 new residents; or (3) result in more than 500 new employees. A quantified analysis first involves calculating the percentage change in the open space ratio between the proposed project and the future conditions without the proposed project. If warranted, the open space and recreation analysis would map and describe open space resources within the study area(s). The open space and recreation analysis would also discuss how these resources, or access to them,

are anticipated to change in the future. Finally, the open space and recreation analysis would disclose any changes associated with Upstate Water Supply Resiliency that have the potential to affect open space as a result of direct impacts (i.e., associated with limited access, changes in views, noise).

8.2.5 CRITICAL ENVIRONMENTAL AREAS

Critical Environmental Areas (CEAs) are specific geographic areas designated by local agencies and NYSDEC. There are numerous criteria that must be met for an area to be designated as a CEA, including:

- A benefit or threat to human health;
- A natural setting (fish and wildlife habitat, forest and vegetation, open space and area) of important aesthetic or scenic quality;
- Agricultural, social, cultural, historic, archeological, recreation, or educational value; or
- An inherent ecological, geological, or hydrological sensitivity to change that may be adversely affected by any change.

An analysis is required if the proposed project has the potential to affect the CEAs identified by NYSDEC. If required for Upstate Water Supply Resiliency, it would generally include mapping of the CEA, a description of its designation rationale, and an analysis of whether the proposed project activities have the potential to disrupt or reduce the value provided by the CEA.[2]

8.2.6 SHADOWS

A shadows screening assessment is required if a proposed project would either result in: (1) new structures (or additions to existing structures, including the addition of rooftop mechanical equipment) of 50 feet or more; or (2) be located adjacent to, or across the street from, a sunlight-sensitive resource. The sunlight-sensitive resources of concern considered in the shadows assessment, listed below, are those resources that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity:

- Publicly accessible open space, including parks, beaches, playgrounds, plazas, schoolyards, greenways, or landscaped medians with seating.
- Historic architectural resources that depend on direct sunlight to be enjoyed by the public. Only the features that are sunlight-sensitive, as listed below, should be considered, as opposed to the entire architectural resource:
    - Buildings containing design elements that are part of a recognized architectural style that depends on the contrast between light and dark design elements, including deep

[2] NYSDEC's CEAs are available online at: http://www.dec.ny.gov/permits/6184.html.

recesses or voids (e.g., open galleries, arcades, recessed balconies, deep window reveals, and prominent rustication);

- Buildings distinguished by elaborate, highly carved ornamentation; or
- Buildings with stained glass windows.

- Exterior materials and color that depend on direct sunlight for visual character (e.g., the multicolored features found on Victorian Gothic Revival or Art Deco facades).
- Historic landscapes, such as scenic landmarks, including vegetation that is recognized as a historic feature of the landscape (e.g., weeping beeches [*Fagus sylvatica 'Pendula*'] or pansy [*Viola* spp.] beds).
- Features in structures where the effect of direct sunlight is described as playing a significant role in the structure's significance as a historic landmark.
- Natural resources where the introduction of shadows may alter the resource's condition or microclimate:
  - Surface waterbodies;
  - Wetland resources;
  - Upland resources; and
  - Significant, sensitive, or designated resources, such as coastal fish and wildlife habitats.

If applicable, a shadows analysis is required to assess whether new structures may cast shadows on sunlight-sensitive publicly accessible resources or other resources of concern such as natural resources at any time throughout the year. If warranted, a shadows analysis would be conducted for Upstate Water Supply Resiliency components by preparing a base map that shows the relevant study area with respect to the location of all nearby sunlight-sensitive publicly accessible resources. The analysis would be conducted by preparing a map with a delineated study area around a proposed structure to represent the longest possible shadow that could be cast by any proposed structure, calculated as 4.3 times the height of the structure as would occur on December 21, the winter solstice. If sunlight-sensitive publicly accessible resources are identified within the shadow area, the significance of the shadow's impact would be evaluated and further studies would be conducted, as warranted.

8.2.7 HISTORIC AND CULTURAL RESOURCES

Historic and cultural resources include both architectural and archeological resources. Architectural resources generally include historically important buildings, structures, objects, sites, and districts. Archeological resources are physical remains, usually subsurface, of the prehistoric, Native American, and historic periods, such as burials, foundations, artifacts, wells, and privies. A historic resources screening assessment is required if there is potential to affect

either archeological or architectural resources. Proposed projects that could affect archeological resources, and that therefore typically require an analysis, are those involving above-ground construction that result in in-ground disturbance, or below-ground construction, such as excavation. Proposed projects that require architectural resources analysis include:

(1) New construction, demolition, or significant alterations to any building, structure, or object;

(2) A change in scale, visual prominence, or visual context of any building, structure, object, or landscape feature;

(3) Construction, including but not limited to excavation, vibration, subsidence, dewatering, and the possibility of falling objects;

(4) Additions to or significant removal, grading, or replanting of significant historic landscape features;

(5) Screening or elimination of publicly accessible views; and

(6) The introduction of significant new shadows or significant lengthening of the duration of existing shadows over a historic landscape or on a historic structure with sunlight dependent features (see "Shadows," above).

The following are examples of architectural resources considered to be historic and cultural resources:

- Locally designated landmarks, interior landmarks, and scenic landmarks.
- Resources listed on, or formally determined to be eligible for inclusion on, the National and/or State Register of Historic Places; or contained within a district listed on, or formally determined to be eligible for listing on, the National and/or State Register of Historic Places.
- Resources recommended by the State Board for listing on the National and/or State Registers of Historic Places.
- National Historic Landmarks.

Typically, analysis of archeological resources is not necessary for proposed projects that would disturb areas that have been recently excavated for other purposes. In addition to direct disturbance from excavation, construction impacts on historic and cultural resources must be considered if in-ground disturbances or vibrations associated with project construction could undermine the foundation or structural integrity of nearby resources. A construction vibration analysis is needed for historic and cultural resources if the proposed project involves construction activities within 400 feet of a historic resource.

For Upstate Water Supply Resiliency, a historic and cultural resources analysis would involve:

- The identification of an appropriate study area based on the potential for disturbance;
- A review of National and/or the State Register of Historic Places for resources identified to be within the study area;
- A review of past uses within the study area and whether there is potential for sensitive materials to remain on site; and
- An analysis of the potential for the proposed project to disturb or alter the integrity of identified or suspected resources, if warranted.

8.2.8 URBAN DESIGN AND VISUAL RESOURCES

Urban design is the totality of components that may affect the visual experience of public space in urban settings. The following public space elements play an important role in that experience: streets, buildings, visual resources, open space, and natural features. Visual resources are those resources whose scenic character has been recognized through national or state designations, and significant natural or built features with a connection from a public space, including views to these features (i.e., public park landmark structures, distinct buildings, or groups of buildings, or natural resources). A preliminary screening assessment of urban design and visual resources is required if a proposed project would result in:

(1) Physical changes to a site that could be observed by the public from a public space;

(2) A change to the public's experience from the public space that is significant enough to require greater explanation and further study;

(3) Obstruction or elimination of important views or vistas or the visual enjoyment of a historic resource either through impairment of the public's ability to view the historic resource, or the alteration of the visual context in which the resource is understood; or

(4) Obstruction or interference with the public's enjoyment of views of the visual resource.

An urban design analysis is not needed since Upstate Water Supply Resiliency is not located in an urban setting. For locations outside of the City, the NYSDEC *Assessing and Mitigating Visual Impacts* policy and guidance defines visual and aesthetic impacts, describes when a visual analysis is necessary and how to review a visual impact analysis, differentiates State and local concerns, and defines avoidance, mitigation, and offset measures that eliminate, reduce, or compensate for negative visual effects.

A visual resources analysis would include identification of the study area, based on the area where the proposed project may influence land use patterns and the built environment and identification of public view corridors, and an analysis of how these view corridors could change as a result of the proposed project using mapping, photographs, design information, and renderings. If warranted, the visual resource analysis would map and describe public view

corridors looking into or out of the study area(s), discuss how these public view corridors are anticipated to change in the future, and disclose any changes associated with Upstate Water Supply Resiliency that have the potential to affect public view corridors as a result of direct impacts (i.e., associated with limited access, obstruction of views by buildings or equipment and changes due to demolition or changes to natural resource communities).

8.2.9 NATURAL RESOURCES

Natural resources are defined as: (1) an area's biodiversity (plants, wildlife, and other organisms); (2) any aquatic or terrestrial areas capable of providing suitable habitat to sustain the life processes of plants, wildlife, and other organisms; and (3) any areas capable of functioning in support of the ecological systems that maintain environmental stability. A natural resources analysis considers species in the context of the surrounding environment, habitat, or ecosystem and, if these are present, an analysis of the proposed project's potential to impact those resources is required. Such resources include groundwater, soils and geologic features, numerous types of natural and human-created aquatic and terrestrial habitats (including wetlands, dunes, beaches, grasslands, woodlands, landscaped areas, gardens, parks, and built structures), and any areas used by wildlife. Although any aspect of the area's biodiversity may be considered in a natural resources analysis, those species classified as sensitive, vulnerable, rare, threatened, endangered, or otherwise worthy of protection (e.g., species of special or management concern, or candidate species) as designated by federal or state agencies are to be given consideration at the individual, indicator species, or group level.

For the purposes of analysis, categorization of natural resources typically includes:

- **Water resources**: surface water (oceans, rivers, bays, streams, estuaries, ponds, lakes) and groundwater, vernal/ephemeral/seasonal pools, springs, seeps, intermittent water courses, drainage, drainage systems, and floodwater systems/floodplains;

- **Wetlands**: freshwater and tidal wetlands;

- **Terrestrial resources**: beaches, dunes, bluffs, thickets, grasslands, old meadows, fields, woodlands and forests, ravines, talus hillsides, rock/bedrock outcrops, caves, landfills, and gardens and other ornamental landscaping;

- **Built resources**: piers, waterfront structures, and ruins that are habitats for marine species and nesting and foraging areas for birds; beach and flood protection structures; and other structures such as mines, bridges, tunnels, and culverts offering habitat to various species; and

- **Plant and animal species and their habitats**: plants, birds, amphibians, reptiles, bivalves, fish, insects, and mammals, and the natural environment that support these species.

According to the *CEQR Technical Manual*, a natural resource analysis is required if: (1) a natural resource is present on or near the site of the proposed project; and (2) the proposed project has the potential to disturb, impact, or affect that resource. If there is a potential for direct or indirect

project-related adverse impacts to natural resources, then further analysis is required. Direct impacts are those that immediately interfere with or alter the resource by causing death, injury, harm, harassment, and/or displacement; impact baseline site conditions, such as filling or draining areas; construction of bulkheads, piers, and other structures in the water; or the removal of vegetation (clearing and grading). Indirect impacts are those that affect a natural system or another resource that uses or relies upon habitat provided by the resource under study (habitat loss/loss of "critical" habitat).

If a proposed project is located within the Coastal Zone Boundary, an assessment of consistency with the State and other applicable Local Waterfront Revitalization Program(s) is also warranted.

A detailed natural resources analysis for the proposed project is not generally warranted if:

- The site and surrounding area is mostly devoid of natural resources;
- Habitat for natural resources or sensitive species does not exist on the proposed project site; disturbance of the subsurface would not impact areas on which other natural systems are dependent; and/or
- The potential for disturbance from the project has been previously deemed insignificant by a government agency with jurisdiction over that resource, and conditions have not changed significantly since prior permits were issued for other projects with the same level of disturbance.

While different for each type of resource, a natural resources analysis for Upstate Water Supply Resiliency, if warranted, would generally include:

- Identification of known resources through mapping and consultation with federal, State, and local agencies;
- Seasonal surveys; evaluation of the environmental systems that support natural resources (i.e., waterways and waterbodies); and
- Description of the proposed project activities and how they would interact with identified natural resources and the overall environmental system.

8.2.10 HAZARDOUS MATERIALS

A hazardous material is any substance that poses a threat to human health or the environment and includes heavy metals, volatile and semivolatile organic compounds, methane, polychlorinated biphenyls, dioxins, pesticides, and hazardous wastes as defined in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 371. The potential for significant impacts from a proposed project related to hazardous materials can occur when:

(1) elevated levels of hazardous materials exist on a site and the proposed project would increase pathways to human or environmental exposure;

(2) a proposed project would introduce new activities or processes using hazardous materials and the risk of human or environmental exposure is increased; or

(3) the proposed project would introduce a population to potential human or environmental exposure from off-site sources.

If all these elements can be ruled out, then no further analysis is required. If the proposed project has the potential to result in one or more of these criteria, a hazardous materials analysis is required.

Prior to conducting a hazardous materials analysis, a historical land use review, regulatory agency list review, and site and surrounding area reconnaissance through a Phase I Environmental Site Assessment (ESA) is conducted. Pursuant to current All Appropriate Inquiry legislation, the current ASTM 1527-13 standard for ESA should be followed. If potential for contamination is found during the Phase I ESA, then Phase II surface and subsurface investigations may be recommended to be included as part of the construction phase of project implementation. The Phase II investigation would be conducted to confirm the presence and extent of the contamination and to identify appropriate mitigation measures. The Phase II investigation may include several physical investigations that confirm the presence, type, and extent of potential contamination. Subsurface testing may include the following: (1) soil gas sampling with probes to test for volatile compounds; (2) soil sampling to sample and test for a range of potential contaminants; and (3) the installation of groundwater monitoring wells to test for groundwater contamination. Magnetometer or ground-penetrating radar may be useful in locating below-grade structures, such as buried storage tanks or underground piping.

For Upstate Water Supply Resiliency, a hazardous materials analysis would involve identification of any areas of potential contamination within or adjacent to the study area(s) and disclosure of the use of any potential contamination as part of Upstate Water Supply Resiliency (i.e., water treatment chemicals). The contamination would be described as well as the potential for Upstate Water Supply Resiliency activities to disturb or alter the integrity of identified or suspected contamination. If there is a potential for disturbance or release of contamination, recommendations for next steps, including Phase II investigations and/or a listing of the approved protocols and standards to be followed to ensure its proper handling, storage, removal and/or disposal would be presented as part of the analysis.

8.2.11 WATER AND SEWER INFRASTRUCTURE

Infrastructure is comprised of the physical systems that support populations and include structures such as water mains and sewers, bridges and tunnels, roadways, and electrical substations. Because these are static structures, they have defined capacities that may be affected by growth in a particular area. A water and sewer infrastructure analysis is grouped into the categories of water supply, wastewater, and stormwater. Other types of infrastructure are addressed in other impact categories.

8.2.11.1 Water Supply

An analysis of a proposed project's impact to a water supply system is required for proposed projects that would result in or include an exceptionally large demand for water (e.g., power plants), very large cooling systems, or large developments (e.g., those that use more than approximately 1 mgd). In addition, proposed projects are required to be analyzed if they are located at the extremities of the water distribution system; could result in an interruption of service from a water supply system; or are located in areas that rely upon water supply sources that could be affected by the proposed project (e.g., groundwater) through the introduction of a potential pollutant or a change in demand on that resource.

A water supply infrastructure analysis for Upstate Water Supply Resiliency would describe the baseline conditions of water supply and distribution system serving the applicable study area, and the project activities that could affect the water distribution system (i.e., any interruption of service from the temporary shutdown of the aqueducts, changes to groundwater from temporary treatment of chlorinated leak water or from cessation of leaks). It would provide an analysis of future conditions of the water supply infrastructure and/or water use in the study areas without the proposed project; the incremental changes to the water supply infrastructure and/or water use from Upstate Water Supply Resiliency; and would outline measures to ensure adequate supply and services would exist to support the project.

8.2.11.2 Wastewater and Stormwater

A preliminary analysis of a proposed project's effects on wastewater and stormwater infrastructure is required depending on the number and intensity of users generated by a proposed project, its location, and its potential to increase impervious surfaces.

A wastewater and stormwater infrastructure analysis for Upstate Water Supply Resiliency would describe the baseline conditions of wastewater and/or stormwater collection system(s) for the study areas and the project activities that would affect runoff or wastewater infrastructure (i.e., increased impervious area or sanitary flow). It would provide an analysis of baseline conditions and future conditions without the proposed project's sanitary flow and stormwater runoff at the project site, and would provide an analysis of Upstate Water Supply Resiliency's incremental increase in sanitary or stormwater flow and its potential to overwhelm or change the capacity of these systems.

8.2.12 SOLID WASTE AND SANITATION SERVICES

Solid waste includes trash or garbage generated from residents, municipalities, and private institutions, regulated medical waste, and designated recyclables. A solid waste and sanitation services analysis is required if a proposed project has the potential to cause a substantial increase in solid waste production that may overburden available waste-management capacity. Few proposed projects have the potential to generate substantial amounts of solid waste (approximately 50 tons per week or more) that could result in a significant adverse impact. However, if warranted, a solid waste analysis for Upstate Water Supply Resiliency would include describing the waste management features of the proposed project and quantifying the incremental quantities of waste that the project would generate.

8.2.13 ENERGY

An energy analysis focuses on a proposed project's consumption of energy and, where relevant, potential effects on the transmissions of energy that may result from the proposed project. If required, the analysis would evaluate energy sources typically used to support operation (e.g., Heating, Ventilating, and Air Conditioning [HVAC], lighting, pumps) from all sources, including electricity, fossil fuels (e.g., oil, coal, gas), and hydroelectric power generation. If warranted, an energy analysis for Upstate Water Supply Resiliency would describe baseline energy use and generation within the study areas. It would also describe the project activities that would affect energy use or generation in the area under future conditions without the proposed project, an analysis of Upstate Water Supply Resiliency's incremental change in energy demand or generation, and its potential to overwhelm or change the energy grid.

8.2.14 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

There are six internationally recognized GHG emissions regulated under the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). [3] The potential for GHG impacts associated with the proposed project is evaluated by calculating the total GHG emissions associated with the project and examining the proposed project's contribution in relation to the City's qualitative goals for reducing GHG emissions.

Although the contribution of a proposed project's GHG emissions to global GHG emissions is likely to be considered insignificant when measured against the scale and magnitude of global climate change, certain proposed projects' contribution of GHG emissions should be analyzed to determine their consistency with the citywide GHG reduction goal of reducing GHG emissions by more than 30 percent by 2030. A proposed project that has the potential to generate GHG emissions does not, in and of itself, suggest the possibility of a significant adverse impact. Consequently, the protocol to utilize a threshold of quantitative increase of a proposed project's GHG emissions in a given study area relative to the future condition without the proposed project is not appropriate. Rather, an analysis of the proposed project's consistency with the City's GHG reduction goals would be required, when applicable. For Upstate Water Supply Resiliency, if required, this would be accomplished through estimates of the total GHG emissions associated with a proposed project and examination of the proposed project's contribution in relation to the City's GHG emissions reduction goal.

8.2.15 TRANSPORTATION

The objective of the transportation analyses is to determine whether a proposed project may have a potential significant impact on: traffic operations and mobility; public transportation facilities and services; pedestrian elements and flow; safety of all roadway users (e.g., pedestrians, bicyclists, and vehicles); on- and off-street parking or goods movement due to project-related

[3] The Kyoto Protocol is an international agreement adopted in 1997 that is linked to the United Nations Framework Convention on Climate Change.

traffic generation; and/or would require closing, narrowing, or otherwise impeding transportation. As presented in the transportation analyses, a peak day is defined as the day that generates the most vehicle trips during the duration of time corresponding to a given construction activity. A peak hour is defined as the hour that generates the most vehicle trips during the duration of time corresponding to a given construction activity. Finally, a Passenger Car Equivalent (PCE) is the number of passenger cars displaced by another type vehicle (such as a truck) in the prevailing traffic stream.

Transportation is grouped into the categories of traffic, transit, pedestrians, and parking, as described further below. The traffic analysis pertains primarily to congestion at intersections. A traffic analysis considers peak-hour vehicle trips in PCEs (see **Table 8.2-1**). If a proposed project would generate fewer than 50 PCEs, the need for further traffic analysis is generally unwarranted. Transit includes commuter rail and bus transit. If a proposed project is projected to result in fewer than 200 peak-hour rail or bus transit riders, further transit analyses are not typically required, as the proposed project is considered unlikely to create a significant transit impact. For pedestrian elements, pedestrian trips include not only "walk" trips, but also trips of other modes that usually have a pedestrian component. For example, bus trips from bus stops, and vehicle trips from parking facilities (except where on-site parking is provided). If the proposed project would result in fewer than 200 pedestrian trips during the analysis peak hours, a further detailed analysis would be unnecessary. However, under all circumstances, if the project proposes to remove or reduce capacity of a pedestrian element (for example, reducing the width of a sidewalk), then further analysis is necessary. Parking includes on- and off-street parking. A parking analysis may be needed if a proposed project generates a new residential unit, commercial space, or community facilities space. Based on these screening criteria, it is possible that detailed transportation analyses may not be required for one or more of these categories as is the case for proposed projects that would create low- or low-to-moderate-density development.

Table 8.2-1: Transportation Passenger Car Equivalents (PCEs)

Vehicle Type	PCE Factor
Personal Auto	1.0
Trucks/Buses with Two Axles and Waste Collection Vehicles	1.5
Trucks/Buses with Three Axles	2.0
Trucks with Four or more Axles	2.5
Source: *City Environmental Quality Review* (*CEQR) Technical Manual*	

If warranted, the transportation analysis for Upstate Water Supply Resiliency would include estimating the number of vehicle trips expected to be generated by the proposed project over the course of the entire day, as well as during the peak analysis hours. Depending on the results of the trip generation estimate, traffic routes would be determined and evaluated. Finally, the incremental increase in traffic would be determined by comparing the anticipated trip generation and routes to the future condition without the proposed project to determine whether there is a potential for impact that could result in reduced levels of service for surrounding road networks during construction or operation of Upstate Water Supply Resiliency.

8.2.16 AIR QUALITY

An air quality analysis (including odors) is required for proposed projects that could result in new mobile or stationary sources of air emissions or introduce new receptors that could be affected by existing mobile or stationary sources of air emissions. Ambient air quality, or the quality of the surrounding air, may be affected by pollutants of concern and proposed projects that include the construction of odor-producing facilities. An air quality analysis considers several "criteria" air pollutants, which are pollutants for which the EPA has established National Ambient Air Quality Standards (NAAQS). The criteria pollutants to be analyzed include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), inhalable particulate matter less than 10 microns in diameter (PM_{10}), fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). These pollutants are produced by mobile sources, such as vehicles, and stationary sources from fixed facilities or equipment. In addition, odors may result from stationary sources. Significant odor impacts may occur when a new, odor-producing facility is created by a proposed project, or when a proposed project adds sensitive uses close to an existing odor-producing facility.

In some cases, an air quality analysis of stationary sources also considers the potential for impacts from several non-criteria air pollutants, referred to as "air toxics." NYSDEC has issued guidance for these air toxics to establish maximum acceptable short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) for various non-carcinogenic air toxics, as well as inhalation risk thresholds for known or suspected carcinogenic air toxics. The SGCs, AGCs, and inhalation risk thresholds are considered to be "significance thresholds" below which a level is deemed insignificant.

A stationary source analysis may be warranted when a proposed project:

(1) Creates new stationary sources, pollutants, or odors, such as emission stacks for industrial plants, hospitals, incinerators, solid waste management facilities, or other large institutions that can affect surrounding uses;

(2) Adds uses near existing or planned future emissions stacks and the new uses might be affected by the emissions from the stacks;

(3) Adds structure(s) near such stacks that are capable of altering the dispersion of emissions so that surrounding uses are affected; or

(4) Places new receptors near stationary sources of emissions.

A mobile source analysis may be warranted when a proposed project increases or causes a redistribution of traffic, results in additional mobile sources of pollutants, or adds new uses near existing mobile sources of pollutants. These same thresholds are used for proposed projects outside of the City that follow CEQR/SEQRA guidance.

Mobile source analysis is required for proposed projects that, based on peak-hour traffic assignments, would exceed the criteria below at intersections in the traffic study area. Note that CO is the primary pollutant of concern for most mobile source analyses, including the analyses

of roadways and automobile parking lots and garages. Particulate matter may also be of concern for parking lots and garages used primarily by heavy-duty diesel-powered trucks and buses, and for proposed projects that would generate bus or truck traffic with the potential to affect nearby sensitive receptors for a prolonged period of time. Under CEQR guidelines, CO from mobile sources and $PM_{2.5}$ are used to determine significant impacts.

- CO screening criteria threshold:
  - 170 or more auto trips.
- $PM_{2.5}$ screening criteria threshold, based on peak-hour heavy-duty diesel vehicle (HDDV) traffic or its equivalent in vehicular emissions:
  - 12 or more HDDV for paved roads with average daily traffic fewer than 5,000 vehicles;
  - 19 or more HDDV for collector roads;
  - 23 or more HDDV for principal and minor arterials; or
  - 23 or more HDDV for expressways and limited access roads.

Vehicle usage generated by Upstate Water Supply Resiliency would be compared to the above CO and $PM_{2.5}$ screening thresholds (for areas in the City) to determine whether a detailed mobile source analysis is required.

If Upstate Water Supply Resiliency exceeds screening criteria in the *CEQR Technical Manual*, a detailed air quality analysis would be conducted using federally approved models to estimate the levels of applicable pollutants that would result from the mobile and stationary sources associated with construction or operation of Upstate Water Supply Resiliency. Results of mobile and stationary source air quality analyses are compared to NAAQS and other applicable CEQR criteria.

8.2.17 NOISE

Noise is unwanted sound. A noise analysis is required to determine whether a proposed project would result in a significant increase in noise levels, particularly around sensitive receptors, or introduce new sensitive receptors that would potentially be affected by project noise levels. Mobile sources are those noise sources that move in relation to a noise-sensitive receptor, principally automobiles, buses, trucks, aircrafts, and trains. Each has its own distinctive noise character and, consequently, an associated set of noise analysis descriptors. Stationary sources of noise do not move in relation to a noise-sensitive receptor. Typical stationary noise sources of concern under CEQR include machinery or mechanical equipment associated with industrial and manufacturing operations, construction equipment operating within a defined area, or building heating, ventilation, and air conditioning systems. Receptors may be affected by noise produced by mobile sources, stationary sources, or by a combination of both.

Noise levels are often A-weighted decibels (dBA) to more closely match the human perception of noise. A commonly used method is to describe the fluctuating noise heard over a specific time period as if it were a steady, unchanging sound. For this condition, a descriptor called the

"equivalent average sound level," L_{eq}, is computed. An L_{eq} is the constant sound level that conveys the same sound energy as the actual fluctuating sound in a given situation and time period. In general, hearing is such that a change of 3 dBA is a sound change that would barely be perceived by most people, whereas a 5 dBA change is readily noticeable. A 10 dBA change is perceived as a doubling (or halving) of loudness. In a large open area with no obstructive or reflective surfaces, noise levels drop from a point source of noise at a rate of 6 dBA with each doubling of distance from the source. For "line" sources, such as vehicles on a street, the noise levels drop off at a rate of 3 dBA with each doubling of the distance from the source. The drop-off rate varies with atmospheric and terrain conditions and the presence of obstructions. If a proposed project would cause a substantial stationary source to be operating within 1,500 feet of a noise-sensitive receptor, with a direct line of sight to that receptor, or introduce a noise-sensitive receptor in an area with high ambient noise levels, a noise impact analysis would be prepared.

A stationary noise impact analysis would be conducted to identify the background noise levels in the area and determine the maximum noise value that could occur at the closest receptors with the worst-case combination of stationary sources operating at one time. Overall noise emissions from the stationary sources are calculated using project-specific noise emission data from the manufacturer or, lacking that, estimating the emissions levels from a literature review. The total noise emission is then calculated at the location of the sensitive receptor, at the appropriate distance from the source.

A mobile noise impact analysis would be conducted based on the estimated change in noise PCE values assigned to proposed project-generated vehicle types to determine whether the proposed project would cause a 100 percent increase or more of existing noise PCEs, which is equivalent to an increase in noise of 3 dBA or more. Noise PCEs are estimated based on the following conversions for each single vehicle:

- Automobile or light truck: 1 noise PCE
- Medium truck: 13 noise PCEs
- Bus: 18 noise PCEs
- Heavy truck: 47 noise PCEs

If the proposed project would result in a doubling or more of existing noise PCEs, a mobile noise analysis would be prepared.

The *CEQR Technical Manual* defines daytime hours as between 7 AM and 10 PM, and nighttime hours as between 10 PM and 7 AM. A potential noise impact is identified if a proposed project has the potential to increase:

(1) An absolute daytime noise level of 65 dBA; or, if the baseline noise level is equal to or greater than 62 dBA, the threshold for significant impacts would be an increase in noise of 3 dBA due to the proposed project; or

(2) An increase in noise of 3 dBA during nighttime hours, irrespective of the background noise levels.

However, since Upstate Water Supply Resiliency would involve work activities in locations outside the City, locally established or accepted noise levels or noise analysis methodologies have been applied in cases where City methods are either irrelevant or less stringent.

For Upstate Water Supply Resiliency, a noise analysis would involve identifying noise-sensitive receptors near the relevant study areas, and calculating the noise levels generated by the project at the receptor locations. The analysis would then determine whether the potential exists for the project to generate a significant noise impact at a receptor or be significantly affected by high ambient noise levels and whether the noise emitted during construction or operation of Upstate Water Supply Resiliency would comply with local noise codes.

8.2.18 NEIGHBORHOOD CHARACTER

Neighborhood character is an amalgam of various elements that give neighborhoods their distinct "personality." These elements may include a neighborhood's land use, urban design, visual resources, historic resources, socioeconomics, traffic, and/or noise. An analysis of neighborhood character is required when a proposed project has the potential to result in significant adverse impacts in any of the following technical areas, or when the proposed project may have moderate effects on several of the elements that define a neighborhood's character: land use, zoning, and public policy; socioeconomic conditions; open space; historic and cultural resources; urban design and visual resources; shadows; transportation; or noise.

For Upstate Water Supply Resiliency, a neighborhood character analysis would include, if warranted, a description of the defining features of the neighborhood and an analysis of whether the proposed project has the potential to affect the neighborhood's defining features either through a single significant adverse impact in one of the related impact categories or a combination of moderate effects or changes identified in several of the relevant impact categories.

8.2.19 PUBLIC HEALTH

Public health is the organized effort of society to protect and improve the health and well-being of the population through monitoring; assessment and surveillance of activities or constituents that may affect public health; health promotion; prevention of disease, injury, disorder, disability and premature death; and reducing inequalities in health status. If an unmitigated significant adverse impact is identified in other impact categories such as air quality, water and sewer infrastructure, hazardous materials, or noise, a public health analysis is required.

For Upstate Water Supply Resiliency, a public health analysis would generally include identifying the extent of potential environmental exposures and summarizing the potential for impacts identified for each project component in the categories of air quality, water and sewer infrastructure, hazardous materials and noise. The public health analysis would also include a cumulative analysis of the quantity and quality of drinking water for the City water supply potentially affected by WFF as a whole.