

# **FISCAL YEAR 2018 CONSULTING ENGINEER'S REPORT**

March 2018



Front cover photo: **Pepacton Reservoir, Delaware Watershed, part of NYC Water Supply**  
*Photography by New York City Department of Environmental Protection*  
<https://www.flickr.com/photos/nycwater/>

March 1, 2018

Ms. Olga Chernat  
Executive Director  
New York City Municipal Water Finance Authority  
255 Greenwich Street  
New York, NY 10007

Re: New York City Municipal Water  
Finance Authority  
**Fiscal Year 2018 Consulting Engineer's Report**

Dear Ms. Chernat:

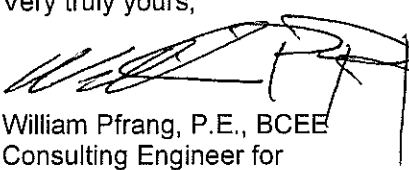
We herewith submit the Fiscal Year (FY) 2018 Consulting Engineer's Report on the operation of the Water and Sewer System of the City of New York (hereinafter referred to as "The System"). This Report addresses the condition and operation of The System as it presently stands, as well as the adequacy of capital and operating programs for Fiscal Years 2018 and 2019.

It is our opinion that The System condition is adequate and that it continues to be managed by the New York City Department of Environmental Protection (NYCDEP) in a professional and prudent manner. The current capital budget allocations for FY 2018 and FY 2019 are adequate for the immediate needs of The System.

The information presented in this report is based on the Preliminary Budget released on February 1, 2018. It is important to note that budgetary planning will continue past the date of this report and revisions may be made. It is our opinion, however, that meaningful observations and conclusions can be drawn at this time, although the final budget allocations may change during the budget finalization process.

We are not required to update this report for events and circumstances occurring after the date of this Report.

Very truly yours,

  
William Pfrang, P.E., BCEE  
Consulting Engineer for  
Municipal Water Finance Authority





**THE NEW YORK CITY MUNICIPAL WATER  
FINANCE AUTHORITY**

**FISCAL YEAR 2018 CONSULTING ENGINEER'S  
REPORT**

**PREPARED BY**

**AECOM**

**March 1, 2018**



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## **1.0 EXECUTIVE SUMMARY**

This Report addresses the condition of The System as it presently stands and the adequacy of the capital investment program and operating budgets for Fiscal Years 2018 and 2019 as presented in the New York City Department of Environmental Protection (NYCDEP) Preliminary Budget received on February 1, 2018.

The NYCDEP is charged with the responsibility of the overall operation and maintenance of the vast water and wastewater infrastructure serving New York City (NYC). The mission of NYCDEP is to protect public health and the environment by supplying and distributing clean drinking water and, collecting and treating municipal wastewater. The NYCDEP is also responsible for reducing air, noise and hazardous pollution in NYC; however the scope of this report will focus on the water and wastewater system and not address the air, noise and hazardous control aspects of NYCDEP's mission. In performing their mission, NYCDEP remains vigilant in providing continuous operation and maintenance of water and wastewater infrastructure made up of a significant number of capital assets and providing long-term planning of future needs. In recent years NYCDEP has implemented new programs and infrastructure to meet evolving regulatory requirements (Biological Nitrogen Removal (BNR) for wastewater treatment plants, Combined Sewer Overflow (CSO) treatment facilities, and water treatment facilities). While providing these infrastructure improvements, DEP is also tasked to maintain its vast water and wastewater infrastructure to comply with strict regulations and avoid critical failure of processes and assets. NYCDEP is responsible for constantly managing risks and prioritizing competing needs of The System to achieve its objectives. Considering the magnitude of the overall infrastructure and the level of operational service required, it is our opinion that:

- The System continues to be managed in a professional and prudent manner with an appropriate regard for the level of service afforded to the users within the available funding.
- The physical condition of The System receives an adequate rating. However due to the size and complexity of The System, NYCDEP requires future capital investments for the continuous replacement and/or repair of aging infrastructure in a systematic and cost-effective manner.
- NYCDEP capital and expense budget projections for FY 2018 satisfy the immediate needs for The System including legally mandated projects, which comprise approximately 21% of the capital budget for FY 2018.
- NYCDEP capital budget projections for FY 2019 satisfy the immediate needs for the System including legally mandated projects, which comprise approximately 24% of the capital budget for FY 2019. Expense budget projections for FY 2019 are currently being evaluated based upon the projected new needs of The System and may require adjustment when the evaluation is complete.
- NYCDEP capital planning is an ongoing iterative process addressing priorities and needs of The System. The NYCDEP is responsive to the long-term requirements of the service area.
- Staffing levels are approximately 91% of current allocations. NYCDEP has identified additional needs and skill sets to meet more complex facility operation requirements and managing the capital program. NYCDEP is also evaluating its future needs focusing on succession planning, transfer of knowledge and staff retention in anticipation of departure of experienced NYCDEP employees that are eligible for retirement in the near future.

## **2.0 PURPOSE AND SCOPE OF THE REPORT**

The purpose of this report is to provide engineering information pertinent to the condition of the Water and Sewer System (The System) serving New York City (NYC) and the adequacy of the proposed capital improvement program (CIP) funds. Since 1983, AECOM (formerly Metcalf & Eddy) has provided engineering services related to the NYC Water and Wastewater Operations Evaluation Study (Study) and has provided services to the NYC Municipal Water Finance Authority (Authority) since 1985. Certain studies and analyses were performed in anticipation of the creation of the Authority and were used in developing the information included in the Municipal Water Finance Authority Official Statements under the captions: "CAPITAL IMPROVEMENT AND FINANCING PROGRAM — Ten Year Capital Strategy, Current Capital Plan and the Capital Improvement Program", "THE SYSTEM — The Water System", and "THE SYSTEM — The Sewer System". AECOM has performed ongoing evaluations of the condition of The System, independently reviewing the capital and operating programs pertaining to water and wastewater, reviewing pertinent studies associated with the long-term development of The System, and conducting Due Diligence interviews with key individuals responsible for managing the activities of the New York City Department of Environmental Protection (NYCDEP).

The report addresses the issues listed below:

- present physical condition of The System,
- Fiscal Year (FY) 2018<sup>1</sup> capital budget and FY 2019 projected capital budget for The System,
- FY 2018 expense budget and FY 2019 projected expense budget relative to operation and maintenance of The System,
- overview of the Preliminary Four Year Current Capital Plan for FYs 2019 to 2022 and,
- management of The System.

## **3.0 METHODOLOGY FOR ANALYSIS**

The analyses conducted by AECOM were accomplished utilizing the following methods:

- Due Diligence interviews with representatives of the NYCDEP and discussions with representatives of the Authority,
- review of documentation relative to the ongoing budgetary process,
- review of the status of ongoing major programs and review of select reports provided by NYCDEP,
- information gathered from visiting operating facilities and major on-going construction programs, and
- consideration of national and local trends in the water and wastewater industry (regulations, resource recovery, aging infrastructure, other issues).

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<sup>1</sup> The NYCDEP Fiscal Year begins on July 1 and ends on June 30. FY 2018 began on July 1, 2017 and ends on June 30, 2018.

# THE NEW YORK CITY MUNICIPAL WATER FINANCE AUTHORITY

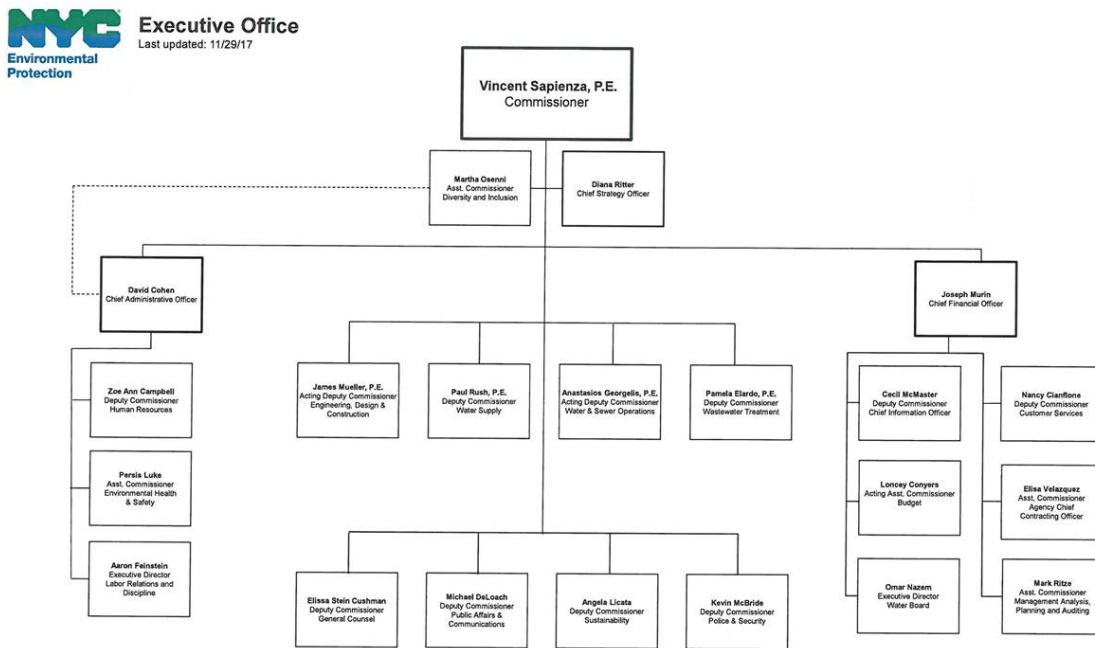
## *Fiscal Year 2018 Consulting Engineer's Report*

The budgetary process is ongoing and was not concluded by the time of this report's publication. Observations and conclusions presented herein are therefore based on budget data as it stood at the date of this report. It is our opinion that these observations and conclusions are meaningful with respect to The System. It should be noted, however, that these observations and conclusions are subject to change based on the outcome of the budgetary process.

### 4.0 MANAGEMENT AND OPERATION OF THE NYCDEP SYSTEM

#### Organizational Structure

Vincent Sapienza was named Commissioner for the NYCDEP, effective October 3, 2017, after being Acting Commissioner since July 2016. NYCDEP is developing a Strategic Plan for the entire Agency which will outline programs and priorities of the Agency. There is ongoing close collaboration among all the bureaus of NYCDEP since many complex programs impact multiple disciplines and operating bureaus. The NYCDEP is currently organized into the following Bureaus:



**Figure 1: NYCDEP Executive Level Organizational Chart**

- The three Operations Bureaus consist of the Bureau of Wastewater Treatment (BWT), Bureau of Water Supply (BWS) and the Bureau of Water and Sewer Operations (BWSO). The Deputy Commissioner of each operating Bureau reports directly to the Commissioner. The key responsibilities of each operating bureau are:
  - BWS is responsible for delivering a sufficient quantity of high quality drinking water to the City of New York. It is organized into seven directorates (Planning, Watershed Protection, Source Water Operations, Water Treatment Operations, Water Quality, Management Services/Budget and Environmental Health/Safety) that report directly to the Deputy Commissioner of BWS. A Research Application section was recently introduced within BWS to apply national and international research developments to BWS best practices and to help prepare for future challenges. The Water Treatment

Operations Directorate focuses on the treatment of water once it leaves the reservoirs and before it moves toward the distribution system. Its responsibilities include the management, operation and maintenance of the Croton Water Filtration Plant, Catskill/Delaware Ultraviolet (Cat/Del UV) Disinfection Facility, Hillview Reservoir, Jerome Park Reservoir, and Chlorination and Fluoridation at Delaware Aqueduct Shaft 18, Pleasantville Alum Plant and all associated dams, aqueducts, shafts, waterworks and support systems. The Source Water Operations Directorate is responsible for the storage and transmission of drinking water, maintenance of reservoirs, dams and other infrastructure, downstream releases and treatment at upstate wastewater treatment plants. BWS conducts extensive monitoring of water quality, both within the city's distribution system and throughout the upstate watersheds. BWS is also responsible for the overall management and implementation of the provisions for the city's Watershed Protection Program and for complying with the city's Filtration Avoidance Determination (FAD) program. BWS recently completed a Strategic Plan for 2017-2019.

- BWT is responsible for the operation and maintenance of the fourteen in-city WWTPs, the City's 96 wastewater pump stations (PSs), interceptors, CSO regulators, sludge dewatering facilities, fleet of marine vessels, laboratories, and the control of discharges from combined sewer overflows. Two Assistant Commissioners (Capital Planning/Delivery and Wastewater Treatment/Resource Recovery Operations) report directly to the Deputy Commissioner of BWT. Because of the energy-intensive nature of their facilities, the Office of Energy and Performance is organized under BWT and is responsible for the consolidation of energy issues for all operating bureaus and NYCDEP energy initiatives. BWT has also developed new groups for data networking/ Supervisory Control and Data Acquisition (SCADA) development and for the coordination of the Asset Management program. BWT added a new Biosolids Program Manager to lead the Biosolids Strategic Planning effort to develop a biosolids beneficial reuse program. BWT is focused on organizational development planning to identify and evaluate the current and future staffing and skill set needs of BWT operations. Currently, seven Area Facility Managers (two WWTPs per Facility Manager) provide senior leadership in the operation of the fourteen wastewater treatment plants. Working with the Chief Operators of the individual plants, the Area Facility Managers provide overall operational consistency. Each Area Facility Manager has an assigned Maintenance Facilitator who coordinates maintenance operations. Three Performance Analysts, who are experienced process engineers, have been assigned to the wastewater treatment plants.
- BWSO is responsible for the operation and maintenance of the city's drinking water distribution system, wastewater collection system, Bluebelts and Green Infrastructure. BWSO field operations are responsible for the following: (1) that residences and businesses have an adequate supply of potable water, (2) that there is sufficient water for fire protection, and (3) that the wastewater collection system is properly functioning. BWSO coordinates closely with the NYC Department of Design and Construction (DDC), since DDC does the design of the water mains and sewers that BWSO is responsible for once in use. BWSO is heavily focused on stormwater management issues and has an intensive program to alleviate the Southeast Queens flooding issues. The Green Jobs (those that maintain the green infrastructure (GI) assets) are part of BWSO.
- Capital Improvement Program Delivery is executed by the Bureau of Engineering, Design, and Construction (BEDC). BEDC is responsible for project delivery consisting of the design and construction of capital improvement projects, including major water

transmission facilities, water treatment facilities, wastewater treatment facilities, wastewater pumping stations, and stormwater/CSO facilities. A newly created group within BEDC, known as the Office of Strategic Planning and Engineering (OSPE) provides strategic planning associated with wet weather flow management, state of good repair, resiliency/ climate change, emerging regulations and rezoning/growth. OSPE collaborates with Sustainability, BWSO and BWT and other city agencies to address current and future long-term planning for infrastructure, and intends to develop integrated facility plans for the 14 WWTP drainage areas. BEDC has developed a Continuous Improvement Program that provides ways to improve business practices that will have positive impact on project implementation, such as project schedules and change orders. BEDC continues to develop the Enterprise Project Management Information System (ePMIS). BEDC has begun to implement a business improvement program known as Recognition-Improvement-Intervention (RI<sup>2</sup>). To support this program, BEDC has initiated a new Data Analytics Team within the Program Management Office. Key performance indicators (KPI) on projects and other reports will form the basis of the RI<sup>2</sup> program and facilitate BEDC's response to each project.

- The Bureau of Sustainability at NYCDEP is responsible for the development and implementation of environmental policy and strategy, including water and air quality, the noise code, and other quality of life issues. The Group includes the Bureau of Environmental Planning and Analysis (BEPA), Hazardous Materials and Superfund Planning & Analysis, and the Bureau of Environmental Compliance (BEC). Coordinating and tracking the many elements of the Green Infrastructure Plan occurs within BEPA. BEPA is also responsible for conducting environmental reviews for NYCDEP, providing technical assistance for the preservation of natural resources, conducting long range planning (population/ employment, consumption and demand/flow), conducting strategic planning to help ensure appropriate forecasting, trend analysis, regulatory review, scientific modeling, and research. BEPA continues the work of the climate change task force, and helps NYCDEP plan for the new growth stimulated by rezoning throughout the city. The Sustainability Group is also responsible for implementing and tracking the OneNYC sustainability initiatives for NYCDEP. BEC is made up of the Division of Air & Noise Policy, Permitting and Enforcement and the Asbestos Control Program. BEC is responsible for responding to air and noise code complaints, maintaining the database of facilities containing hazardous and toxic material, overseeing remediation of hazardous waste municipal landfills, managing investigation of contaminated sites and responding to hazardous material emergency incidents.
- The Chief Financial Officer oversees the Budget Office, Bureau of Customer Service, the Office of Agency Chief Contracting Officer, Information Technology, Management Analysis, Planning and Auditing, and other administrative divisions.
- The Chief Administrative Officer oversees Labor Relations & Discipline, Human Resources, and Environmental Health & Safety (EH&S).
- The Legal Affairs Department is responsible for handling NYCDEP's legal matters.
- The Bureau of Police and Security is responsible for protecting the city water supply and the associated critical infrastructure from unauthorized access, acts of sabotage or terrorism, pollution and crime.
- The Executive Level includes the Commissioner, Chief Strategy Officer, Chief of Staff and Bureau of Public Affairs and Communications.



## **5.0 OVERVIEW OF THE SYSTEM**

NYCDEP is charged with the operation and maintenance of a vast complex system of water and wastewater infrastructure.

### **5.1 Water Supply System**

The NYC water is supplied from three upstate watersheds (Delaware, Catskill and Croton), which extend as far as 125 miles north of NYC, consisting of 21 reservoirs and three controlled lakes, as shown in Figure 1. NYCDEP maintains operational flexibility to vary the water supply from all three water systems; the Catskill, Delaware and Croton systems.

The Croton water supply system is the NYC's oldest water supply, put into service in 1842 with the construction of the Old Croton Aqueduct delivering water to the City. The Croton system continued to expand; the Croton watershed is made up of several reservoirs (New Croton, Croton Falls Main, Cross River, West Branch, Titicus, Amawalk, East Branch, Muscoot, Bog Brook, Middle Branch, Boyds Corner, Croton Falls Diverting), all of which feed into The New Croton Aqueduct.

The Catskill system was put into service in 1915 and provided water to all five boroughs by 1917. The Catskill system is made up of the Schoharie Reservoir and the Ashokan Reservoir, which feed water to the City via the Catskill Aqueduct.

Construction of the Delaware system began in 1937. The Delaware watershed was put into service in phases and is comprised of 4 reservoirs - Cannonsville Reservoir completed in 1964, Pepacton Reservoir completed in 1955, Neversink Reservoir completed in 1954 and Rondout Reservoir completed in 1950, which receives water from the other reservoirs in the Delaware System. Delaware water is conveyed to the City by the Delaware Aqueduct.

NYCDEP also maintains wells in Queens; however, the groundwater supply system has not been providing water to the NYC distribution network since 2007. NYCDEP submitted the groundwater permits renewal in December 2017 so that the groundwater will be available as a back-up water supply, if necessary. However, the upstate surface water supply is the primary source water for NYC. The average daily NYC water consumption for calendar year (CY) 2017 was 990 million gallons per day (MGD), which is the lowest in-City consumption in over fifty years<sup>2</sup>. It should be noted that current average daily water consumption in NYC is about 35% less than the consumption levels experienced in the early 1990s. If the conservation measures in place remain effective there will be no immediate need for the city to develop additional long-term water sources to meet normal demand. The Water System also provides potable water to upstate consumers.

The New York City water supply is conveyed by gravity from the upstate reservoirs through an extensive system of tunnels and aqueducts. The 92-mile Catskill Aqueduct conveys water from the Ashokan Reservoir to the Kensico Reservoir and the 85-mile Delaware Aqueduct conveys water from the Rondout Reservoir to the West Branch Reservoir and then to the Kensico Reservoir. Because of the high quality water in the upstate reservoirs, the US Environmental Protection Agency granted NYC a waiver from the federal requirement to filter drinking water originating from surface water supplies. As a result, the Delaware and Catskill watersheds do not require filtration and the watersheds are protected by a mandated Filtration Avoidance Determination (FAD), which specifies disinfection requirements and identifies watershed source protection requirements to maintain its high level of water quality. Water entering the distribution system is treated with chlorine, fluoride, food-grade phosphoric acid and sodium hydroxide. BWS disinfects Catskill and Delaware water systems at Kensico Reservoir Shaft 18 and additional chlorine disinfection occurs prior to entering the distribution system at Hillview Reservoir. The Catskill/Delaware Ultraviolet Disinfection (Cat/Del UV) Facility,

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<sup>2</sup> Water consumption data provided by BWS

which treats water from Kensico Reservoir, commenced operations in the fall of 2012, and feeds water to NYC through the Hillview Reservoir. The Cat/Del UV Facility, located in Eastview on a 153 acre facility between the Kensico and Hillview reservoirs has a capacity of 2.4 BGD and is the largest UV facility in the United States. The UV Facility consists of 56 UV disinfection units that contain a total of 11,760 large UV light bulbs.

The Croton System delivers water from the New Croton Reservoir through the New Croton Aqueduct to the Jerome Park Reservoir in the Bronx. From there, the water is sent to the Croton Water Filtration Plant (WFP), which came online and started to send water into the NYC distribution system in May 2015. The Croton WFP has a maximum capacity of 290 MGD and is divided into Plant A and Plant B. The water treatment processes consist of chemical addition, dissolved air flotation (DAF), and filtration followed by UV disinfection. The Croton WFP is located beneath Van Cortlandt Park in the Bronx. It is the largest underground water filtration plant in the United States. The Croton WFP is also the largest stacked DAF filter plant in the United States. After treatment, the water is conveyed through concrete lined pressure water tunnels to the distribution service areas. Use of the Croton WFP varies based upon NYCDEP's operational needs. The Croton WFP has provided NYCDEP with a valuable and flexible resource.

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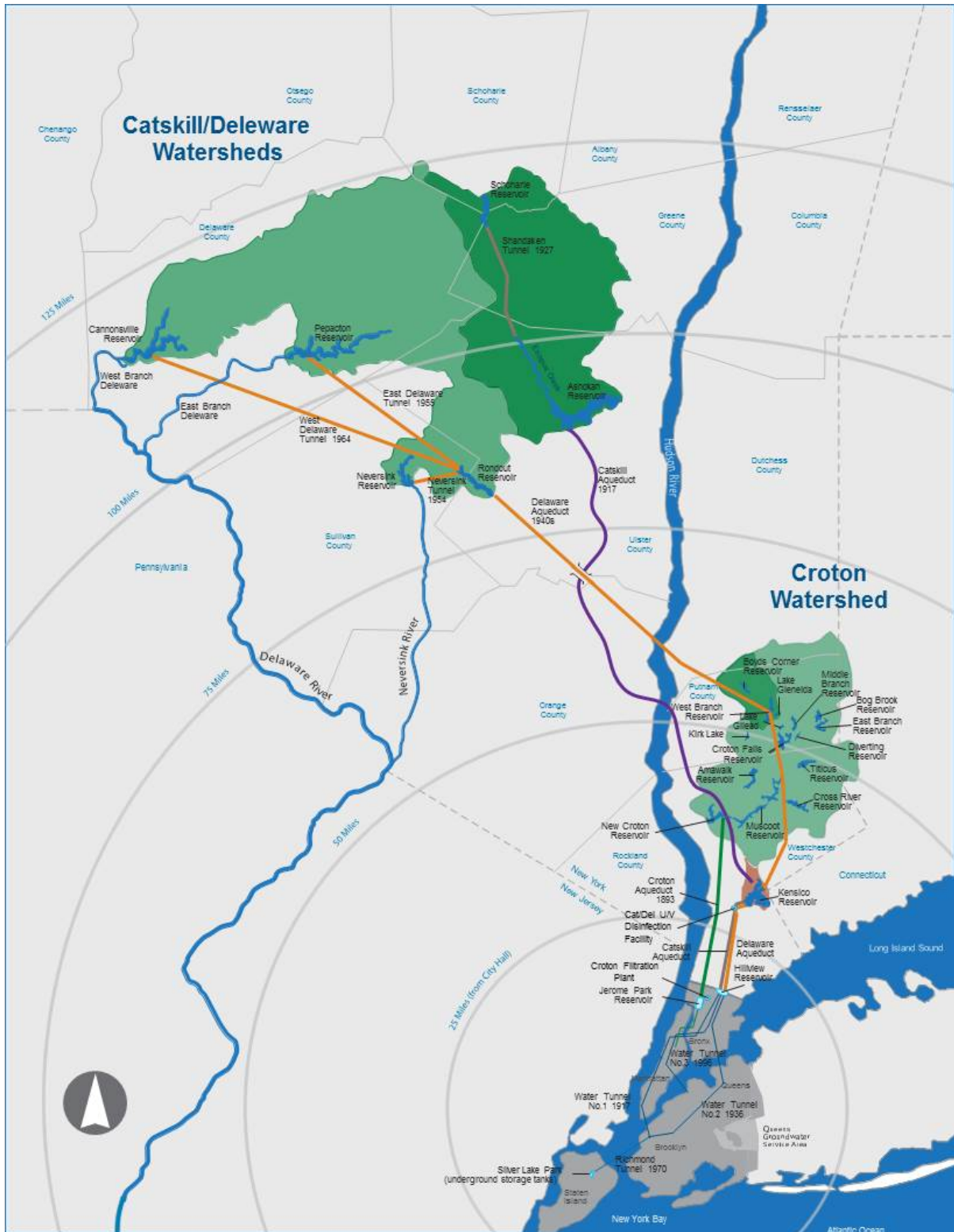


Figure 2: New York City Water Supply System



Both the Kensico Reservoir (30.6 billion gallons storage capacity) and the Hillview Reservoir (900 million gallon storage capacity) serve as balancing reservoirs for the water system, handling the daily and hourly fluctuations of water demand, respectively. Figure 2 shows the NYCDEP conveyance facilities downstream of these reservoirs. Water from Hillview Reservoir is conveyed to the city through three tunnels, City Tunnel No. 1, City Tunnel No. 2, and City Tunnel No. 3, which is partially in operation and partially under construction. Water from the Croton WFP to NYC is pumped into the city tunnels. The water distribution system from the three city tunnels consists of a network of approximately 7,000 miles of water mains, as well as valves, fire hydrants, distribution facilities, gatehouses, pump stations, water quality monitoring stations, laboratories and maintenance and repair yards.



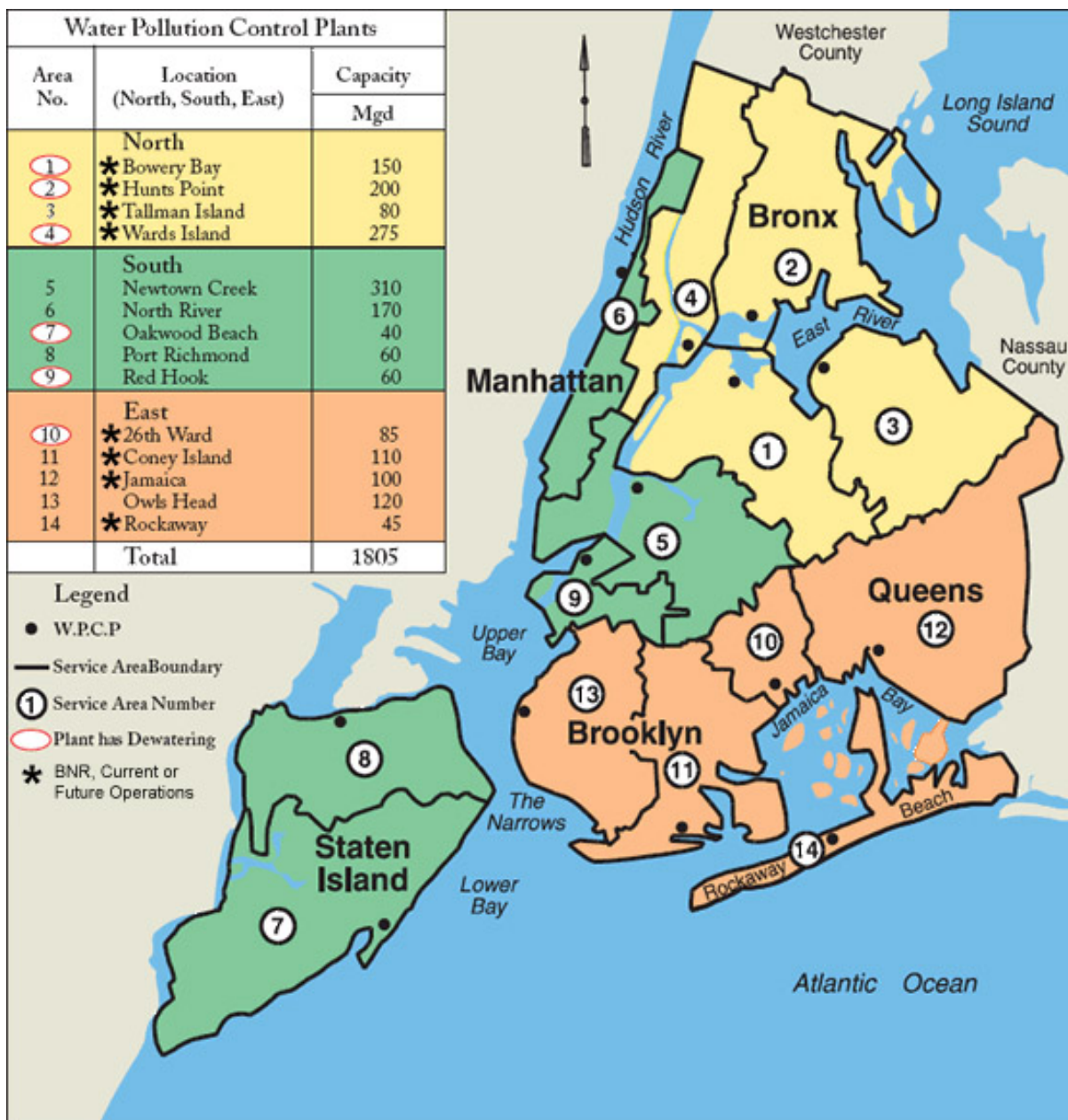
Figure 3: New York City Water Conveyance Infrastructure

## **5.2 Wastewater System**

The NYCDEP wastewater treatment system is comprised of fourteen (14) in-city Wastewater Treatment Plants (WWTPs) that discharge into receiving bodies surrounding NYC, as indicated in Figure 3 and is operated by the Bureau of Wastewater Treatment (BWT). There are eight upstate WWTPs and one community septic system that are operated by Bureau of Water Supply (BWS) which are necessary to protect the NYC upstate watersheds. The NYC WWTPs have a capacity of 1.8 BGD and are currently treating approximately 1.3 BGD of municipal wastewater consisting of municipal sewage and some stormwater from combined sewers.

The NYC sewer system is divided into 14 drainage areas, which correspond to each of the WWTPs. The NYCDEP in-city WWTPs provide physical, chemical and biological treatment of the wastewater flows to achieve secondary treatment standards in accordance with their State Pollutant Discharge Elimination System (SPDES) permits. As indicated in Figure 3, eight of the WWTPs are required to provide Biological Nitrogen Removal (BNR) to meet Total Maximum Discharge Limit (TMDL) regulatory requirements that have been set to protect the Upper East River and Jamaica Bay receiving waters. Four of the Upper East River WWTPs and two of the Jamaica Bay WWTPs have been upgraded and are currently operating in BNR mode. The Rockaway WWTP is currently being upgraded to BNR and Coney Island WWTP is currently undergoing procurement for construction of BNR facilities. Both of these WWTPs are scheduled to begin BNR operation in the near future. While the main purpose of the WWTPs is to protect the receiving waters surrounding New York City, the industry is rapidly evolving and WWTPs are now being considered as Water Resource Recovery Facilities (WRRF) where treated wastewater effluent can be recycled and beneficially used to meet non-potable water demand, wastewater treatment sludge can be reclaimed as biosolids suitable for use as soil conditioner, and methane gas created during the anaerobic stabilization of sludge can be used as a green energy source. Additional capital investment and operational modifications are needed before NYCDEP WWTPs can be considered as WRRFs.

The sewer system is comprised of approximately 7,500 miles of sewer pipes of varying size and material, which are classified as sanitary, storm or combined sewers. Much like many other older cities, the NYC collection system consists primarily of combined sewers (approximately 60% of NYC land area is served by combined sewers). During dry weather, the combined sewers carry municipal wastewater to the WWTPs. During a wet weather event, municipal wastewater, and rainwater from surface water runoff is also collected in the combined sewers. Most of the flow is sent to the WWTPs while excess combined sewer flow discharges to the receiving water as combined sewer overflow (CSO). There are approximately 426 permitted outfalls and four CSO retention facilities (Paerdegat, Alley Creek, Spring Creek, Flushing Bay) that provide screening, settling and storage of the CSO before discharging. The stormwater remaining in the CSO facilities after the wet weather event is then directed to the WWTPs for treatment. Additional NYCDEP infrastructure that supports the wastewater system includes 96 wastewater pump stations, 148,000 catch basins, laboratories, six active sludge dewatering facilities and inner-harbor vessels which transport sludge between facilities.



**Figure 4: New York City Wastewater Treatment Plants (WWTPs)**

## **6.0 CAPITAL IMPROVEMENT PROGRAM (CIP)**

### **6.1 Overview**

Budgeting is a lengthy and comprehensive process, especially for an agency operating such a large and complex system as is the responsibility of the NYCDEP. NYCDEP budgeting is an ongoing iterative process that takes into account significant/substantial needs including regulatory requirements/legal mandates, mayoral initiatives such as OneNYC, state of good repair (SOGR) projects to maintain existing aging infrastructure, energy projects, capacity issues, dependability, environmental, health, and safety (EH&S) compliance requirements, localized community drivers, climate change adaptation and resiliency, and other facility improvements. Sometimes these many needs are competing for funding; however, NYCDEP seeks for opportunities for synergies with project implementation such as addressing SOGR needs along with energy projects and flood resiliency projects. Project schedules, cost estimate updates, technical issues, regulatory updates, emergency events, reoccurring events and legal issues may impact project prioritization and the overall budgeting process. NYCDEP is continuously evaluating competing projects to determine the most important funding requirements across all NYCDEP programs to prioritize NYCDEP's most critical needs first. This challenging budget exercise constantly forces NYCDEP (and other City agencies) to prioritize and in the process of doing so, some projects are typically deferred. These deferred projects need to be reevaluated and funded in future budget cycles. NYCDEP must remain diligent to make sure operational needs are being met while capital programs are identified and then implemented.

The NYCDEP CIP consists of the Ten Year Capital Strategy, along with the Four Year Current Capital Plan, which is updated quarterly. The Ten Year Strategy is updated every two years. The next Ten Year Capital Strategy will be released in January 2019. The Preliminary Four Year Current Capital Plan for FY 2019 through FY 2022 was published on February 1, 2018 and is the document considered herein. This review includes the budget for FY 2018, which ends on June 30, 2018, and the budget for FY 2019, which begins on July 1, 2018. AECOM has reviewed the Preliminary Four Year Current Capital Plan and met with key individuals responsible for budgetary planning to provide an assessment of its adequacy. It is anticipated that the Mayor will issue the Executive Budget in April 2018. Our findings are summarized in the following paragraphs.

#### **Regarding FY 2018**

The Preliminary Plan FY 2018 budget is set at \$2.588 billion. Approximately 21% of FY 2018 funding supports regulatory mandated projects, consisting primarily of CSO (green and grey infrastructure) projects, the FAD programs, citywide repairs of intercepting sewers and CSO reduction sewer system improvements and BNR upgrades at Coney Island. Significant funding is also included in FY 2018 for NYCDEP priority projects such as the Catskill Aqueduct optimization project for water supply augmentation, completion of City Tunnel #3, Southeast Queens program, accelerated water main replacement work, water distribution system and wastewater collection sewer work, wastewater treatment plant SOGR projects, water supply infrastructure SOGR projects, emergency contracts for water and sewer work, the Bluebelt program and water supply infrastructure SOGR projects.



### **Regarding FY 2019**

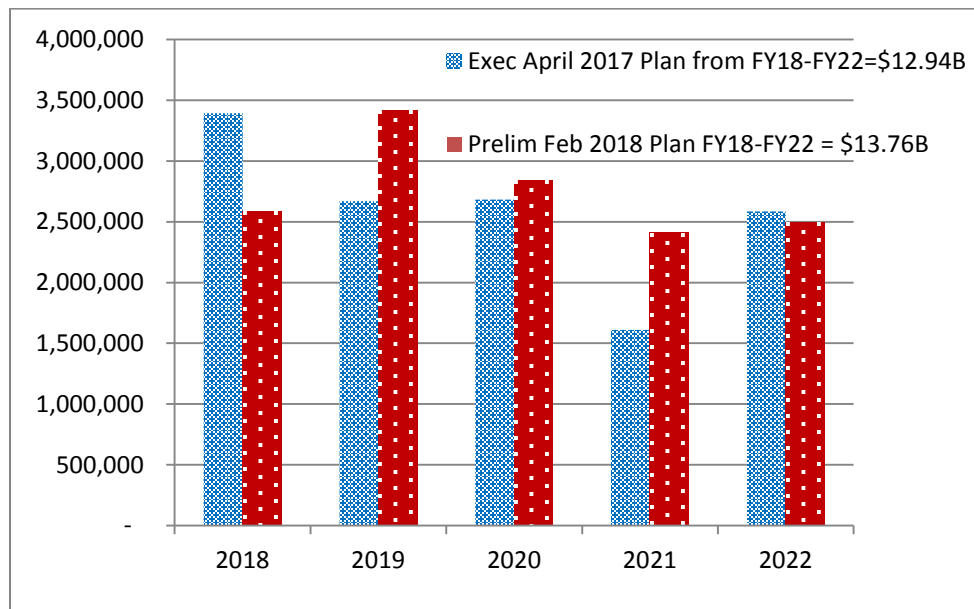
The Preliminary Plan FY 2019 budget is set at \$3.419 billion. Approximately 24% of FY 2019 funding supports legally mandated projects, such as CSO projects (grey and green infrastructure), storm sewer build-out and FAD requirements. Significant funding is also included in FY 2019 for NYCDEP priority projects such as the Southeast Queens storm sewer program, wastewater treatment SOGR projects, specific sewer and water main work, water supply infrastructure SOGR projects, emergency contracts for water and sewer work and the Bluebelt program.

### **Regarding the Preliminary Current Capital Plan for FY 2018 to FY 2022**

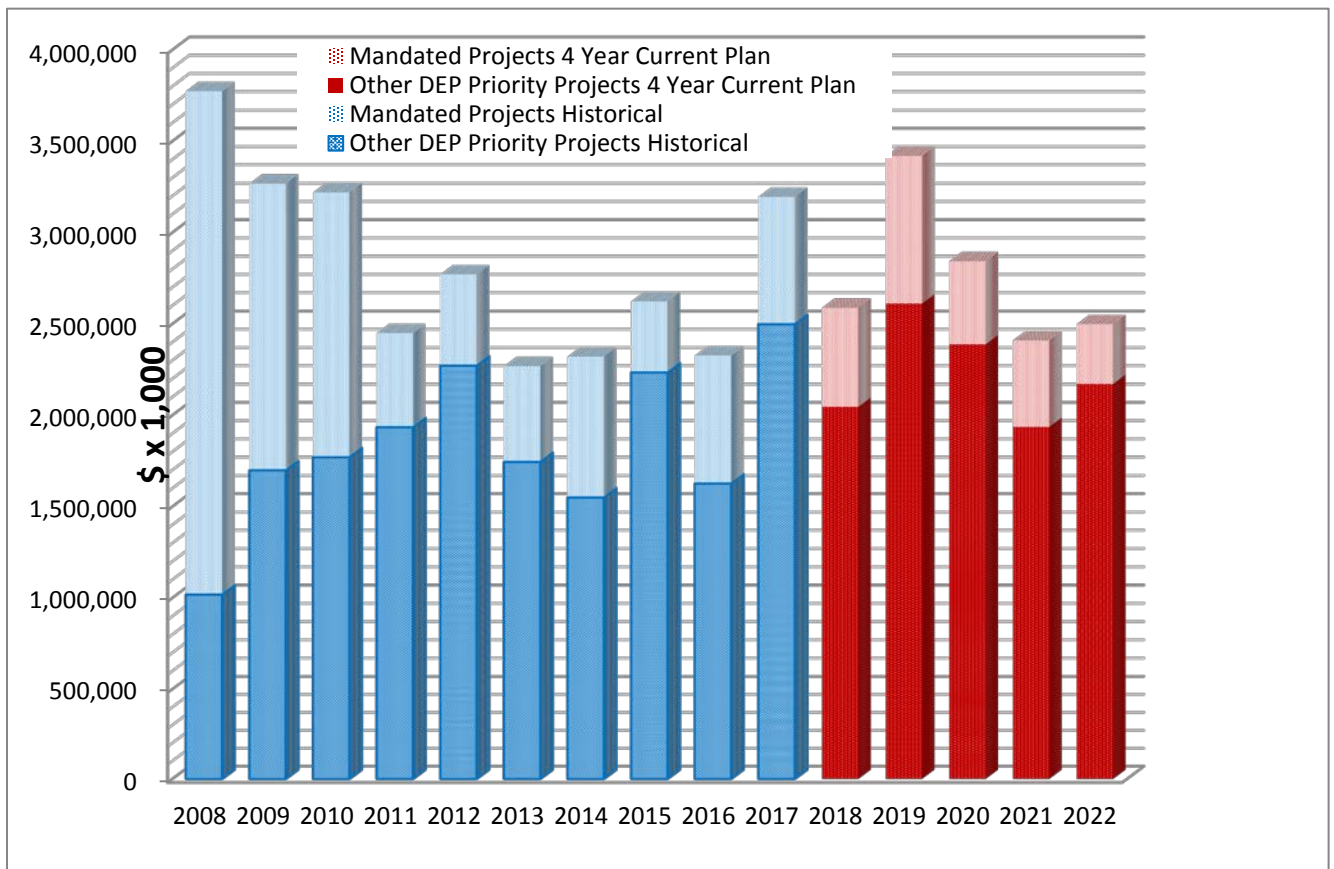
The Preliminary Four Year Current Capital Plan for FY 2018-2022 consists of \$13.76 billion in funding, approximately \$65.68 million greater than the previous quarterly update of the Current Plan, which was released in September 2017 and approximately \$815 million greater than the same years (FY2018-FY2022) of the Executive Plan released April 2017 (as shown in Figure 5). Approximately 19% of the total funding for FY 2018-2022 is dedicated to regulatory mandated projects. As shown in Figure 6, there have been significantly less mandated projects during the past several years, as compared to FY 2008. For FY 2008 through FY 2010, the overall budget consisted of a high percentage of regulatory mandated project costs including the construction of the Croton WFP, UV Facility, and the Newtown Creek WWTP Upgrade projects. The majority of the mandated projects in FY 2018–FY 2022 consists of the green and grey CSO-related infrastructure, storm sewer build-out, FAD requirements, TRC program and Coney Island BNR projects. The majority of the remaining capital improvement program must be planned and budgeted based solely on its importance to the overall System and NYCDEP prioritization as determined by NYCDEP, such as the state of good repair needs of the older assets in The system, the Southeast Queens storm sewer buildout program, City Tunnel #3 completion and activation, a start on KEC2 and significantly more BWSO water main replacement and sewer work. However, as discussed later in this report, the mandated CSO Program and the Hillview Cover will require additional funding in the future and may extend beyond the next ten year planning horizon. Although, it is not anticipated that there will be many large mandated projects occurring simultaneously as there were in FY 2008-FY 2010, the need to fund regulatory mandated projects will continue. There will be an increased need for SOGR funding due to the age of the NYCDEP infrastructure and the ability to more readily identify needs using the Asset Management tools now in place. Based upon the age of the infrastructure, there will continuously be a need to replace wastewater and water system assets in accordance with a proactive, systematic plan that minimizes reactive replacements brought about by asset failures.

Additional funding is needed in FY 2020-FY 2022 for BWT Job Order Contract (JOCs) and in FY 2020–FY 2022 for emergency contracts for BWSO.

As is the case in most US cities and municipalities, the NYCDEP water and wastewater infrastructure is aging. Therefore, it is necessary to refurbish or replace infrastructure in a planned manner to cost effectively minimize risk of failure. The NYCDEP has refined and implemented its Asset Management program significantly in order to set priorities for the continued refurbishment of its physical assets. The Asset Management program provides a uniform methodology for a comprehensive evaluation of capital assets throughout The System and allows a systematic approach to maintain and upgrade physical assets so that capital improvements can progress in an orderly manner. To further improve upon this effort, BWT is undertaking a pilot program at one wastewater treatment plant, Port Richmond WWTP to take a more detailed assessment of their asset management program. The pilot program will help BWT further identify needs by assessing life cycle costs of equipment and will provide a bottom up approach to identify needs for equipment repair/ replacement.



**Figure 5: Funding for FY2018-FY2022: Comparison of Executive Plan (April 2017) and Preliminary Plan (February 2018)**



**Figure 6: NYCDEP Historical and Projected Budgets**

In addition to the asset condition assessment NYCDEP is undertaking a number of other studies/assessment tools that will support the long-term requirements of the WWTP assets. These include Infiltration and Inflow (I&I) assessments (currently being considered for the Rockaway, Coney Island, and Oakwood Beach WWTPs), which will identify improvements necessary to reduce extraneous water flow reaching each facility, energy audits at all WWTPs to identify opportunities to reduce energy consumption and costs, and resiliency improvements to protect facilities from projected sea level rise and increasing storm intensities due to changing weather patterns. These studies will identify needed improvements that will then have to be organized and prioritized. With the completion of these studies/assessments, Facility Plans should be prepared for each WWTP drainage area to effectively group and prioritize the needed upgrades for each WWTP as part of a systematic approach to guide capital investment planning.

## **6.2 System-wide Programs**

### **NYCDEP Sustainability Initiatives**

On April 22, 2015, Mayor deBlasio released *One New York, The Plan for a Strong and Just City Report* (OneNYC). This comprehensive plan focuses on four principles - growth, sustainability, resiliency and equity. OneNYC is an expansion of the previous sustainability plan, PlaNYC. Greenhouse gas reduction and energy planning are being incorporated into NYCDEP's planning and design projects. A Progress Report was issued in April 2017 providing progress on the OneNYC initiatives.

*Greenhouse Gas Reduction Requirements.* Mayor deBlasio released *One City: Built to Last* in September 2014 with further aggressive reductions of greenhouse gas emissions and carbon management. New York City Office of Sustainability committed to an 80 percent citywide reduction in green-house gas emissions from 2006 base year levels by 2050 (also known as 80 by 50). Also, an interim goal of 35% reduction of green-house gas emissions from 2006 base year levels in municipal government operations is required by 2025. In accordance with Local Law 66 of 2014, the NYC Mayor's Office of Sustainability released a report in September 2016 titled, *Roadmap to 80 x 50 Report*.

NYCDEP's maintains a four-point approach to GHG reductions, which consists of: demand-side solutions, supply-side solutions, traditional renewable energy solutions and energy/ carbon offsets. NYCDEP has reduced its GHG emissions by more than 20% since FY 2006, despite the addition of energy-intensive facilities and processes coming on-line. NYCDEP is performing a study to determine how NYCDEP will contribute to the city's overall 80 by 50 GHG reductions. The study will evaluate carbon management and net energy neutrality of the NYCDEP operations. In order for the NYCDEP to become net energy neutral, a cost effective analysis is required to evaluate energy efficiencies, energy generation and renewable energy initiatives. The results of this study will form NYCDEP's strategic plan to achieve energy neutral operations. NYCDEP has secured some funding through the Department of Citywide Administrative Services (DCAS) programs - Accelerated Conservation and Efficiency (ACE) and the Expenses for Conservation and Efficiency Leadership (ExCEL) for energy and GHG reduction projects.

*Energy Planning.* With new systems and facilities coming on-line, NYCDEP Office of Energy will assist in the planning of reliable sources of power, both from conventional and renewable sources. NYCDEP will commence a comprehensive energy study this year that will evaluate energy project opportunities throughout all NYCDEP operations. NYCDEP is looking at energy conservation measures (ECMs) at each of the WWTPs. NYCDEP is evaluating the incorporation of energy efficiency with SOGR projects through the SOGR-ECM Integration Study for all 14 WWTPs. This study will evaluate existing and identify new ECMs, then prioritize energy projects around the SOGR needs to optimize operating costs and bring significant potential GHG reductions.



In September 2017, NYC released the report titled *1.5°C: Aligning New York City with the Paris Climate Agreement*. This plan committed NYC to a goal of reducing citywide greenhouse gas emissions 80% by 2050 and an interim energy reduction goal of 20% by 2025 for City-owned buildings.

NYCDEP is participating in an innovative resource recovery program at the Newtown Creek WWTP, their largest wastewater treatment plant. As part of the Newtown Creek/National Grid public private partnership, NYCDEP will send anaerobic digester gas (ADG) to a biogas purification facility to be constructed and operated by National Grid, where the ADG will be purified to pipe-line quality gas. The product gas will then be added to National Grid's natural gas supply network. This project will improve local air quality, reduce citywide greenhouse gas emissions, utilize a renewable energy resource, and supplement the citywide natural gas supply. Another public private partnership ongoing at Newtown Creek WWTP is with Waste Management, Inc. Newtown Creek WWTP is accepting food wastes from NYC public schools and the green markets. The food waste, delivered by Waste Management, Inc. is added to the digesters to increase the production of ADG. NYCDEP has successfully completed a one-year monitoring and testing pilot study under a grant from New York State Energy Research and Development Authority (NYSERDA) to evaluate the food waste/ADG co-digestion in Newtown Creek digesters. Due to the success of that study, NYCDEP has implemented a more comprehensive three-year demonstration project in collaboration with NYSERDA, Water Environment Research Foundation (WERF), Bucknell University and Manhattan College. Phase 1 of the demonstration operated with the addition 20 tons per day (tpd) of food waste, Phase 2 will operate with 100 tpd and Phase 3 will operate at 250 tpd by June 2019. If the demonstration project is successful and full-scale is implemented, the goal would be to send 500 tpd of food waste to Newtown Creek for co-digestion. The food waste co-digestion and the excess ADG sent to National Grid projects at Newtown Creek serve as a model for integrating renewable energy in a dense urban environment. Food waste co-digestion will be evaluated at other NYCDEP WWTPs, where applicable.

Other energy projects that NYCDEP is implementing are cogeneration facilities and solar panels at NYCDEP facilities. A cogeneration facility is currently under construction at North River WWTP. Cogeneration at other WWTPs is being evaluated. Solar panels (1.2 megawatt (MW) system) have been installed at the Port Richmond WWTP in Staten Island since 2015. There is an ongoing feasibility study for solar installations at the Wards Island WWTP. A feasibility study for solar installations in the upstate watershed will commence next year.

In 2014, NYCDEP received a Federal Energy Regulatory Commissioner (FERC) license for the installation of a 14 MW hydroelectric facility consisting of four hydro-electric turbines at Cannonsville Reservoir and Dam, upstate in the Delaware watershed. In the summer of 2015, while the contractor was on site drilling borings in preparation of the hydroelectric facility design and construction phases, turbid flow was found below the dam. It is thought that the drilling connected into artesian conditions which were known to exist in areas of the dam foundation. The Cannonsville Dam is being monitored and is deemed safe; however, all drilling for the hydropower facility was halted. NYCDEP's main concerns are dam safety, maintaining operational control over the dams and the ability to meet flow management agreements. NYCDEP conducted a Feasibility Study to determine the viability of a hydroelectric facility at Cannonsville Dam in the future. It is anticipated that the final results of this feasibility study will be released in the near future. In April 2016, FERC granted NYCDEP a two-year extension of the construction milestones that are required under the FERC license. There is \$8 million in design funding for a hydro-electric facility at the Cannonsville Reservoir in the Preliminary Four Year Current Capital Plan.

### **Climate Change Adaptation and Resiliency**

NYCDEP has been planning and evaluating climate change adaptation requirements for the past several years, well before Superstorm Sandy impacted the NYC area. Adaptation refers to those

actions that must be taken to allow NYCDEP facilities to meet its intended functions when considering projected sea level rise and more intense storm events. In May 2008, NYCDEP released its Climate Change Program Assessment and Action Plan. Following its release, the NYCDEP began studying the effects of climate change on the city's stormwater/wastewater collection system in more detail to determine what level of infrastructure and policy modifications are necessary to alleviate potential damage from larger, more frequent storm events and projected rising sea levels. In May 2010, the NYC Panel on Climate Change released a report titled *Climate Change Adaptation in New York City: Building a Risk Management Response*, which among other important information, includes climate trends and projections for NYC, which NYCDEP has used for analysis and planning. In addition, BEPA completed a two-year pilot study to develop an adaptation and optimization strategy to minimize global climate change risks for NYCDEP infrastructure using one WWTP (Hunts Point) and one drainage area (Flushing Bay).

When Superstorm Sandy significantly impacted the New York City area in October 2012, NYCDEP made a clear decision to continue to strengthen its work on climate change adaptation and resiliency. In December 2012, the Mayor's Office formed the Special Initiative for Rebuilding and Resiliency (SIRR). In June 2013, NYC released a comprehensive document entitled *A Stronger, More Resilient New York*, which covered citywide infrastructure impacts and community rebuilding and resiliency plans. Subsequently, NYCDEP released the *NYC Wastewater Resiliency Plan, Climate Risk Assessment and Adaptation Study* in October 2013. This Plan provided a comprehensive assessment of wastewater facilities at risk from future storms with proposed measures to protect equipment to reduce the risk of damage and loss of service. The study evaluated infrastructure at the NYCDEP WWTPs and wastewater pump stations to identify and prioritize facilities most at risk for flood damage. The framework used for this study consisted of climate analysis, risk analysis and adaptation analysis. The possible adaptation strategies ranged in varying degrees of resiliency, effectiveness and cost.

NYCDEP BEDC Resiliency Program is on-going. There are established contracting mechanisms to implement resiliency projects across 14 WWTPs and 96 PSs. There are four design contracts in place to address resiliency upgrades at the WWTPs and PSs. The resiliency construction contracts will start to be bid out later this year. NYCDEP plans to secure funding and financing through the NYSDEC Storm Mitigation Loan Program (SMLP) and through the Flood Emergency Management Agency (FEMA) for these resiliency upgrades. Prioritizing the resiliency capital projects is an important step in the planning process. The criteria being used for prioritization of projects and needs includes operational, environmental, social and financial metrics. As facilities are being upgraded the results of the October 2013 Wastewater Resiliency Plan will be reassessed with detailed site analyses during the design. NYCDEP has adopted new design standards to account for the critical flood elevation with FEMA maps. NYCDEP has developed *Resiliency Design Guidelines*. As part of the October 2013 study, Storm Surge Guidance was also developed for all 14 NYCDEP WWTPs to assist NYCDEP staff in preparing for another storm.

Along with many other NYC agencies, NYCDEP will play a role in the Eastside Coastal Resiliency (ESCR) project. This project will provide improved coastal protection by reducing flood risk due to coastal storms and sea level rise on Manhattan's East Side. The Preliminary Four Year Current Capital Plan includes \$170 million for NYCDEP's participation in the ESCR project.

Climate change adaptation evaluations are also taking place for other parts of The System. BWS is focused on climate change impacts on the water supply side through the use of their Operation Support Tool (OST) models, the watershed protection program and improving flexibility in operations with increased water supply interconnections.

NYCDEP's Green Infrastructure Program provides a comprehensive adaptive approach to stormwater management. The plan is based on implementing citywide green infrastructure improvements to reduce the volume of stormwater that reaches the engineered (grey infrastructure) stormwater

collection system. NYCDEP continues to focus on climate change as it evaluates its stormwater management needs.

NYCDEP maintains strong involvement with the climate change science community on the city, state, national and international level. On the national level, NYCDEP maintains utility membership and actively engaged with the Water Utility Climate Alliance (WUCA) and the National Association of Clean Water Agencies (NACWA). NYCDEP initiated a three-year working partnership with Copenhagen, Denmark. The knowledge sharing between the NYCDEP and Copenhagen will involve best practices in response to intense rain events and stormwater management. NYCDEP completed a Cloudburst Resiliency Planning study applied to Southeast Queens. Two pilot projects derived from this study are being developed in coordination with NYC Housing Authority (NYCHA) and NYC Department of Transportation (DOT).

The New York City Panel on Climate Change (NPCC) is an independent body that advises the city on climate risks and resiliency. In February 2015, Mayor de Blasio announced the release of the NPCC 2015 report titled *Building the Knowledge Base for Climate Resiliency*. This report provides climate projections for temperature, precipitation and sea level rise through year 2100. The NPCC recommends setting up a climate change monitoring system, so that resilience measures can be adapted as changes continue to evolve in the future. In April 2017 the Mayor's Office of Recovery and Resiliency released *Preliminary Climate Resiliency Design Guidelines*. The Guidelines were developed based on the New York City Panel on Climate Change's regional climate projections that inform New York City resiliency policy.

Climate change adaptation is a challenge facing all water and wastewater utilities, and should be considered in short-term and long-term utility planning. There is uncertainty inherent in climate science due to the magnitude, variability, timing and frequency of localized events and their impacts on The System. However, despite the uncertainty of climate change prediction, rational capital investments must be considered to protect NYCDEP facilities. NYCDEP's Resiliency Program Management will provide a framework for the implementation of climate change adaptation and resiliency in a systematic prioritized approach at NYCDEP WWTPs and PSs.

### **Asset Management**

NYCDEP is continuing with a five-year Asset Management contract, to provide a third party independent review of all assets. NYCDEP Asset Management program includes the majority of the water and wastewater infrastructure. The results of the Asset Management program will be used in the development of the funding needs for the state of good repair for future capital budgets. This effort is based upon a collaborative approach between the operating bureaus so that all stakeholders have input throughout the process. Business case project prioritization is based upon a scoring of the following criteria: physical condition, performance/process condition, regulatory/environmental, service level/reliability, efficiency/energy, O&M and hazard, community, public image and financial. All potential projects receive a numerical rating. NYCDEP will perform continuous real time updating of the status of the many NYCDEP physical assets to reflect completion of improvement projects and condition survey updates for operating assets. The capital program for the state of good repair projects is determined based upon the highest numerically rated projects within the available funding. The principles of Asset Management have been effectively applied to many water and wastewater utilities worldwide and the NYCDEP's progress in asset management is a positive development. The continued integration of the NYCDEP Asset Management program with the Capital Improvement Program for the prioritization of the replacement and rehabilitation of NYCDEP assets is anticipated. In addition, implementation of a robust asset management program may lead to a shift from capital funding to expense funding for replacement of assets.

NYCDEP has completed several Asset Management Guidance Documents that establish criteria project prioritization. The 2016 OmniBus Consent Order requires NYCDEP to submit annual updates of the NYCDEP Asset Management Program to NYSDEC.

### **6.3 Program Accomplishments**

There are a number of capital program accomplishments during the past year that are noteworthy. These items play an essential role in the development and advancement of the CIP, and providing for prudent and professional management of the System.

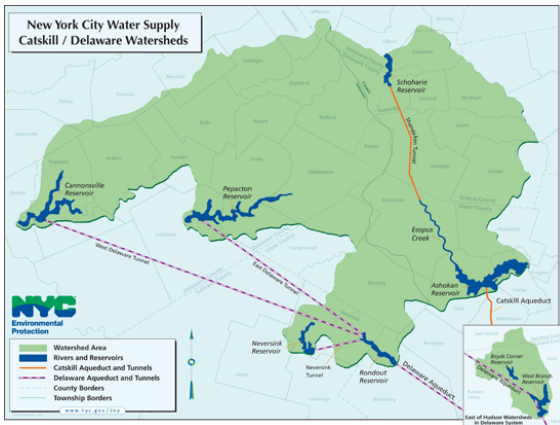
- NYCDEP received another 10-year FAD extension for the Catskill and Delaware watersheds, which will allow the City to continue to implement robust programs to protect the upstate watershed and avoid building a costly filtration plant.
- NYCDEP has initiated tunnel boring of the by-pass tunnel around the leaking section of the Delaware Aqueduct under the Hudson River, as part of the Water for the Future Program.
- The NYSDEC has approved seven of the nine submitted LTCPs for the CSO Program this past year. Two LTCPs are still under NYSDEC review and the final two LTCPs are under development by NYCDEP.
- Newtown Creek WWTP received Certification of Completed Construction from NYSDEC for the multi-phased multi-year upgrade at this facility.

### **6.4 Capital Improvement Program Highlights for the Water System (Supply, Treatment, and Conveyance Programs)**

#### **Catskill/Delaware Water Supply System Filtration Avoidance**

On December 28, 2017, the New York State Department of Health (NYSDOH) issued another 10-year Filtration Avoidance Determination (FAD), known as the 2017 FAD to the NYCDEP for the Catskill and Delaware watersheds. The 2017 FAD consists of a watershed protection program for 2017-2027. The new FAD requires NYCDEP to continue its core watershed protection programs that are already established and in place, such as land acquisition, whole-farm planning, stream management and various upgrades to wastewater infrastructure in the upstate watersheds. In addition, the FAD contains new requirements, which includes expanding the small business septic program in the Catskills, development of a community wastewater treatment facility for the hamlet of Shokan near Ashokan Reservoir, and protecting additional streamside lands through the Conservation Reserve Enhancement Program and the Streamside Acquisition Program. The FAD states several milestones and implementation schedules for the required programs. A National Academy of Science (NAS) expert panel is expected to commence work in 2018 to review the FAD programs. Although the FAD spans ten years there is a halfway point review planned at the five year mark. This review will be based upon the finding of the expert panel and could impact the future capital investment program.





**Figure 7: Filtration Avoidance Determination (FAD) for the Delaware and Catskill watersheds**

The NYCDEP capital and expense financial investment in FAD programs are a far more cost-effective means to protect the Catskill/ Delaware water supply than building a costly filtration plan with high operation and maintenance costs.

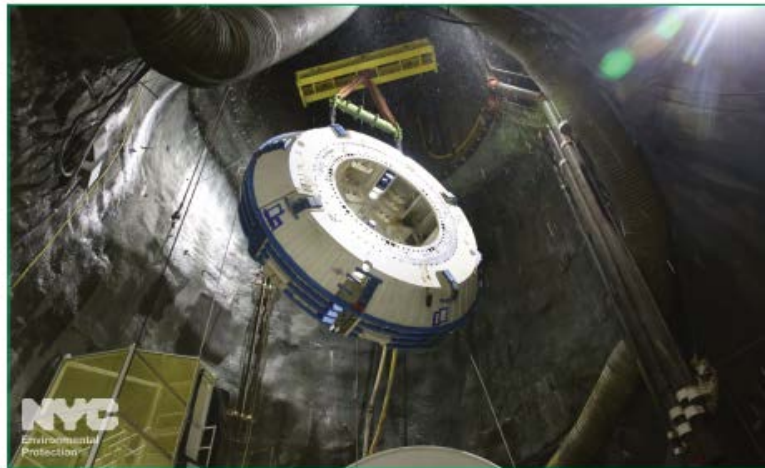
#### **Water for the Future (WFF)**

The Water for the Future program consists of two main components; fixing the Delaware Aqueduct in two areas where significant leaking has been noted and supplementing NYC water supply during the period when these water transmission elements are out-of-service. The Water for the Future program is a comprehensive program that requires continued thorough coordination throughout the entire NYCDEP. A strong organizational structure is in place within BEDC and across all operating bureaus (with designated liaisons) and executive management, to continue with the construction, implementation and risk management of the Water for the Future

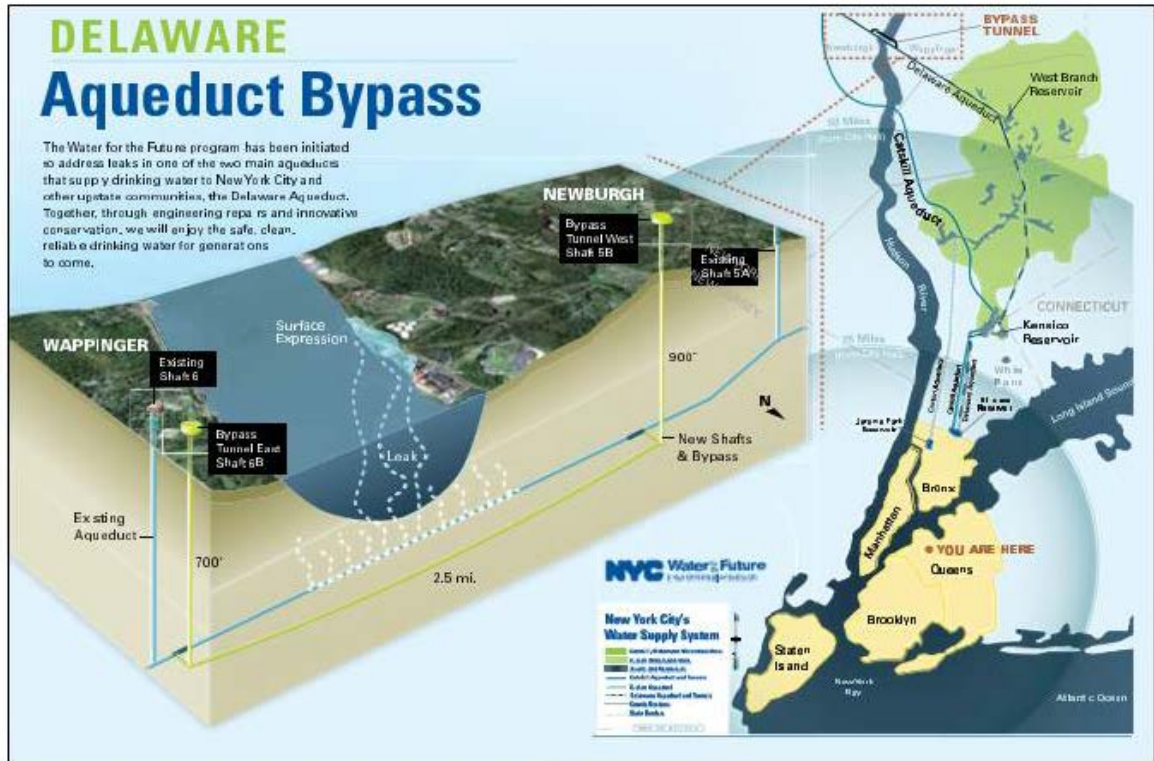
program due to the magnitude and complexity of the program. There is approximately \$262.2 million in funding in the Preliminary Four Year Capital Plan for the Water for the Future program, which consists of \$38.1 million for the continued construction of by-pass tunnel and repairs and \$274.4 million in water supply augmentation projects (when the Delaware Aqueduct is not in service for by-pass connection). Engineering studies conducted during the progression of the project development have identified program improvements that will result in shorter shutdown periods and less required water supply augmentation which has reduced the overall program cost.

NYCDEP estimates approximately \$1 billion will be spent in programs over the next 10 years to comply with the current FAD. Funding for FAD programs comes from both the NYCDEP capital budget and the annual expense budgets. The continuation of the existing FAD program is currently funded in the Preliminary Four Year Current Capital Plan at a level of approximately \$225.44 million. Additional capital funding will be required to continue to support the FAD program in the next Ten Year Capital Strategy. It is anticipated that funding for the FAD will be included in the NYCDEP expense budget for the duration of the FAD.

As part of the continuous long-term planning efforts, NYCDEP will update its planning level studies, if it were ever to become necessary to build a filtration plant for the Delaware and Catskill water supply. NYCDEP plans to evaluate filtration technologies, conceptual level design, updated cost estimates.



**Figure 8: TBM being assembled, part of the Delaware Aqueduct by-pass tunnel repairs**



**Figure 9: Delaware Aqueduct Bypass**

Since the early 1990s, NYCDEP has closely monitored the Rondout-West Branch (RWB) Tunnel portion of the Delaware Aqueduct that has shown evidence of water leakage through cracking of the aqueduct concrete lining. NYCDEP has performed a series of tunnel leak investigations including geological investigations, tunnel flow monitoring, well monitoring, surface expression monitoring, automated underwater vehicle (AUV) investigations, remote operated vehicle (ROV) investigations and a series of underwater diver inspections at Shaft #6. After evaluating several repair alternatives, NYCDEP developed a comprehensive plan to build a two and a half mile bypass tunnel around the leaking section in the area of Roseton, NY and to perform repairs of the concrete liner in upstream areas near Wawarsing, NY. In 2013, NYCDEP began construction of two new shafts, Shaft 5B (in the Town of Newburgh) and Shaft 6B (in the Town of Wappinger), which are required for the construction of the bypass tunnel. The construction of the two vertical shafts has been completed (contract BT#1). The tunnel construction contract (contract BT#2) was initiated in the summer of 2015. A tunnel boring machine (TBM) is being utilized for the construction of the new tunnel between the two shafts. The TBM began tunnel construction in January 2018. The TBM assembled 845 feet below ground in Newburgh at the bottom of the shaft in a bell-out chamber. It is approximately 470 feet in length and weighs 2.7 million pounds. The connections to the bypass tunnel with the existing Delaware Aqueduct are planned for October 2022. These connections will require taking the Delaware Aqueduct out of service and dewatering the aqueduct for several months during the low water demand season.

The NYCDEP has been evaluating and planning strategies for water supply augmentation to meet the demands of The system when water supply system components are out-of-service, either planned (when the Delaware Aqueduct is shut down to connect the bypass tunnel to the existing tunnel and to make the other upstream repairs) or unplanned. NYCDEP is currently planning to implement demand management measures and optimization of the Upper Catskill Aqueduct to increase its capacity as water supply augmentation projects that will be in place before the tunnel is taken out-of-service. Reactivation of the Queens groundwater system is no longer deemed necessary as part of the water supply augmentation plan for this project; however, NYCDEP submitted renewal for the groundwater permits in December 2017 for added protection against drought or other emergency.

NYCDEP's Water Demand Management Plan is in its fifth year of implementation. The plan focuses on five key strategies for managing water demand, which consists of: the Municipal Water Efficiency Program, the Residential Water Efficiency Program, the Non-Residential Water Efficiency Program, Water Distribution System Optimization and Water Supply Shortage Management. NYCDEP anticipates a 20 mgd overall reduction of water consumption citywide due to the planned water demand management program. NYCDEP released its Water Conservation Annual Update Report in June 2017. NYCDEP is currently implementing an Upstate Water Conservation Program for targeted areas, which will help lower water demand for non-New York City communities consuming city water.

A project to repair and rehabilitate the Upper Catskill Aqueduct (from Ashokan Reservoir to Kensico Reservoir) is funded at \$212.5 million in FY2018. This project includes full inspection, implementation of mechanical and structural upgrades, and removal of the biofilm with chemical addition to increase the capacity to its historical flows. It is anticipated that 40 MGD of additional capacity in the Catskill Aqueduct will be available when this project is completed.

A Notice of Completion for the Final Environmental Impact Statement (FEIS) was issued in December 2017 for the Water for the Future: Upstate Water Supply Resiliency Project, which includes the rehabilitation of the Catskill Aqueduct, WFF Shutdown System Operations, and Inspection and Repair of the RWBT.

#### **Kensico Eastview Connection (KEC2) Tunnel**

NYCDEP has completed preliminary studies to evaluate options to improve redundancy and increase operational flexibility by allowing additional flow to be conveyed from the Kensico Reservoir for treatment at the CAT/DEL UV Facility. Currently, the Catskill Aqueduct is not in service between Kensico and the Cat/Del UV Facility. This is an important high priority project for NYCDEP therefore they have decided to move forward with design of a new tunnel, second Kensico Eastview Connection (KEC2) Tunnel. Funding of \$822.4 million is included in the Current Capital Plan, however this project extends beyond the Current Four Year Plan and funding is required to complete this project in the next Ten Year Capital Strategy. NYCDEP will begin design for the KEC2 and evaluate project schedule as the sequencing of KEC2 may impact other water system projects.

#### **Dam Safety**

Upstate reservoir dams are critical infrastructure for NYCDEP operations and the safety of the surrounding communities. NYCDEP has committed to go beyond the level of protection currently required by New York State, which requires existing dams to be capable of safely passing half of the probable maximum flood (PMF). When capital improvements are made at a dam, NYCDEP commits to providing that the dams safely pass the full PMF.

Due to significant SOGR needs to provide continued dam safety; there is \$183.78 million in funding for the Olive Bridge Dam at the Ashokan Reservoir and the upper/lower outlet structures. The full long-term rehabilitation upgrades for the Gilboa Dam that brought the dam into compliance with the NYSDEC dam safety guidelines have been completed. The remaining upgrades at Gilboa Dam are funded at approximately \$27 million in the Preliminary Four Year Current Capital Plan. The New Croton Dam requires reconstruction and is funded in the budget with \$147 million. NYCDEP expects to add funding for Delaware system dam upgrades in future planning periods.

NYCDEP has installed additional monitoring equipment at several upstate dams to enhance the monitoring capacity during and after storms. In addition to capital programs, NYCDEP maintains an inspection and maintenance program to support dam safety. NYCDEP continues their dam inspection program using engineering contracts and in-house NYCDEP inspectors. NYCDEP operates and maintains a safe dam system for upstate and in-city dams, based upon capital upgrades, inspection and maintenance program, and emergency action plans.



### **Ashokan Century Program**

As part of their commitment to SOGR upgrades in the watershed, NYCDEP announced the Ashokan Century Program which will upgrade all infrastructure associated with the Ashokan Reservoir in the Catskill watershed. In addition to the upgrade to the Olive Bridge Dam discussed above, this program will include upgrades to the Ashokan Reservoir spillway, dividing weir bridge, and the Ashokan Reservoir headworks. This program is estimated at \$750 million; funding will be required in the Ten Year Capital Program for these upgrades.

### **City Tunnel No. 3, Stage 2**

Most of the tunneling work for City Tunnel No. 3, Stage 2 has been completed. There is funding of \$659.3 million in the Preliminary Four Year Current Capital Plan for the completion, activation and shaft work (Shafts 17B and 18B) for City Tunnel No. 3, Stage 2 Brooklyn Queens leg. As of December 2017, City Tunnel No. 3 Brooklyn/Queens leg achieved activation-readiness, which means it is available as a back-up in case of an emergency. Design of Shafts 17B and 18B is ongoing. Full operation of City Tunnel No. 3 Brooklyn/Queens leg is expected once the funded construction contracts are completed. Design is also underway for the connection of the Brooklyn Queens leg of City Tunnel No. 3 to the Richmond Downtake Chamber, which will connect City Tunnel No. 3 to Staten Island. NYCDEP plans to conduct inspections of CT#1 and then eventually CT#2 once CT#3 is fully in service. Funding of \$27.7 million is included in the Preliminary Four Year Current Capital Plan for DDC trunk water main connection projects for City Tunnel No. 3.

### **Accelerated Water Main and Sewer Replacement**

Significant additional funding has been allocated in the budget for the acceleration of water main and sewer replacement. NYCDEP anticipates working with DDC to address areas with recurring problems and replacement of the oldest cast iron distribution pipe assets, when possible. There is approximately \$224 million in the Preliminary Four Year Current Capital Plan for the accelerated program funding.

### **Hillview Reservoir Cover**

The Hillview cover is required by federal regulations administered by USEPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2) and an Administrative Consent Order with NYSDOH and USEPA, which includes a schedule for installation. NYCDEP and USEPA executed a revised Administrative Order in May 2010, which provided an extension of time for construction of the Hillview cover. According to the current Administrative Consent Order, the site preparation construction contract was required to start by January 31, 2017. Construction start



**Figure 10: Hillview Reservoir located in Yonkers**

for the East Basin cover was required by December 31, 2018, and construction completion of the cover by May 31, 2028. This revised Order also allowed NYCDEP to submit an additional time deferral request. In October 2010, NYCDEP requested an additional six years, due to planned water system projects that would not permit Hillview cover construction simultaneously, due to the need to



undertake several water related projects that would need to be completed prior to construction of the Hillview cover. In February 2011, NYCDEP received a letter from the United States Department of Justice (USDOJ) indicating that this issue had been referred to them. NYCDEP submitted a proposal to the USEPA in the spring of 2012. In August 2011, USEPA announced that it is reviewing the requirements of LT2 for controlling microbial risks, including covering reservoirs, such as Hillview Reservoir. At that time, USDOJ and the city had agreed to defer negotiations over revised dates until USEPA completes its review.

USEPA notified NYCDEP in December 2016 that the USEPA will not be amending the LT2 Rule or providing a waiver for the Hillview Cover. In January 2017, EPA published in the Federal Register its decision not to revise the reservoir cover requirement under the LT2. NYCDEP plans to negotiate schedules to build the cover for inclusion in the Consent Order Agreement. NYCDEP's most recent cost estimate for a concrete cover is \$1.6 billion. However, NYCDEP plans to further evaluate cover alternatives before committing capital investment funding.

NYCDEP is planning to evaluate all alternatives to comply with the LT2 rule and the Consent Order. There is no funding for construction of the Hillview cover in the budget. Depending upon the outcome of the discussions with USEPA regarding the additional time extension and the results of an alternative analysis, funding will be required in future budget planning periods. The timing and amount of funding is not known at this time.

#### **Croton Water Filtration Plant**



**Figure 11: The underground Croton Water Filtration Plan in the Bronx**

The Croton WFP sent potable water into the NYC distribution network on May 7, 2015 well before the Croton Consent Order milestone date of May 17, 2015. In November 2015, the Croton WFP operated at full capacity and delivered 290 MGD to high level and low level service areas. NYCDEP submitted the requirements for the Final Completed Works Approval to NYSDOH in 2016. The Croton Consent Order was terminated by the Department of Justice on September 28, 2016, after the NYCDEP successfully completed the requirement to operate the facility for more than a year.

Course Club House along with construction and construction management (CM) change orders. Funding of approximately \$37.46 million is included in the CIP for payments to the Parks Department in connection with the Croton WFP. NYCDEP is reviewing the energy demand for standby power for the Croton WFP to increase dependability in case of a major power outage. The additional facilities for standby power are currently not funded in the Croton budget.

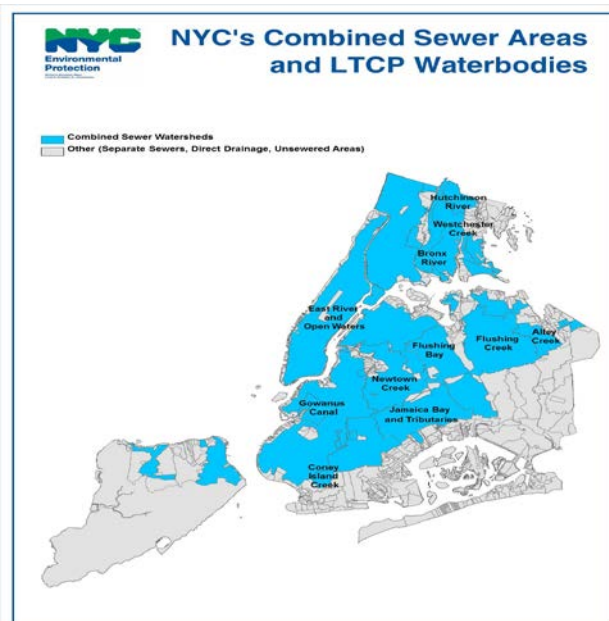
Approximately \$97.05 million is included in the Preliminary Four Year Current Capital Plan for facilities associated with the Croton WFP, which includes the permanent aboveground Moshulu Golf

## 6.5 Capital Improvement Program Highlights for the Wastewater and Stormwater System

### Combined Sewer Overflow (CSO) Program

The 2012 CSO Consent Order Modification incorporates a hybrid approach of green and grey infrastructure control strategies. The modified Consent Order is based upon an adaptive management approach to solving the CSO water quality issues which incorporates the Green Infrastructure (GI) Plan. The CSO Order contains milestones and schedules governing the planning, design and construction of a significant number of projects for NYCDEP's Citywide CSO Program. As required by the Order, NYCDEP has developed several waterbody-specific Long Term Control Plans (LTCPs) for NYC tributaries to reduce CSOs and improve water quality in NYC's waterbodies and waterways. The goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with the Federal CSO Policy and the

water quality goals of the federal Clean Water Act (CWA).



**Figure 12: CSO LTCP Waterbodies**

NYCDEP has submitted nine of the eleven LTCPs to NYSDEC. Each approved LTCP identifies recommended plans at each CSO LTCP waterbody. The following table presents the status of the LTCPs:

**Table 1: Status of CSO Long Term Control Plans**

<b>Waterbody/LTCP</b>	<b>Status of LTCP</b>
Alley Creek	Approved March 2017
Westchester Creek	Approved August 2017
Hutchinson River	Approved March 2017
Flushing Creek	Approved March 2017
Bronx River	Approved March 2017
Gowanus Canal	Approved March 2017
Flushing Bay	Approved March 2017
Coney Island Creek	Submitted Jun 2016, Pending approval
Newtown Creek	Submitted Jun 2017, Pending approval
Jamaica Bay and Tributaries	To be submitted June 2018
Citywide/Open Waters	To be submitted Dec 2018

NYCDEP held the annual citywide public meeting for the CSO Long Term Control Plans in November 2017.

The recommended projects in the approved LTCPs are now enforceable requirements under the CSO Consent Order. Based upon the recommended plans and projects derived from the nine completed CSO LTCPs, NYCDEP has estimated an additional \$4.4 billion in CSO projects over the next 25 years to mitigate the impacts of CSOs. The Preliminary Four Year Current Capital Plan includes approximately \$872 million in funding for grey infrastructure capital projects for implementation of the CSO Program, which includes \$535 million for the CSO retention tank at the Gowanus Superfund site, required due to the federal EPA Superfund Program. Funding for disinfection facilities, required as part of the LTCPs at Alley Creek, Hutchinson River and Flushing Creek are included in the Four Year Current Capital Plan. Additional funding will be required in the Ten Year Plan and beyond the current budget planning period to implement infrastructure required as part of the approved LTCPs.

The LTCPs are based upon the current water quality standards for fecal coliform bacteria. Environmental groups have sued USEPA over the NY State's 2015 water quality standards. The claim is that water quality standards should be for enterococcus bacteria rather than fecal coliform. Pending the court's finding, NYCDEP may be required to revise LTCPs based upon enterococcus bacteria rather than fecal coliform standard. If this occurs, there can be significant additional costs required to comply with the CSO 2012 Consent Order.

### Green Infrastructure (GI)

Green infrastructure is an approach to wet weather management that is cost-effective, sustainable and environmentally friendly. Several cities across the country have implemented green infrastructure for wet weather management and water quality control issues. The ambitious goal of NYC's Green Infrastructure Plan, which NYCDEP released in September 2010, was to capture the first inch of rainfall on 10% of the impervious areas in combined sewer watersheds through detention or infiltration over a 20-year period. The Green Infrastructure Plan is an adaptive approach to incorporating green infrastructure into



**Figure 13: Green Infrastructure Rain Garden**

NYCDEP's overall CSO program. DEP's adaptive management strategy includes regular monitoring of green infrastructure performance, continuous evaluation of lessons learned in the field, furthering the understanding of green infrastructure co-benefits, and development of additional cost-effective tools to implement GI. NYCDEP's ongoing Research and Development Program assists in this effort.

The NYCDEP submits an annual report updating NYSDEC on the progress of the GI Plan. The next Annual Report for 2017 will be submitted on April 30, 2018. The implementation of the GI Program in NYC focuses on three main areas which are (1) right of way bioswales or rain gardens, (2) installation of GI on public property (3) installation of GI assets on private property through the grants program. There are approximately 4,000 rain garden assets currently installed in NYC, primarily in right-of-ways (public sidewalks and streets). NYCDEP coordinates with many city agencies and partnering agencies to implement green infrastructure on city property. These partnerships include NYC Parks and Recreation, Department of Transportation (DOT), Department of Design and Construction (DDC), Economic Development Corporation (EDC), NYC Housing Authority (NYCHA), Department of Education (DOE), Trust for Public Land (TPL). The Green Infrastructure Grant Program will continue for private property in 2018; however, in order to address some of the challenges on the private property, NYCDEP is contracting with a third party facilitator for successful implementation of green infrastructure projects on private property. Eligible projects include blue roofs, rain gardens, green roofs, porous pavement and rainwater harvesting on private property in New York City.

Although NYCDEP was unable to meet the first major milestone on December 31, 2015 (capturing the equivalent of stormwater generated by one-inch of precipitation on 1.5% of impervious areas), NYCDEP submitted a Contingency Plan to NYSDEC in June 2016. As the Order allows NYCDEP to employ adaptive management principles for green infrastructure, the Contingency Plan includes a list of specific green infrastructure projects along with a schedule to make-up the shortfall and to reach the 1.5% green infrastructure implementation rate. NYCDEP submitted the Green Infrastructure Performance Metric Report to NYSDEC in June 2016. NYCDEP has also developed a database, known as NYC GreenHUB for green infrastructure tracking.

The Preliminary Four Year Current Capital Plan includes approximately \$857.55 million in funding for green infrastructure projects. Additional funding for continued implementation of the GI program in NYC is anticipated in the next Ten Year Plan. Components of the GI program are also funded through the expense budget, such as the Research and Development program and maintenance of the GI assets. NYCDEP continues aggressive efforts for optimizing the GI Program.

### **Southeast Queens Stormwater Infrastructure**

NYCDEP is performing a comprehensive program to improve drainage to address flooding issues in Southeast Queens. In the Preliminary Four Year Current Capital Plan, \$1.096 billion is funded for FY 2018–FY 2022 for the Southeast Queens storm sewer program. NYCDEP is aggressively working on this storm sewer build-out program in Southeast Queens. The majority of the funding will go toward large trunk sewer spines that will be constructed by several different projects. Many smaller local storm sewer projects will connect neighborhoods to these trunk storm sewer spines. NYCDEP provides continuous public outreach and program updates to the Southeast Queens community. NYCDEP maintains close coordination with other city agencies. NYCDEP plans to implement projects in a phased approach on a priority basis. Green infrastructure and bluebelts are also being constructed in Southeast Queens to help manage stormwater.

### **Cogeneration Facility at North River WWTP**

A project for a Cogeneration Facility at North River WWTP was developed as a sustainability project to meet the needs of GHG emission reductions and achieving a SOGR to replace the engine-driven, main sewage pumps and engine blowers that are near the end of their useful life. The North River WWTP Cogeneration Facility construction contract was awarded in FY 2017, and the facility is currently under construction. Additional funding of \$43.43 million is included in the Preliminary Four Year Current Capital Plan. The North River Cogeneration project consists of replacing the main sewage pump engines with electric motors, and the existing engine-driven aeration blowers with new aeration blower with electric motors. The new cogeneration facilities will provide new gas driven engines and generators which will provide electricity to drive the main sewage pumps and the nine high speed turbo aeration blowers, and heat for digester and building heating. The new engines would operate on both digester gas and natural gas. Fuel oil will no longer be used at the facility.

### **Hunts Point WWTP Digesters and Sludge Thickening**

NYCDEP is planning a major sludge stabilization facility upgrade at the Hunts Point WWTP that will allow wastewater biosolids to be fully stabilized and recycled for beneficial reuse. Replacement and upgrade of the digesters at Hunts Point WWTP is funded in the Preliminary Four Year Capital Plan at \$220.9 million in FY 2020. Additional funding will be required for the construction of the Hunts Point digester upgrade. The upgrade to the sludge thickening process is an integral part of the overall sludge stabilization facilities and improved thickening will make the digesters operate more efficiently. Funding for the sludge thickeners at Hunts Point is in the Preliminary Capital Plan at a level of \$29.5 million, however additional funding will be required in the next budget cycle for construction of the sludge thickener upgrades.

The sludge thickeners reduce the volume of water that passes through the digesters, which reduces the energy required for heating and provide sufficient solids retention time to result in a sludge stabilization product meeting the criteria for Class “B” Biosolids so that the full program goals are attained. It is important that the schedules of these two projects (digesters and sludge thickening) are coordinated so that both process upgrades will be operational at the same time to provide the most efficient processes.

As discussed earlier in the report, NYCDEP is evaluating potential energy projects in collaboration with SOGR needs. It is anticipated that digesters and sludge thickening at other WWTPs will be evaluated.

### **Citywide Nitrogen Removal Program**

The Upper East River (UER) WWTPs (Hunts Point, Bowery Bay, Tallman Island, and Wards Island WWTPs) and two of the Jamaica Bay WWTPs (26<sup>th</sup> Ward and Jamaica WWTPs) have been



operating in Step Feed BNR mode as required by the Nitrogen Consent Judgment for the Phase I Facility Plan and a Stipulation and Order Modifying the Nitrogen Consent Judgment.

NYCDEP, NYSDEC and Natural Resources Defense Council (NRDC) entered into a Jamaica Bay Agreement, which includes nitrogen removal upgrades at Rockaway WWTP and Coney Island WWTP, construction milestones for the Jamaica Bay WWTPs interim nitrogen effluent limits for Jamaica Bay and the funding of an environmental benefits project for the saltwater marsh restoration in Jamaica Bay. Funding is currently included in the Preliminary Four Year Current Capital Plan for the nitrogen removal upgrades at Coney Island and Rockaway at a combined level of \$46.8 million. NYCDEP is evaluating alternatives for future use and operations at the Rockaway WWTP facility. Rockaway WWTP under in construction for BNR upgrades and Coney Island is going out for bid this year. The interim nitrogen load limits for the Jamaica Bay WWTPs are being met. Final Jamaica Bay nitrogen limits are based upon performance based standards.

Glycerol has been selected as the supplemental carbon source for additional nitrogen removal. The supplemental carbon addition for Phase II BNR at the UER WWTPs (Hunts Point, Bowery Bay, Tallman Island and Wards Island WWTPs) and the Jamaica Bay WWTPs (Jamaica and 26<sup>th</sup> Ward WWTPs) is operational. The Consent Judgement required reducing the combined nitrogen discharges in the WWTP effluent for the UER WWTPs by 58.5 percent by January 2017. The UER WWTPs achieved the required level of nitrogen removals in advance of the milestone. By September 2016, nitrogen discharges from the UER WWTPs have been reduced by approximately 61 percent. After significant upgrades to the UER WWTPs for implementation of BNR, the UER WWTPs continue to be in compliance with the TMDL for total nitrogen and have achieved the final required stepdown for the total nitrogen allowable load in the UER. There is funding of \$35 million in the budget for the conversion of the Sharon demonstration facility at Wards Island to another nitrogen removal process, known as Annamox.

### **Total Residual Chlorine (TRC)**

Prior to discharge to a receiving body, wastewater effluent is disinfected with chlorine at the WWTPs. Excessive residual chlorine can be toxic to aquatic life in the receiving water body. A TRC Consent Order between NYSDEC and NYCDEP became effective October 2015, which includes interim TRC limits, proposed final TRC limits and a compliance schedule for the TRC upgrade projects required at each of the WWTPs.

NYCDEP and NYSDEC are finalizing a modified TRC Consent Order. There is \$120.26 million in the Four Year Current Capital Plan for the TRC program. Additional funding will be required in the next Ten Year Capital Strategy.

### **Rockaway WWTP**

Due to several factors including low wastewater flows at the Rockaway WWTP along with the Hurricane Sandy impacts to the plant, NYCDEP has been evaluating alternatives for future operation of the Rockaway WWTP. NYCDEP completed a Facility Plan for Rockaway WWTP in 2014, which analyzed alternatives for future Rockaway WWTP operations. The evaluation considered maintaining wastewater treatment operations at the existing Rockaway WWTP or sending wastewater to 26<sup>th</sup> Ward WWTP for treatment. Significant SOGR upgrades, BNR upgrades and resiliency measures are required at Rockaway WWTP to maintain continuous operation. Two consolidation plans were evaluated to transfer the wastewater flows to 26<sup>th</sup> Ward WWTP across the Jamaica Bay: horizontal directional drilling (HDD) with open cut conveyance and tunneling under Jamaica Bay with tunnel boring machine (TBM). A pumping station would be required for the consolidation options. The Facility Plan underwent a Value Engineering workshop in December 2014. This project has also undergone an Envision™ triple bottom line evaluation. NYCDEP continues to evaluate alternatives to determine the best solution for future Rockaway wastewater flow. Additional studies are underway

that may impact this decision, such as the Rockaway infiltration/inflow (I/I) studies. There is currently approximately \$47.5 million in SOGR funding for Rockaway WWTP in the Preliminary Four Year Current Capital Plan. However, after a decision has been determined for future operations, significant additional funding may be required for serving the Rockaway drainage basin.

### **Bluebelts**

NYCDEP has been successful in developing effective Bluebelt sites in the South Shore of Staten Island since the 1990s. Bluebelts are an innovative stormwater drainage system made up of wetlands, streams and ponds. NYCDEP is evaluating expansion of the program to sites on the North Shore of Staten Island, Queens and the Bronx, where they would be effective. Approximately \$373.77 million is included in the Preliminary Four Year Current Capital Plan for land acquisition and construction to expand the Bluebelts for stormwater management. This past year NYCDEP completed its largest expansion of the Bluebelt program in Staten Island, in the South Shore neighborhood of Woodrow. This project included new storm sewers, catch basins, manholes, new sanitary sewers and replacement of existing water mains. The catch basins will allow precipitation to drain from the roadways into the new storm sewers which will then direct it to the Bluebelt wetland where it will be filtered naturally to protect the environment. The Institute for Sustainable Infrastructure (ISI) recognized the project with its Envision Silver Award.



### **6.6 Superfund Designations**

In March 2010, the Gowanus Canal was declared a Superfund site and USEPA has notified NYC that they are considered a potential responsible party (PRP) for hazardous waste under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for the Superfund sites. On September 30, 2013, USEPA issued its Record of Decision (ROD) for the Gowanus Canal, establishing the dredging, capping and source control requirements. The ROD requires NYC to build two CSO retention tanks as part of the source control component due to the CSO contribution at Gowanus Canal. In December 2013, NYCDEP completed and reactivated the Gowanus Canal Flushing Tunnel to directly improve water quality and circulation within the canal. In May 2014, USEPA issued a Unilateral Administrative Order requiring the City to design major components of the remedy for the Gowanus Canal, including the CSO retention tanks. In June 2016, USEPA issued a memorandum stating that the size of the two CSO storage tanks should be 8-million gallons at RH-034 outfall and 4-million gallons at OH-007 outfall. Also, in June 2016, USEPA issued an Administrative Settlement Agreement directing NYCDEP to construct the Head End Facility at the recommended location and requiring that NYCDEP issue an environmental impact statement (EIS) for the Head End Facility. NYCDEP is proceeding with the siting and design of the CSO Facility at Owl's Head Outfall OH-007 in accordance with the Unilateral Order. The environmental review process is complete and the Final Environmental Impact Statement (FEIS) for the Gowanus Canal CSO Facilities was released February 2018. The FEIS addresses the two CSO tanks, one at the Head End site and one at the Owls Head site. It is anticipated that City Council will vote on the Uniform Land Use Review Procedure (ULURP) for the Head End site tank location. The ULURP process for the Owls Head tank will take place at a later time. Funding of \$535 million is included in the Preliminary Four Year

Current Capital Plan for the Gowanus Canal CSO retention tanks. Additional funding will be required in the next Ten Year Capital Strategy.

In September 2010, Newtown Creek was declared a Superfund site. NYCDEP has entered into an Administrative Settlement Agreement and Order on Consent with EPA, along with five other potential responsible parties that own or operate facilities adjacent to Newtown Creek in the investigation of conditions in Newtown Creek and the evaluation of feasible remedies. The Remedial Investigation/Feasibility Study (RI/FS) is ongoing. The city is responsible for a portion of the cost of the study; however, the settlement does not cover any remediation that might eventually be required by USEPA to address the contamination identified as a result of the investigation and evaluation. The ROD for the Newtown Creek Superfund has been delayed and it is expected in 2023. NYCDEP is coordinating with the NYSDEC and the USEPA regarding the recommended plans for the Newtown Creek CSO LTCP along with the Newtown Creek Superfund program.

In May 2014, the USEPA listed Wolff-Alport Chemical Company in Queens as a Superfund site, based upon radioactive contamination at the site. USEPA has indicated that the Superfund process would include an investigation of impacts to the NYCDEP sewer system from operations at the chemical company site. Radioactive material was disposed on-site and also into the sewer system.

There are future potential financial impacts to NYC for the Superfund sites; however, the extent to which NYC will be responsible has not yet been fully determined for the Newtown Creek and the Wolff-Alport Chemical Company Superfund sites.

## **6.7 Potential Future Long-Term Water and Wastewater Projects Beyond Current Budget Planning**

### **Catskill Aqueduct Roundout Pressure Tunnel**

NYCDEP began monitoring the Catskill Aqueduct pressure tunnel due to leaks beneath the Roundout Creek using a remote operated vehicle. Funding will need to be added to future budgets to complete the investigations to quantify the amount of leaks and identify the location in order to devise a plan to repair the leak. United States Geological Survey (USGS) is also monitoring the area. Once the Delaware repairs are completed, it is anticipated that NYCDEP will address these leaks in the Catskill Aqueduct tunnel section. A temporary fix to one area of leaks due to a leaking valve will be included in the near-term planned shutdowns during the Catskill Aqueduct Repair and Rehabilitation project. A long term solution will need to be devised to address the other suspected leaks in the pressurized tunnel portion of the Catskill Aqueduct.

### **City Tunnel No. 3, Stage 4**

The long-term planning for the next phase of City Tunnel No. 3 is the Stage 4 extension. Stage 4 would deliver additional water to the eastern parts of the Bronx and Queens. It would extend southeast from the northern end of Stage 1 in the Bronx to Queens and then southwest to interconnect with the Queens portion of Stage 2. City Tunnel No. 3 Stage 4 will enable The system to maintain full service even if Tunnel 1 or 2 were shut down. NYCDEP must decide on its next long-term priorities and needs, and therefore a schedule or budget for this anticipated next phase will have to be developed.

### **Potential Further Nitrogen Removal in NYC WWTPs**

The New York/New Jersey Harbor Estuary Program (HEP) is a National Estuary Program that has been sanctioned by the USEPA to restore the waters of the Lower Harbor Estuary and the tidally



influenced portions of all rivers and streams that empty into the Estuary. The HEP was convened as a partnership of federal, state, and local governments; scientists; civic and environmental advocates; the fishing community; business and labor leaders; and educators (called the Management Conference). NYCDEP submitted a report to USEPA in 2007 that evaluated the capital investment cost of upgrading four WWTPs (Owls Head WWTP, Red Hook WWTP, North River WWTP, and Port Richmond WWTP) to provide nitrogen and carbon removal at four different levels of treatment. The water quality impacts on the Harbor Estuary are now being evaluated by USEPA for the various levels of treatment. Through this methodology, it is expected that USEPA and the Management Conference will determine which treatment upgrades, if any, will be required for NYC. Funding is not in the current budget for HEP-related upgrades. Upon completion of the HEP studies and based upon negotiations with USEPA, funding may be required in a later planning period.

The USEPA Long Island Sound Study is evaluating further nitrogen reductions for the Long Island Sound. The results of this analysis have the potential to impact NYCDEP UER WWTPs by requiring further nitrogen removals. NYCDEP will continue to remain involved and will provide meaningful input throughout this Nitrogen Reduction Strategy.

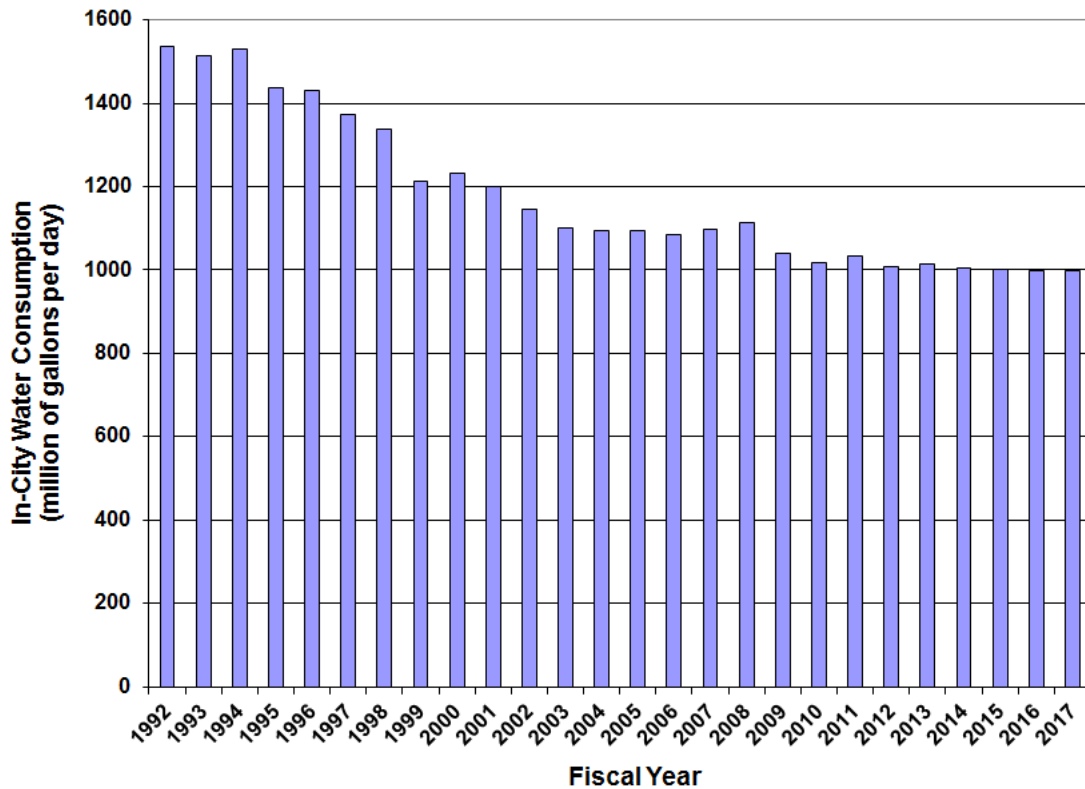
## **7.0 EXPENSE BUDGET**

The FY 2018 expense budget released in the Preliminary Plan is \$1.506 billion. The proposed FY 2019 expense budget in the Preliminary Plan is \$1.307 billion. Expense budget projections for FY 2019 are currently being evaluated based upon the projected new needs of The System and will require adjustment when the evaluation is complete. The FY 2019 expense budget is expected to increase and be updated in the Executive Budget, to be released in April 2018. The expense budget is made up of Personal Services (PS) and Other than Personal Services (OTPS). The personnel services budget is made up of staff salary, fringe benefits and pension costs. The OTPS makes up the remaining expense budget, including taxes, chemicals, supplies, fuel oil, gasoline, biosolids, equipment, contract services, leases, FAD, training, and others requirements/needs. There are many competing needs within the Expense budget each year; therefore, NYCDEP must continue to evaluate all requirements of the water and wastewater system when completing the expense budget. In accordance with applicable regulations and directives, NYC decides the projects (or elements of a project) that are eligible for capital funding. The remaining needs are covered in the expense budget. In addition to the day-to-day requirements to operate and maintain the NYCDEP system, the expense budget must also cover planning studies that are necessary to prioritize and capital investments but the studies, themselves, are not capital eligible. Planning studies/Facility Plans are important aspects of long-term management of The system and should be carried out before any significant capital funds are committed to a specific facility.

## **8.0 PERFORMANCE OVERVIEW**

### **Water Conservation**

Figure 5 presents the annual water demand for the City over the last 25 years. Water conservation measures taken by NYCDEP in the 1990s have resulted in a steady reduction in the overall water demand. Water demand has decreased by approximately 35% since the 1990s. More recent declines in water consumption have been noted most likely attributed to continued conservation measures, water usage metering, availability of easily accessible data for tracking and weather patterns.

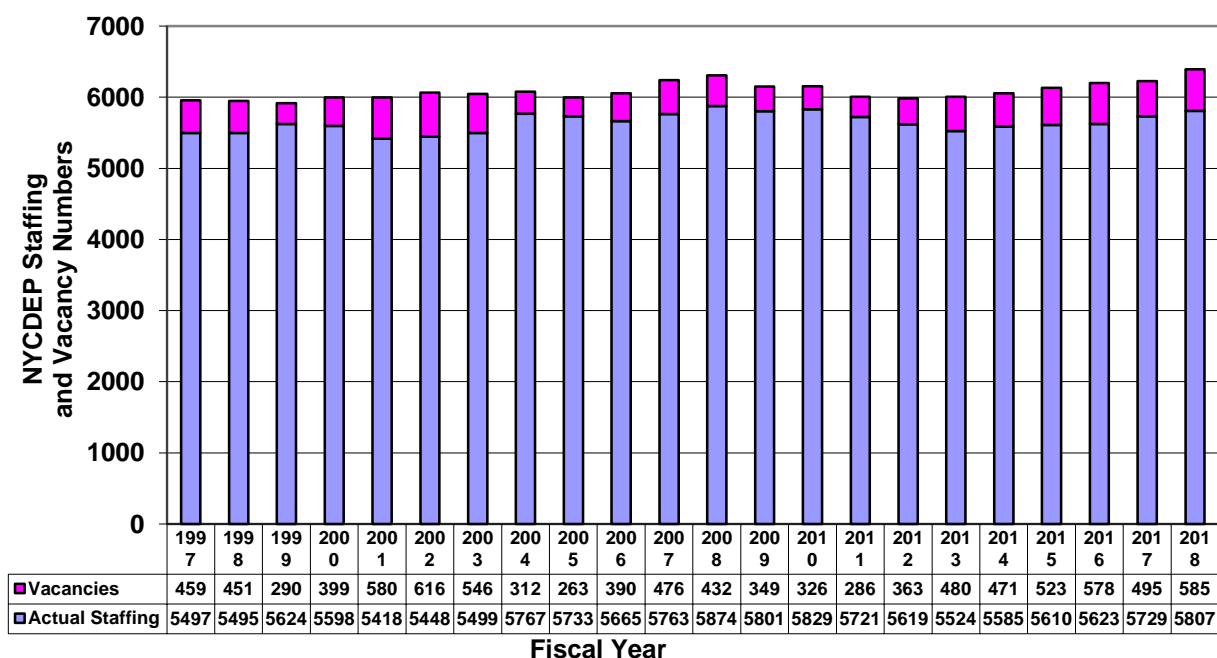


**Figure 15: New York City Average Daily Water Demand in Million Gallons per Day (MGD)**

### System Staffing Levels

Approved positions for the entire NYCDEP system are currently at 6,392 for FY 2018 and vacancies currently stand at 585. This reflects a slight increase in budgeted headcount and in vacancies compared to FY 2017, as shown in Figure 14. NYCDEP aggressively works to fill vacancies and has seen improvements in attracting highly skilled and qualified staff. NYCDEP Organizational Development is also developing and implementing succession planning and staff retention programs. A large number of NYCDEP staff are eligible to retire in the near future (1/2 the current workforce is eligible to retire in the next 10 years). Recruitment, training and succession planning are essential to maintain a skilled DEP workforce. NYCDEP maintains a strong diverse workforce.

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**Figure 16: NYCDEP – Staffing and Vacancy Levels FY 1997-2018**

NYCDEP continues evaluating current and future staffing needs and skill sets to meet both operational needs and implementation of the capital program. Additional staff will be required as the growing demands of NYCDEP operations continue. The operating bureaus are evaluating effective means to operate more efficiently. BWT has added an Organizational Development Director to evaluate BWT staffing needs. BWT is constantly trying to fill Sewage Treatment Worker (STW) positions, as it is important for knowledge transfer, mentoring programs that encourage the interaction between experienced staff and new hires. BWT is trying to implement a process which will improve flexibility to get STWs on board. Besides filling vacancies, BWT will identify new staffing needs as new facilities come on-line (CSO facilities, BNR facilities). For BWSO, there will be an increase in the Green Jobs that perform maintenance of green infrastructure assets throughout the City, over the next few years as the GI Program expands and more assets require maintenance. BWSO positions increased recently to support the expansion of the catch basin inspection program. For BWS, succession planning is challenging for licensed operators of new water treatment facilities; BWS will remain focused on succession planning. BEDC has identified additional staff for the implementation of the large capital program.

NYCDEP is evaluating the cost-effectiveness of insourcing some tasks/needs that are currently provided by contract services. If NYCDEP determines that insourcing is a viable means of achieving the same result, it is anticipated that additional staff will be identified and needed. NYCDEP will look to provide a balance of insourcing and contract service where appropriate.

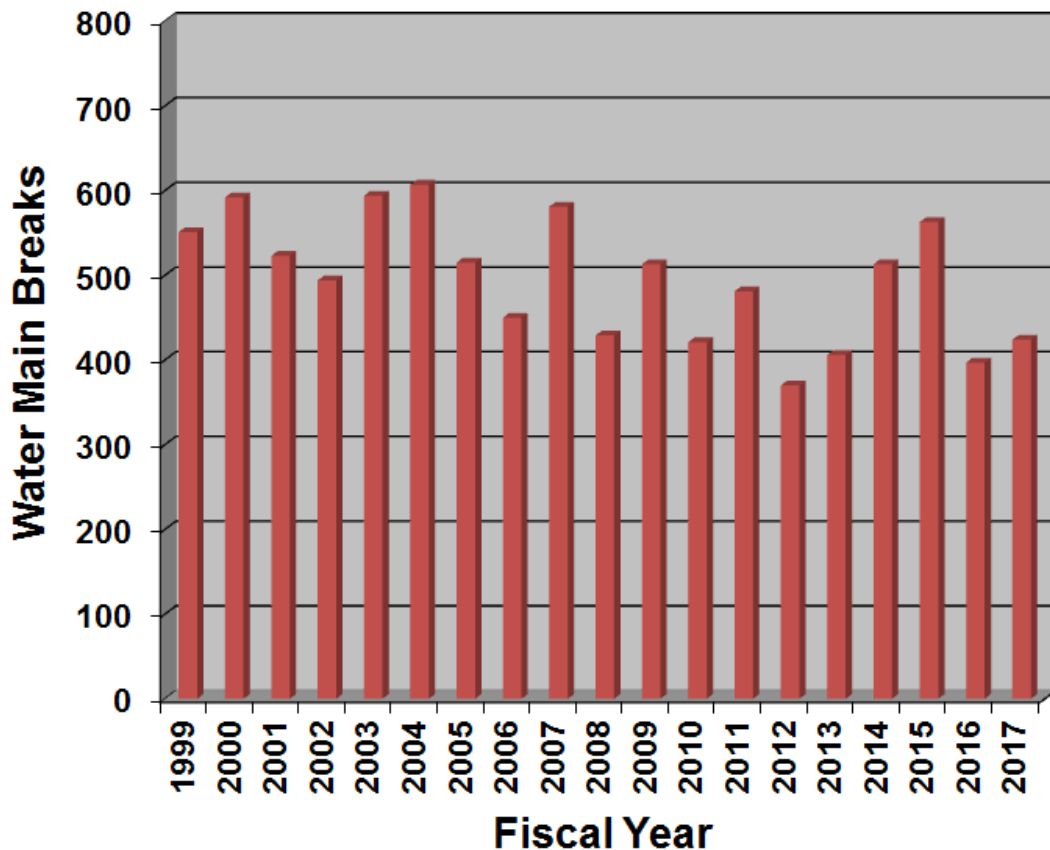
### Operational Performance Indicators

There are many operational parameters that can be reviewed to assess the effectiveness of operating programs. Several performance indicators for water and sewer operations are summarized below.

There were 424 water main breaks reported in FY 2017, which translates to 6.1 breaks per 100 miles of main over a 12 month period. The number of water mains breaks in FY 2017 increased slightly

compared with FY 2016 but a decrease from prior years (see Figure 15). NYCDEP BWSO operations continue a preventative maintenance program to target pressure reducing valves by exercising valves and inspecting regulators to help prevent the occurrence of water main breaks, costly repairs, leaks and disruption of service. The majority of water main breaks occur in the winter since the water mains are impacted by the freeze/thaw cycles in the colder temperatures. The range of water main breaks that NYC has recently experienced remains below that of other municipalities in the United States. NYCDEP continued to restore water to residents within an average of 4.4 hours after confirming the water main break.

NYCDEP achieved 62.5 miles of new water main replacement this past year which is close to a 1% annual replacement rate.

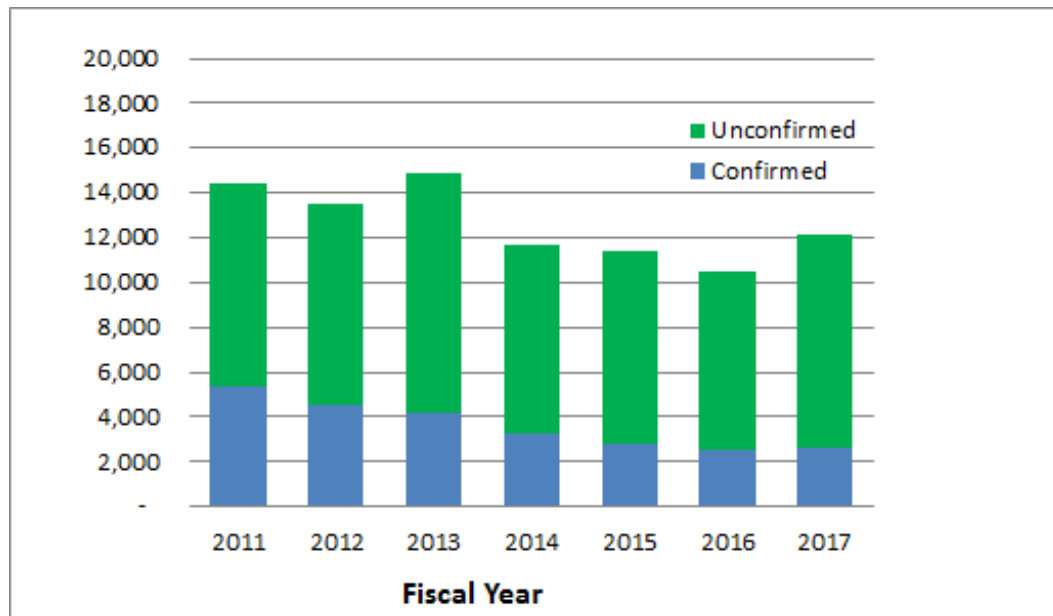


**Figure 17: Total NYCDEP Water Main Breaks per Fiscal Year**

Approximately 0.56% of total fire hydrants were broken and inoperative in FY 2017. The average time to repair or replace high priority broken or inoperative hydrants (as determined by the Fire Department) by NYCDEP was 2.5 days in FY 2017, which is slightly less than last year's average time and far less than the target time for repair or replacement of 7 days. The number of catch basins that were surveyed and inspected in FY 2017 jumped to 98.3% from 31.7% of the total. In accordance with Local Law (LL) 48, effective FY 2017, the inspection cycle for catch basin inspection changed. This new LL requires annual catch basin inspections for the next three years. The LL includes reporting requirements to the City Council. In FY 2017, BWSO commenced catch basins cleaning annually instead of once every three years, for all 148,000 catch basins. BWSO achieved inspections for 98.3% of catch basins the first year of the revised inspection schedule implementation.

BWSO field crews are using tablets in the field to track catch basin cleaning data. The total number of catch basins that were cleaned by NYCDEP in FY 2017 is 51,816.

NYCDEP received 12,134 sewer backup (SBU) complaints in FY 2017, which is made up of 2,649 confirmed SBUs (on NYCDEP infrastructure) and 9,490 unconfirmed SBUs (not on NYCDEP infrastructure or not found). Response time for SBUs was 3.8 hours on average, which is similar to the past several years and well below the target of 7 hours. NYCDEP has found that the significant majority of confirmed sewer backups can be attributed to fats, oils and grease (FOG) buildup in the sewers. NYCDEP has continued to implement and expand aggressive operational and public outreach initiatives to address the FOG problem in the sewers.



**Figure 18: Sewer Backup (SBU) Complaints**

NYCDEP uses a data-driven risk management approach to operate and maintain the sewer system, targeting specific locations with reoccurring problems. A group within BWSO addresses the Capacity, Management, Operations, and Maintenance (CMOM) program and related issues with specific Standard Operating Procedures (SOPs) in place. The Sewer Operations and Analysis Program (SOAP) at NYCDEP allows for a more proactive rather than reactive approach. This group analyzes areas with reoccurring problems to determine the cause of the problem and then determines a remediation plan (degreasing, cleaning, repair, replacement). BWSO's top priority remains its core work, which consists of televising of sewers, sewer cleaning, catch basin reconstruction and cleaning, hydrant repair, installation of new water mains.

NYCDEP submitted a Sewer Backup Prevention and Response Plan to the NYSDEC in May 2017. In July 2017, NYCDEP commenced a three year pilot program (July 2017 – June 2020), known as a Targeted Sewer Inspection Pilot (TSIP). The goal of the pilot is to further reduce the frequency of confirmed SBUs throughout NYC. During the pilot NYCDEP will perform two cycles of visual inspections of the sanitary sewers over the 3-year period across specific geographic areas in Brooklyn and Queens that historically have had the highest number of SBUs. BWSO plans to complete 55,000 sewer segment inspections by June 2020. Based upon the results of the SBU pilot, additional SBU performance metrics may be identified. The increased inspections for these targeted



areas reflect a proactive position rather than reactive for NYCDEP operations. BWSO plans to release existing metrics on their sewer operations annually in a report known as State of the Sewers.

### **Operational and Maintenance Program Summary and Updates**

*Water Supply and Treatment Operations.* NYCDEP strives to increase the reliability, flexibility and redundancy of overall water supply operations. The interconnection of the Delaware Aqueduct with the Catskill Aqueduct at Shaft #4, which allows water from the Delaware Aqueduct to be diverted to the Catskill Aqueduct has been operational since 2015. This interconnection gives operational flexibility and an additional tool in dealing with turbidity incidents following high rainfall in the Catskill watershed. The upgrades at the Croton Falls Pump Station and the Cross River Pump Station provide conveyance flexibility to NYCDEP and provide the ability for Croton water to be supplied to the Delaware Aqueduct, if required in emergencies.

*Croton Operations.* The Croton WFP began sending treated drinking water to the NYC distribution network in May 2015. In November 2015, Croton demonstrated operating at full capacity, 290 MGD. The operations at the Croton WFP have varied depending upon the operational needs of the overall water supply and distribution system. Depending upon the needs of the overall system, NYCDEP will continue to vary the operations at the Croton WFP.

*UV Operations.* The Cat/Del UV Facility has been in operation since October 2012. NYCDEP BWS Operations staff successfully took over 100% control of the facility on June 15, 2013. The facility is operated and maintained with approximately 52 NYCDEP BWS staff. The UV facility is the largest UV water disinfection facility in the world and consists of fifty-six 40 MGD UV disinfection units. It is currently receiving and providing UV disinfection to all Cat/Del waters and it is designed to disinfect 2.4 billion gallons per day. Currently water is transferred from the Kensico Reservoir to the Cat/Del UV Facility via the Delaware Aqueduct. The Consent Order for the Cat/Del UV Facility was terminated July 2016.

*Drinking Water Quality and Quantity.* NYCDEP released the *New York City 2017 Drinking Water Supply and Quality Report* in February 2018. NYCDEP conducts significant monitoring of the source water and in-city water quality. In CY 2017, NYCDEP collected 36,120 samples from the in-city distribution system and performed approximately 401,200 analyses, meeting all state and federal monitoring requirements. In addition, NYCDEP collected 14,170 samples and performed 214,600 analyses from the upstate watersheds, and completed approximately 1.2 million robotic monitoring measurements to support FAD watershed protection programs and to optimize water quality. Microbiologists, chemists and other scientists with the BWS test water from key locations across the watershed and the City at NYCDEP laboratories. NYCDEP water quality laboratories are located in Hawthorne, Kingston, Grahamsville and Queens. As of February 28, 2018, the overall storage in NYC's water supply system stands at 95.3% of capacity, compared to the normal levels at this time of 87.3% of capacity.

NYCDEP utilizes the Operation Support Tool (OST) for various decision making and operating modes. The OST model links water quality and water quantity models, uses near real-time data for reservoir levels, stream flows entering reservoirs, snowpack and water quality in streams and reservoirs, and it includes National Weather service forecasts.

*Wastewater Operations.* In Fiscal 2017 the percent of critical equipment out-of-service at wastewater treatment plants was 1.8% below the minimum, which continued to improve and remained well below the target of 5.0 percent. For first 4 months of FY2018, 1.4% below the minimum of critical equipment was out-of-service at wastewater treatment plants. BWT has implemented an enhanced equipment maintenance program which is predictive based minimizing the downtime of critical equipment. This program is anticipated to save on capital replacement and energy costs.

*BNR Operations at the Wastewater Treatment Plants.* NYCDEP has been operating in Step Feed BNR mode at several of the NYCDEP WWTPs (Hunts Point, Bowery Bay, Tallman Island, Wards Island, 26<sup>th</sup> Ward and Jamaica WWTPs). Due to the long-term planning and significant capital projects that have been implemented, NYCDEP operations have been achieving the final total nitrogen (TN) removals established for the Upper East River. The final TN load for Jamaica Bay will be performance-based once the BNR upgrades at the remaining two Jamaica Bay WWTPs (Rockaway and Coney Island) are completed. Due to the required upgrades at the plants, the UER WWTPs have seen an approximate 61% reduction in total nitrogen in the effluent.

*Harbor Water Quality.* NYC has been collecting and maintaining records of water quality data for over 100 years. The New York Harbor Water Quality Survey currently consists of 89 sampling stations harborwide. NYCDEP has increased the number of monitoring sites throughout the harbor and at the mouth of key tributaries in order to evaluate the effectiveness of the NYCDEP stormwater management and CSO control projects. The number of water quality parameters measured has increased from five in 1909 to 27 water quality parameters at present.

The water quality in the harbor has continued to improve as a result of the maintenance and operation of the wastewater treatment plants and the combined sewer overflow programs. Figures 17 and 18 below demonstrate the improvements in water quality over the past 42 years as indicated by the increased dissolved oxygen concentrations and reduced Fecal Coliform counts. The trend graphs for the 2016 Harbor Survey data have been modified to reflect the extension of the bathing season by the NYC City Council. All trend graphs that are presented include data collected from the extended recreational bathing season, beginning of May to the end of October, rather than the beginning of June to the end of September, as previous graphs have shown. In FY 2016, 90% of the harbor survey stations met the fishable standard of 5 mg/L for dissolved oxygen. The percentage of wastewater treatment plant effluent that met federal standards in FY 2016 was 99.5%.

*Sludge Vessels.* In 2014, NYCDEP commissioned three new sludge vessels, the Motor Vessel (M/V) Hunts Point, the M/V Port Richmond and the M/V Rockaway. The three new ships join the M/V North River and the M/V Red Hook sludge vessels. The sludge vessels transport liquid sludge from the six wastewater treatment plants not served by onsite dewatering facilities to those wastewater treatment plants with dewatering facilities.

*Biosolids.* NYCDEP typically produces 1,400 wet tons per day of biosolids from the wastewater treatment operations at the 14 WWTPs. NYCDEP is developing a Biosolids Strategic Plan to identify alternative applications for NYCDEP biosolids. Currently the majority of biosolids from NYCDEP WWTPs are landfilled. However BWT plans to increase the beneficial reuse of biosolids, starting with a beneficial reuse contract for 10% of NYC biosolids, as it has significant environmental and sustainability benefits. Beneficial reuse of biosolids supports the OneNYC mayoral initiative of zero waste to landfills by 2030.

*Environmental Health & Safety (EH&S).* NYCDEP maintains a robust and comprehensive EH&S program across all bureaus throughout the NYCDEP. NYCDEP provides consistent EH&S training so that staff can carry out their work responsibilities safely and in compliance with the many local, state and federal regulations. The EH&S Group is responsible for a comprehensive EH&S compliance program, all EH&S training, audits, EH&S employee surveys and the NYCDEP internal compliance office. EH&S is carried out by in-house NYCDEP management and staff as well as EH&S contracts.

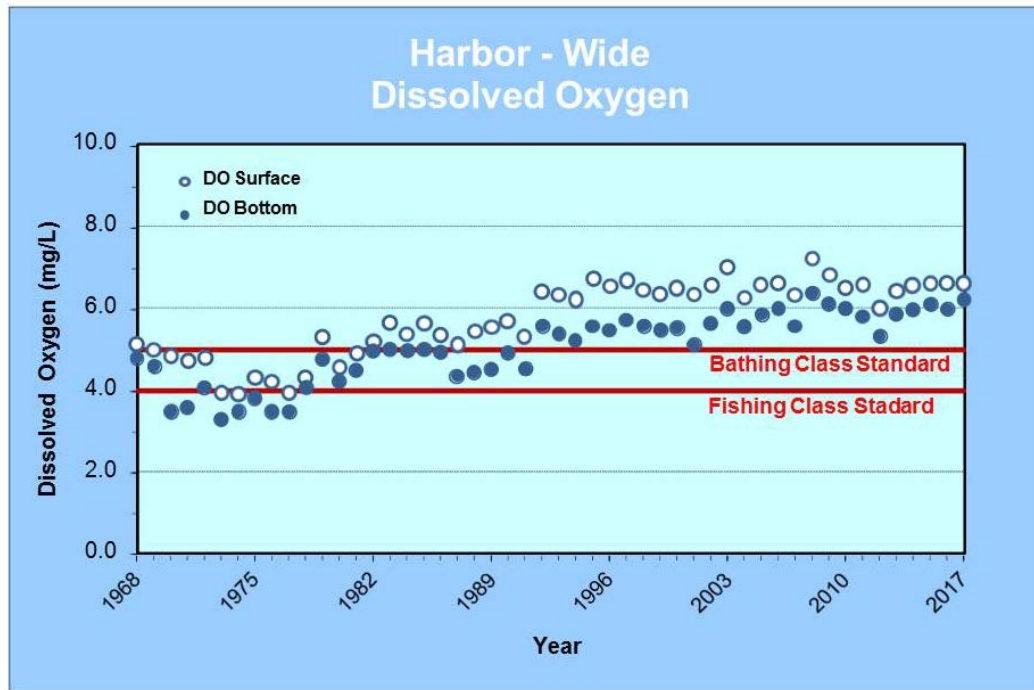


Figure 19: Dissolved Oxygen for Harbor Survey Key Stations (1968-2017)

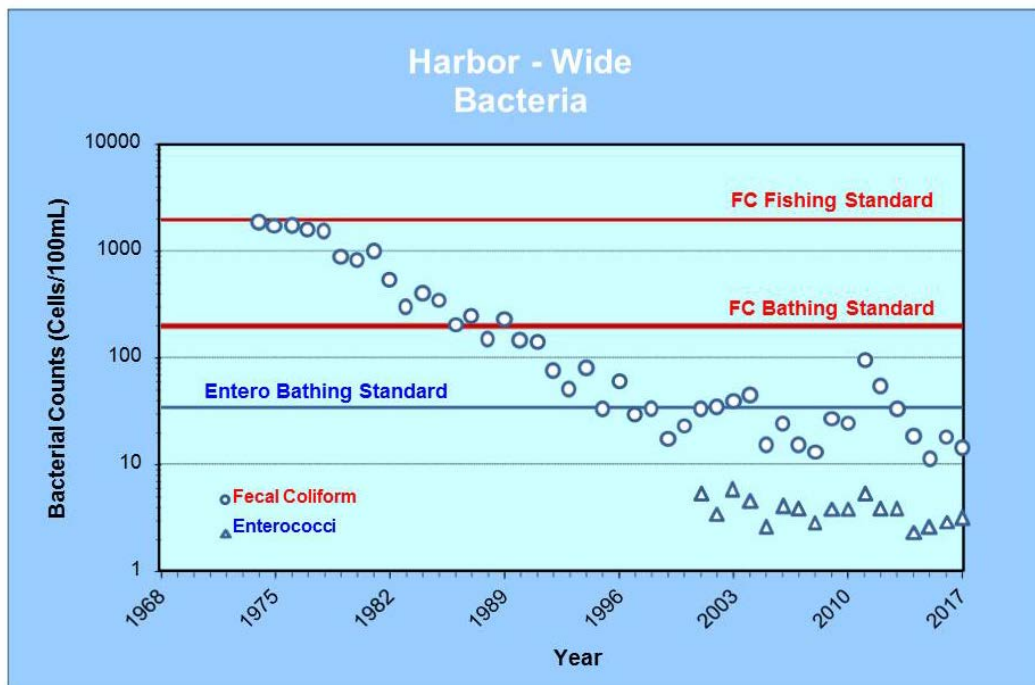


Figure 20: Fecal Coliform Counts and Enterococci for Harbor Survey Key Stations (1974-2017)

## Permit Updates

**Wastewater Treatment.** NYSDEC issued final State Pollutant Discharge Elimination System (SPDES) permits for the 14 NYC WWTPs on October 15, 2015. NYCDEP plans to commence discussions with NYSDEC in 6 months in anticipation of the SPDES permits expiring in 2020. NYCDEP is operating in accordance with the current SPDES permits for 14 WWTPs. Based upon diligent wastewater treatment plant operations, as stated previously 99.8% of the NYCDEP wastewater treatment plant effluent met federal standards in FY 2017. For the first four months of FY 2018, 100% of the NYCDEP wastewater plant effluent met federal standards.

**Stormwater.** NYSDEC issued a final municipal separate storm sewer system (MS4) permit for NYC on August 1, 2015. A portion of New York City has separate storm and sanitary sewer systems. The storm sewers are addressed under the MS4 permit and the separate sanitary sewers send flows to the WWTPs, which operate under the SPDES permits. NYC is the permit holder since the MS4 requirements covers 14 city chartered agencies. However, NYCDEP coordinates all required activities under the permit. In October 2013, an Executive Order was signed addressing coordination and implementation of stormwater controls and MS4 permit requirements for NYCDEP and other NYC agencies. Memorandums of Understanding (MOUs) have been developed between NYCDEP and the chartered city agencies that are impacted by the MS4 permit. As required by the MS4 permit, NYC established legal authority in 2017 with the passage of Local law 97. The city has established a Stormwater Controls Working Group that includes representatives from each agency that meet quarterly to discuss stormwater program development tasks and permit-related information. The MS4 permit includes robust requirements, which significantly expand the city's obligations to reduce pollutants discharging to the storm sewers. The MS4 permit requires NYC to submit a Stormwater Management Program (SWMP) Plan within three years of the effective date of the permit. The SWMP is due August 1, 2018. A draft of the SWMP will be released in April 2018. Key components of the SWMP include public education and outreach, mapping, illicit discharge detection and elimination (IDDE), construction site stormwater runoff control, post-construction stormwater management, pollution prevention and good housekeeping for municipal operations, industrial stormwater sources, control of floatables and settleable debris, monitoring and assessment of controls, and impaired waters. The MS4 includes annual reporting requirements. NYCDEP submitted the second MS4 Annual Progress Report in 2017. Among other requirements, NYC must also submit a fiscal analysis of the capital, operating and maintenance costs necessary to meet the requirements of the permit within three years of the permit effective date, due August 1, 2018.

As part of NYCDEP's public outreach and education, in June 2017 NYCDEP announced the launch of *Don't Trash Our Waters*, a public awareness campaign aimed at reducing litter and improving the health of New York City's waterbodies.

In September 2017 NYCDEP released a report entitled, *Innovative and Integrated Stormwater Management*. The report provides an overview of stormwater control measures along with several case studies from other municipalities across the country, along with a few international case studies.

## 9.0 OTHER NOTEWORTHY ISSUES AND COMMENTS

### Lead and Copper Rule

NYCDEP has been in compliance with the current Lead and Copper Rule. NYCDEP has an active corrosion control program in place in order to reduce lead absorption from service lines and internal plumbing. NYCDEP treats the water with food grade phosphoric acid and sodium hydroxide. Sodium hydroxide is added to raise the pH and reduce corrosivity, which prevents the leaching of lead from pipes into the drinking water. Phosphoric acid is added to create a protective film on pipes that reduces the release of metals, such as lead, from household plumbing. Under the federal Lead and Copper Rule, mandated at-the-tap lead monitoring is conducted at select households throughout New

York City. In 2017, based on the results of this monitoring, the 90<sup>th</sup> percentile did not exceed 15 µg/L, the established standard or Action Level for lead. The at-the-tap monitoring results will be presented in the annual New York City Drinking Water Supply and Quality Report. In addition to the mandated at-the-tap monitoring, NYC residents can request a free lead kit to test their water. NYCDEP's Water Quality Lead Unit recently made improvements to the free lead testing program by revising the sampling and mailing instructions to better explain the procedures.

The USEPA is considering Long-Term Revisions to the Lead and Copper Rule to improve public health protection by making practical changes and to streamline the rule requirements. NYCDEP has been engaged with the National Drinking Water Advisory Council (NDWAC) Lead and Copper Rule Working Group. Changes to the federal Lead and Copper Rule are anticipated be released in 2018, in draft form.

### **Awards**

NYCDEP capital program, operations and customer service have been recognized throughout the industry by professional and trade organizations. The American Council of Engineering Companies (ACEC) New York awarded several NYCDEP projects in 2017. These projects include the Interim Upgrade of Newtown Creek WWTP (Diamond Award), the Croton Water Filtration Plant (Diamond Award), the Water-Energy Nexus Study (Platinum Award), the Bowery Bay WWTP Emergency Pump-Around System (Platinum Award), and the Springfield Gardens Area D Project (Silver Award).

The Croton WFP also received the New York State American Water Works Association (NYS AWWA) Project of the Year award and Operator of the Year award. The NYSAWWA's Project of the Year award was established to promote excellence in the management and administration of projects within the water industry. The NYSAWWA Operator of the Year award recognizes the outstanding performance of one water treatment operator in the state each year.

NYCDEP was also recognized by American Council for an Energy-Efficient Economy as a top water utility nationwide in the 2017 City Energy Efficiency Scorecard. NYCDEP received the highest score in the Efficiency Efforts for the Water Services category, with specific mention for the water demand management, energy, greenhouse gas emissions management and green infrastructure programs.

NYCDEP ranked #1 in customer satisfaction according to a *J.D. Power 2017 Water Utility Residential Customer Satisfaction Study*. Overall satisfaction was determined based upon 33 attributes in the following six categories: delivery, price, conservation, billing/payment, communications, and customer service. The survey measured satisfaction among residential customers of 87 water utilities serving a population of at least 400,000 people in four geographic regions - Midwest, Northeast, South and West.

### **Flexible Flow Management Plan (FFMP)**

On October 21, 2017 the 2017 Flexible Flow Management Plan (2017 FFMP) became effective and was signed by all five Delaware Decree parties. The Delaware Decree parties include New York State, New York City, New Jersey, Pennsylvania and Delaware. The 2017 FFMP is a 10-year agreement that addresses and governs the quantity and timing of water that is released from the NYC Delaware watershed reservoirs (Cannonsville, Neversink and Pepacton Reservoirs) to the rivers downstream. The 2017 FFMP includes several new provisions that address water supply, flood control, flood attenuation, ecological interest, fisheries, etc. For flood attenuation, New York City will aim to meet a storage objective of 85 percent at its three reservoirs between Nov. 1 and Feb. 1, compared to the previously set 90% storage objective. This change will take place without affecting water supply reliability. Several scientific studies are also required to be undertaken as part of the 2017 FFMP agreement, including studying the NJ water supply diversions during drought conditions, the potential for increased water storage in the lower part of the Delaware basin, calculation of water



available to be released downstream of NYC reservoirs and the study of salinity intrusion into the lower Delaware River. The Current FFMP was developed based upon significant scientific data analyses and modeling.

#### **Bathymetry Study of Catskill and Delaware Reservoirs**

USGS recently completed a bathymetry study of the NYCDEP Catskill and Delaware reservoirs to evaluate changes in sediment deposit in these water supply reservoirs. The results of the study found that total reservoir capacity has been reduced by 2.4%, or 11.6 billion gallons. The study found that most of this accumulation of sediments has occurred in the “dead storage” which means beneath the water intakes for the water supply. At this time and for the foreseeable future NYCDEP has determined there is no impact to the water supply operations based upon this study, however NYCDEP will continue to monitor. USGS is completing a similar study for the Croton watershed reservoirs.

#### **Groundwater Feasibility Study**

A Groundwater Feasibility Study is ongoing to study the groundwater drainage project with the goal of addressing basement flooding in southeast Queens. The study will evaluate how high the groundwater table has risen, how far it must be lowered in order to reduce the basement flooding, and the feasibility of a groundwater collection plan. The study is expected to be completed in 2018.

### **10.0 SUMMARY AND CONCLUSIONS**

Considering the magnitude of the overall infrastructure and the level of operational service required, it is our opinion that:

- The System continues to be managed in a professional and prudent manner with an appropriate regard for the level of service afforded to the users within the available funding.
- The physical condition of The System receives an adequate rating. However due to the size and complexity of The System, NYCDEP requires future capital investments for the continuous replacement and/or repair of aging infrastructure in a systematic and cost-effective manner.
- NYCDEP capital and expense budget projections for FY 2018 satisfy the immediate needs for The System including legally mandated projects, which comprise approximately 21% of the capital budget for FY 2018.
- NYCDEP capital budget projections for FY 2019 satisfy the immediate needs for The System including legally mandated projects, which comprise approximately 24% of the capital budget for FY 2019. Expense budget projections for FY 2019 are currently being evaluated based upon the projected new needs of The System and may require adjustment when the evaluation is complete.
- NYCDEP capital planning is an ongoing iterative process addressing priorities and needs of The System. The NYCDEP is responsive to the long-term requirements of the service area.
- Staffing levels are approximately 91% of current allocations. NYCDEP has identified additional needs and skill sets to meet more complex facility operation requirements and managing the capital program. NYCDEP is also evaluating their future needs focusing on

succession planning, transfer of knowledge and staff retention in anticipation of departure of experienced NYCDEP employees that are eligible for retirement in the near future.

### **Regarding System Management**

In our opinion, The System continues to be managed in a professional and prudent manner with an appropriate regard for the level of service afforded to the users. The physical condition of The System receives an adequate rating, our highest rating. In our opinion, the NYCDEP facilities and infrastructure are in adequate condition. NYCDEP faces similar issues to many other large urban areas nationwide, such as aging infrastructure, strict regulatory requirements and ongoing climate change resiliency concerns. NYCDEP continues to successfully manage the overall operations of the NYC large and complex water and wastewater system, and prioritize the most important projects and programs. As indicated, an Asset Management program is being utilized by NYCDEP that better identifies the needs and costs for infrastructure upgrades. Capital funding will need to be allocated to address the state of good repair of the aging infrastructure in order to avoid critical failure of essential processes. These needs will have to continue to be addressed and implemented in a systematic way. NYCDEP is taking a proactive approach prioritizing its needs and spending money (capital investment and operating expenses) where it will have the greatest impact to the water and wastewater system operations, reliability and redundancy, and to the water quality in the upstate watershed and the surrounding NYC waterways. NYCDEP has started to move from the planning stage to implementation phase of climate change adaptation based upon sound cost-effective analysis and this process will need to continue. Prioritization of greatest need is a significant factor in moving forward with implementation of climate change resiliency. Because of the vast and extensive nature of the NYCDEP facilities and its aging infrastructure, continued diligence and future capital improvements will continue to be required in the near term and long term.

### **Regarding the Capital Improvement Program (CIP)**

Projects/Programs that are will require additional funding in future budgets include:

- *SOGR*: As indicated throughout the report, significant additional funding in future budgets will be required for the continuation of SOGR projects due to the aging infrastructure throughout the wastewater and water system. Specifically, additional funds have been identified for the Hunts Point digesters and sludge thickening projects, BWT job order contracts (JOCs) funding and emergency contract funding for BWSO in FY20-FY22.
- *Climate Change Resiliency, Energy Efficiency, and Sustainability Projects*: NYCDEP is seeking other funding mechanisms for climate change resiliency and energy efficiency projects. There might be a need in the future for additional NYCDEP funding to pursue these projects. This might result in an incremental cost added to some state of good repair projects or entirely new projects. Additional funding needs may be identified in the next budgeting cycle.
- *Combined Sewer Overflow (CSO) Program*: NYCDEP has submitted several Long Term Control Plans (LTCPs) and will continue to submit two more LTCPs in the next year. Based upon the recommended plans for the approved LTCPs, additional funding will continue to be required for implementation of the CSO LTCPs in the next Ten Year Capital Strategy and future budget cycles beyond the ten year horizon.
- *Hillview Cover*: Depending upon the outcome of negotiations regarding a revised implementation schedule for the Hillview cover and the results of an updated alternative analysis, significant funding will need to be added to future capital plans.

- *Municipal Separate Storm Sewer System (MS4)*: Capital and expense costs have not fully been identified. NYC is required to submit a fiscal analysis of the capital, operating and maintenance costs necessary to meet the requirements by August 2018. MS4 requirements may impact expense budgets and staffing needs.

## **11.0 LIST OF ACRONYMS**

ACE	Accelerated Conservation and Efficiency
ADG	Anaerobic Digester Gas
AUV	automated underwater vehicle
BEC	Bureau of Environmental Compliance
BEDC	Bureau of Engineering, Design, and Construction
BEPA	Bureau of Environmental Planning and Analysis
BGD	Billion Gallons per Day
BNR	Biological Nitrogen Removal
BWS	Bureau of Water Supply
BWSO	Bureau of Water and Sewer Operations
BWT	Bureau of Wastewater Treatment
Cat/Del	Catskill/ Delaware
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIP	Capital Improvement Program
CM	construction management
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DAF	Dissolved Air Flotation
DCAS	Department of Citywide Administrative Services
DDC	Department of Design and Construction
DOE	Department of Education
DOT	Department of Transportation
ECM	Energy Conservation Measure
EDC	Economic Development Corporation
EIS	Environmental Impact Statement
ESCR	Eastside Coastal Resiliency
ePMIS	Enterprise Project Management Information System
EH&S	Environmental Health & Safety
ExCEL	Expenses for Conservation and Efficiency Leadership
FAD	Filtration Avoidance Determination
FEIS	Final Environmental Impact Statement
FEMA	Flood Emergency Management Agency
FERC	Federal Energy Regulatory Commissioner
FOG	fats, oils and grease
FY	Fiscal Year
GHG	Greenhouse Gas
GI	Green Infrastructure
HEP	Harbor Estuary Program
HDD	Horizontal Directional Drilling
ISI	Institute for Sustainable Infrastructure
KEC2	Second Kensico Eastview Connection Tunnel
KPI	Key Performance Indicator
LT2	Long Term 2 Enhanced Surface Water Treatment Rule
LTCP	Long Term Control Plan
MGD	Million Gallons per Day
MS4	Municipal Separate Storm Sewer System
MW	megawatt
NACWA	National Association of Clean Water Agencies
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYSDEC	New York State Department of Environmental Conservation

**THE NEW YORK CITY MUNICIPAL WATER FINANCE AUTHORITY**  
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NYCHA	NYC Housing Authority
NPCC	New York City Panel on Climate Change
NYSERDA	New York State Energy Research and Development Authority
OSPE	Office of Strategic Planning and Engineering
OST	Operation Support Tool
PMF	probable maximum flood
PRP	Potential Responsible Party
PS	Pump Station
RI <sup>2</sup>	Recognition-Improvement-Intervention
ROD	Record of Decision
ROV	remote operated vehicle
ROW	Right of Way
RWB	Rondout-West Branch
SBU	Sewer Backup
SCADA	Supervisory Control and Data Acquisition
SIRR	Special Initiative for Rebuilding and Resiliency SIRR
SOGR	State of Good Repair
SPDES	State Pollutant Discharge Elimination System
SMLP	Storm Mitigation Loan Program
TBM	tunnel boring machine
TMDL	Total Maximum Discharge Limit
Tpd	tons per day
TPL	Trust for Public Land
TRC	Total Residual Chlorine
ULURP	Uniform Land Use Review Procedure
USDOJ	United States Department of Justice
USGS	United States Geological Survey
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
WERF	Water Environment Research Foundation
WFF	Water for Future
WRRF	Water Resource Recovery Facility
WUCA	Water Utility Climate Alliance
WWTP	Wastewater Treatment Plant

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