New York City Water Board

Report on the Cost of Supplying Water to Upstate Customers for the 2020 Rate Year

Draft of April 16, 2019

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To the Members of the New York City Water Board:

The Amawalk Consulting Group LLC is pleased to submit its Report on the cost of supplying water to upstate customers of the Water System of the City of New York (the "City"). The Report presents our findings on the cost of service and identifies: a) the unit rate for Fiscal Year 2019 that is necessary to recover the anticipated cost of water supply service, and b) the proposed unit rate for Fiscal Year 2020 for consideration by the Water Board.

The Report presents the actual cost of water supply service for Fiscal Years 2016 through 2018. The methodology used to develop the cost of service for these years is consistent with that used in previous years. In addition, the anticipated cost of service is presented for Fiscal Years 2019 through 2023 (the "Projection Period").

The Report shows that the cost of water supply service is expected to increase during the Projection Period compared to the actual costs incurred in 2016 through 2018. The increases are primarily attributable to rising operating expenses, including the property taxes levied on watershed properties, together with capital investments in water supply infrastructure. Significant investments have been made in the Water System in recent years to protect the quality of the water supply, to enhance the integrity of the System, and to achieve other water supply objectives. Additional capital investments will be made during the Projection Period. In addition to the projected increases in the cost of service, the unit rate for water supply service is impacted by changes in both upstate and in-City consumption including the expectation that System-wide water consumption will decline at a relatively slow pace over the long-term.

We appreciate the opportunity to be of assistance to the Water Board and would be pleased to answer any questions you may have regarding the study methodology or findings. We also wish to acknowledge the assistance provided by representatives of the Office of Management and Budget, the Department of Environmental Protection and the Law Department of the City, as well as the New York City Water Board and the New York City Municipal Water Finance Authority in the preparation of this Report.

Should you have any questions or comments, please do not hesitate to contact the undersigned at (212) 361-0050.

Very truly yours,

Edward J. Markus
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1.0 Introduction

1.1 Purpose

The purpose of this Report is to summarize the results of the study performed by the Amawalk Consulting Group LLC ("Amawalk") of the cost of providing water supply service to communities north of New York City (hereinafter, "the City"). The Report presents the calculated regulated rate for Fiscal Year 2020 to recover the cost of service. The Report also presents the calculated cost of service and rates for Fiscal Years 2016 through 2018; the anticipated cost of service and rates for 2019 (the current year); and the projected cost of service and rates for 2021 through 2023. The calculated regulated rate for Fiscal Year 2020 is $2,001.00 per million gallons ("MG"), which represents an increase of $272.01 per MG from the current unit rate of $1,728.99, or an increase of 15.7%.

As noted below, there has been no change in the regulated rate being charged during the last three years so that the above increase of 15.7%, when averaged over the period of 2016 to 2020, is about 3.7% per year on a compounded basis. However, in an effort to mitigate a portion of the transition to the higher unit rate, this Report proposes a delay in the recovery of part of the increase in the cost of service. The effect of the recommended delay is to modify the proposed regulated rate for Fiscal Year 2020 to $1,888.06 per MG, which represents an increase of $159.07 per MG from the current unit rate of $1,728.99, or an increase of 9.2%. The proposed increase, when averaged over the period of 2016 to 2020, is about 2.2% per year on a compounded basis.

It is noted that the regulated rate that was adopted by the New York City Water Board (the "Board") for Fiscal Year 2017 in the amount of $1,750.52 per MG was not implemented and no further rate action was taken for Fiscal Year 2018 and 2019. Thus, the current regulated unit rate that is being used to bill customers for water supply service was implemented beginning with the 2016 Fiscal Year, or July 1, 2015.

1.2 Scope

The Report presents the findings of Amawalk regarding the revenue requirements for water supply service as well as water consumption by customers and a unit rate for calculating charges to upstate customers. The revenue requirements take into consideration the operation and maintenance expenses, principal and interest on bonds, and other financial needs related to facilities north of the City. The Fiscal Year 2020 cost of service and unit rate are based, in part, on the calculated cost of service for the current fiscal year and prior years, which is presented herein. All years referred to in the Report reflect the fiscal year of the City that begins July 1 and ends June 30.

Amawalk has reviewed, to the extent practicable, the books, records, financial reports, and statistical data of the City, the Board, and the New York City Municipal Water Finance Authority (the "Authority"), and it has conducted such other investigations and analyses as

deemed necessary to assemble and analyze the cost of water supply service and rates. We have performed analyses necessary to support our findings and conclusions.

In analyzing the projection of future operations summarized in this Report, Amawalk has reviewed certain assumptions with respect to conditions, events, and circumstances, which may occur in the future. We believe that these assumptions are reasonable and attainable, although actual results may differ from those in the forecast as influenced by the conditions, events, and circumstances, which actually occur.

1.3 Background

The City, through its Department of Environmental Protection ("DEP"), is responsible for operating and maintaining dependable sources of water supply and providing drinking water to certain communities north of the City and to in-City consumers. DEP operates and maintains the water supply system (the "Water System" or the "System") and is responsible for planning, designing and constructing capital improvements to the System. The Capital Improvement Program (the "CIP") of DEP identifies planned commitments for design, construction, and construction-related work for the System by category of project in each year of the planning period of 2019 through 2029.

The information presented in this Report is as of April 1, 2019, unless otherwise noted. Additional information, changes in the System, or events occurring after these dates are not reflected in the Report. This Section 1.3 is intended to provide background information for the reader.

1.3.1 The Water System

Water for the System can be drawn from three upstate reservoir systems (Croton, Catskill, and Delaware) and a system of wells in Queens. The three upstate water collection systems, which benefit customers north of the City, as well as in-City consumers, include 19 storage reservoirs and three controlled lakes with a total storage capacity of approximately 580 billion gallons. They were designed and built with various interconnections to increase flexibility by permitting the exchange of water from one system to another. This feature mitigates localized droughts and takes advantage of available water in any of the three watersheds. DEP is continuing to enhance its infrastructure to increase its operational flexibility.

The Water System furnishes water to users in portions of four of the eligible counties north of the City. The Water System provides approximately 90% of the water used in Westchester County and approximately 10% of the water used in the counties of Putnam, Orange, and Ulster.

Although all water from the Croton System must be pumped, approximately 95% of the total water supply delivered from the Catskill and Delaware Systems is delivered by gravity. Figure 1 provides an overview of the Water System.

Figure 1 Map of the Water System

1.3.1.1 The Croton System

The Croton System consists of 12 reservoirs and three controlled lakes on the Croton River, its three branches, and three other tributaries. The water in the Croton System flows from upstream reservoirs through natural streams to downstream reservoirs, terminating at the New Croton Reservoir. The watershed that supplies the Croton System has an area of 375 square miles. It lies primarily within the State of New York (the "State"), approximately 45 miles north of lower Manhattan. A small portion of the watershed is located in the State of Connecticut.

The Croton System is available to supplement the Catskill System and the Delaware System. Use of the Croton System is determined by DEP's operational needs.

1.3.1.2 The Catskill System

The Catskill and Delaware Systems together currently provide the vast majority of the daily water supply for the City and customers north of the City. The Catskill System watersheds occupy sparsely populated areas in the central and eastern portions of the Catskill Mountains. Water in the Catskill System comes from the Esopus and Schoharie Creek watersheds, located approximately 100 miles north of lower Manhattan and 35 miles west of the Hudson River. The Catskill System is comprised of Schoharie Reservoir (formed by the Gilboa Dam across Schoharie Creek) and Ashokan Reservoir (formed by the Olivebridge Dam across Esopus Creek) and the Catskill Aqueduct. Schoharie Reservoir water is delivered to the Esopus Creek via the Shandaken Tunnel, from which it then travels to Ashokan Reservoir.

1.3.1.3 The Delaware System

The Delaware System is located approximately 125 miles north of lower Manhattan. Three Delaware System reservoirs collect water from a sparsely populated region on the branches of the Delaware River: Cannonsville Reservoir (formed by the Cannonsville Dam on the West Branch of the Delaware River), Pepacton Reservoir (formed by the Downsville Dam across the East Branch of the Delaware River), and Neversink Reservoir (formed by the Neversink Dam across the Neversink River, a tributary to the Delaware River). Water from these three reservoirs is diverted to Rondout Reservoir (formed by the Merriman Dam across Rondout Creek, a tributary to the Hudson River).

The conditions under which the System's Pepacton, Neversink, and Cannonsville Reservoirs may be operated are set forth under the terms of a 1954 decree of the Supreme Court of the United States (the "1954 Decree"). It authorizes the System to divert up to 800 million gallons per day ("MGD") of water from the Delaware River Basin for use by the Water System, subject to specified conditions. A series of agreements among the parties to the 1954 Decree required the System, under certain circumstances, based on the time of year, reservoir storage, anticipated inflow and water supply demand, to release water from the three reservoirs into the tributaries of the Delaware River, in support of enhanced habitat protection and flood mitigation. A new agreement among the Decree Parties was reached in October 2017, which establishes a new 10-year program. The agreement protects the available supply of drinking water for the City, and expands efforts to enhance flood attenuation and support recreational use of the upper Delaware River. The parties to the agreement have committed to pursue a number of scientific studies to refine management of the resources to advance the myriad interests connected to the Delaware River. Enforcement of the 1954 Decree is under the jurisdiction of a River Master appointed by the Supreme Court of the United States.

1.3.1.4 The Catskill Aqueduct

The Catskill Aqueduct, which conveys water by gravity, is 92 miles long and extends from Ashokan Reservoir to Kensico and Hillview Reservoirs. The delivery capacity of the Catskill Aqueduct from Ashokan Reservoir to Kensico Reservoir is about 600 MGD. From Kensico Reservoir to Hillview Reservoir, the Catskill Aqueduct has a capacity of approximately 800

MGD. The Catskill Aqueduct passes under New Croton Reservoir. At this location, it is possible to transfer water from Ashokan Reservoir to New Croton Reservoir.

1.3.1.5 The Delaware Aqueduct

The Delaware Aqueduct is 85 miles long and similarly carries water by gravity from Rondout Reservoir to West Branch Reservoir, which is in the Croton System, and from West Branch Reservoir to Kensico Reservoir, and then on to Hillview Reservoir. Water enters the Delaware Aqueduct via the Rondout Reservoir, which is fed by the Neversink, Pepacton, and Cannonsville Reservoirs. The capacity of the section that delivers water from Rondout Reservoir to West Branch Reservoir is about 890 MGD. The delivery capacity of the Delaware Aqueduct from West Branch Reservoir to Kensico Reservoir is about 1,050 MGD. The Delaware Aqueduct has a capacity of approximately 2,020 MGD from Kensico Reservoir to Hillview Reservoir.

1.3.1.6 The Queens Groundwater Supply

The System also includes a number of groundwater wells in the Borough of Queens. These wells have been offline since 2007 due to the availability of higher quality water from the Catskill and Delaware Systems. When in use, the wells are capable of providing approximately 1% of the City's daily water supply. The wells could be used to provide more of the daily supply if required to meet water supply needs. Unlike the rest of the City's water supply, which is a surface and gravity-supplied system originating in a network of upstate reservoirs, well water is pumped from extensive underground aquifers.

1.3.1.7 Long-Term System Capacity

Current demand and flow projections show that if conservation programs, including metering, toilet replacement, hydrant locking, leak detection, and public information campaigns remain effective, there will be no immediate need for the City to find additional long-term water supply sources to meet normal demand. However, with the construction of the Rondout-West Branch bypass tunnel noted in Section 1.3.2.1, there will be a short-term need for water supply augmentation and/or demand management.

1.3.1.8 System Security

To protect the System, including water supply structures and facilities, DEP has a police force of approximately 200 officers. DEP also secures facilities through locks, fences, and other physical barriers to prevent access by unauthorized persons.

1.3.2 Condition of the Water System

The System has reliably served the City since 1842, and many additions and improvements have been made over the years to develop the System that exists today. On an overall basis, AECOM USA, Inc., the consulting engineer to the Authority, rates the condition of the water and wastewater system of the City "Adequate", the highest rating category. Nonetheless, DEP is pursuing a number of initiatives to enhance the long-term integrity of the Water System. An overview of some of these initiatives is presented in this part of the Report.

1.3.2.1 Rondout-West Branch Tunnel

The Rondout-West Branch Tunnel is a section of the Delaware Aqueduct which can convey up to 890 MGD, and typically delivers an annual average of 600 MGD, more than 50% of the City's daily water supply. The Tunnel carries water 45 miles from the Delaware System under the Hudson River and into West Branch Reservoir. It has the highest pressures and the highest velocities in the Water System. A portion of the tunnel crosses a fractured rock formation, which is potentially subject to greater stress than the deep rock tunnels located in the City.

DEP regularly assesses the condition and integrity of the System's tunnels and aqueducts to determine the extent and effect of water loss and, since the early 1990s, DEP has monitored the condition of the Rondout-West Branch Tunnel. As a result of DEP's flow tests, visual observations and other analyses, it has been determined that approximately 15 MGD to 36 MGD of water is being lost from the Rondout-West Branch Tunnel and is surfacing in the form of springs or seeps in the area. This amounts to a loss of approximately 4% of the daily volume of water provided by the tunnel under peak flow conditions. The situation in the Rondout-West Branch Tunnel and the amount of water loss is stable. In the opinion of the professional engineering firm retained by DEP in conjunction with that investigation, there is very little immediate risk of failure of the Rondout-West Branch Tunnel.

To address the leak, DEP is undertaking its Water for the Future program, which includes construction of an approximately two and one-half mile long bypass tunnel. Connection of the bypass to the existing tunnel is expected to require that the tunnel be shut down for up to eight months or two or three shut downs of shorter duration, starting in 2022, during which periods supply augmentation and demand management practices are expected to be needed. The estimated remaining cost to complete the design and construction of the shafts and tunnel bypass and to implement updated water supply augmentation projects and water conservation measures is $152 million, all of which is funded in the CIP.

1.3.2.2 The Gilboa Dam and Ashokan Reservoir

Gilboa Dam, part of the Catskill Water System, is comprised of an earthen dam and a concrete gravity dam, with the concrete portion also acting as the spillway. DEP is currently upgrading the dam to meet safety guidelines for new dams. The estimated cost to complete the rehabilitation of the dam is $23 million, all of which is funded in the CIP.

DEP will be making improvements to the structures and mechanical systems at the Ashokan Reservoir, including upgrading and stabilizing the thirteen dikes and dams that impound the Reservoir to bring them up to modern standards. The estimated cost of the improvements at the Ashokan Reservoir to be performed in the years covered by the CIP is $810 million, all of which is included in the CIP.

1.3.2.3 Kensico-Eastview Connection

The Kensico-Eastview Connection ("KEC") will connect the Kensico Reservoir to the Ultra Violet ("UV") Disinfection Facility, providing critical redundancy in the Water System. The project is estimated to cost $1.3 billion, all of which is included in the CIP.

1.3.3 Water Quality and Treatment

Pursuant to the Safe Drinking Water Act (the "SDWA"), the United States Environmental Protection Agency ("USEPA") has promulgated nationwide drinking water regulations which specify the maximum level of contaminants allowed in drinking water and which govern the construction, operation, and maintenance of the System. USEPA has also promulgated filtration treatment regulations, known as the federal Surface Water Treatment Rule ("SWTR"), which prescribe guidelines concerning protection and treatment of surface water supplies. Enforcement of many of the related regulations promulgated under the SDWA, including the SWTR, has been delegated by USEPA to the New York State Department of Health ("NYSDOH").

1.3.3.1 Filtration in the Croton System

The City has constructed a full scale water treatment facility to filter Croton System water. Since the Croton Filtration Plant is located within the City and does not supply water to upstate customers, all costs of the Croton Filtration Plant after late 2004 are excluded from the cost of water supply service for the regulated rate.

1.3.3.2 Watershed Protection/Filtration Avoidance in the Catskill and Delaware Systems

With respect to the Catskill and Delaware Systems, the City believes that it will continue to be able to meet the criteria for non-filtered supplies under the SWTR.

Since 1993, DEP has operated the Catskill and Delaware Systems pursuant to a series of Filtration Avoidance Determinations ("FADs") under which the City is not required to filter water from such systems. Each FAD has required the City to take certain actions to protect the Catskill and Delaware Water supplies. Based on an analysis performed in 2007, DEP estimated that if the City were to have to filter water from the Catskill and Delaware Systems, construction costs would be $6 billion. An updated analysis is to be performed as part of the 2017 FAD, as defined below. DEP expects that any updated estimate will exceed $6 billion. To further the City's ability to comply with the FAD, on January 21, 1997, the City entered into the Watershed Memorandum of Agreement (the "MOA") with the State, watershed communities, USEPA, and several environmental groups.

In December 2017, NYSDOH issued a new FAD (the "2017 FAD"), which supersedes previous FADs. The 2017 FAD will remain in effect until a further determination is made, anticipated to be in 2027. The estimated capital cost of complying with the 2017 FAD is $479 million, of which $319 million is funded in the CIP.

The 2017 FAD continues many of the protective actions within the watershed included in previous FADs, including land acquisition; working with farmers to prevent farm runoff from reaching streams; upgrading wastewater infrastructure; and stabilizing streambanks to withstand flood events and reduce erosion. In addition, the 2017 FAD includes enhancements to existing programs, including a new focus on acquiring lands in stream buffers and flood prone areas; resizing municipal infrastructure like bridges and culverts to better accommodate high stream flows; and expanding eligibility to small businesses to access funds to repair failing septic systems. Further, the 2017 FAD requires the City to allocate an additional $69 million for its core land acquisition program, as well as an additional $11 million for agricultural conservation easements, and up to $11 million for the streamside acquisition program.

On June 29, 2015, the New York State Department of Environmental Conservation ("NYSDEC") issued a findings statement, completing its eight-year environmental review of natural gas drilling using high volume hydraulic fracturing ("HVHF") in New York State, including the Catskill/Delaware watershed, concluding that the public health risks of HVHF cannot adequately be avoided or mitigated. While HVHF is now effectively banned based on the environmental review, low volume hydraulic fracturing is currently allowed Statewide, including in the watershed. However, NYSDEC has stated its belief that it is not economically viable, and especially in light of the statewide ban on HVHF, it is unlikely that it will take place in the watershed in the foreseeable future.

1.3.3.3 Disinfection Requirements

In January, 2006, USEPA issued the Long Term 2 Surface Water Treatment Rule ("LT2"). The purpose of LT2 is to reduce the incidence of waterborne disease by mandating certain levels of inactivation and/or the removal of certain microorganisms from the Water System, including the Catskill and Delaware Systems. DEP is complying with such levels through the operation of its UV Facility, which provides treatment for Catskill and Delaware water.

LT2 also mandates that uncovered finished water storage facilities, which include Hillview Reservoir, be covered or that water from such facilities be treated. Although in 2011, USEPA announced that as part of a periodic review of existing regulations, it would review LT2, in December 2016, USEPA notified the City that it did not plan to revise LT2 at that time. Therefore, DEP is required under LT2 to cover the Hillview Reservoir.

DEP's commitments to cover the Hillview Reservoir pre-date LT2. In March 1996, DEP entered into the State Hillview Administrative Order which, as modified in 1997 and 1999, required, among other things, the City to cover Hillview Reservoir by December 31, 2005 to reduce the possibility of E. coli bacteria entering the Water System. Pursuant to the Federal Hillview Administrative Order in 2010, the City's deadline to begin constructing the cover was extended to January 31, 2017, with a construction completion date of May 31, 2028. The State Hillview Administrative Order was modified to mirror the Federal Hillview Administrative Order schedule.

In March 2013, DEP requested that NYSDOH and USEPA extend the deadline to begin construction of the cover for an additional six years beyond the existing January 31, 2017 deadline, but negotiations were suspended while USEPA completed its review of LT2. In 2017, after USEPA declined to reconsider the requirement to cover finished water reservoirs such as Hillview, DEP requested that NYSDOH and USEPA further extend the deadline to complete construction of the cover to enable DEP to complete two higher priority water supply infrastructure capital improvements: construction of the KEC and the Hillview Reservoir Improvements ("HVR"). NYSDOH and USEPA agreed to extend the schedule for construction of the cover to 2049.

A federal Consent Decree (the "Hillview Consent Decree"), which includes the new deadline for covering the reservoir, will now be subject to approval of the federal court prior to becoming enforceable; DEP anticipates such approval will be forthcoming. The Hillview Consent Decree includes a $1 million civil penalty payable to the United States and a $250,000 penalty to the State ($50,000 in cash and $200,000 as an environmental benefit project), along with design and construction milestones for the KEC, the HVR and the cover, and stipulated penalties to enforce such milestones.

The most recent estimate of the cost of constructing a concrete cover over Hillview Reservoir, as DEP originally proposed, is expected to be approximately $1.6 billion. DEP has initiated procurement of a facility planning contract to analyze alternatives for achieving LT2 compliance. The CIP does not include funding to construct a cover.

1.3.4 Water Quality Monitoring

The System has multiple laboratories employing microbiologists, chemists, hydrologists, limnologists, and other scientists to monitor water quality. In addition to the monitoring program, DEP inspectors maintain surveillance of the watersheds.

The SDWA requires all drinking water suppliers to provide the public with an annual statement describing the sources and quality of its water supply. The most recent Drinking Water Supply and Quality Report prepared by DEP for calendar year 2018 demonstrates that the quality of the City's drinking water remains high. This report was prepared in accordance with the New York State Sanitary Code and the National Primary Drinking Water Regulations and can be found at: https://www1.nyc.gov/html/dep/html/drinking_water/wsstate.shtml.

1.3.5 Governmental Regulation

The System is subject to federal, State, interstate, and municipal regulation. At the federal level regulatory jurisdiction is vested in USEPA; at the State level in NYSDEC and NYSDOH; at the interstate level in the Delaware River Basin Commission ("DRBC") and the Interstate Environmental Commission; and at the municipal level in DEP, the New York City Department of Health and Mental Hygiene ("NYCDOH"), the New York City Department of Buildings ("DOB"), the New York City Department of Small Business Services, and, to a limited degree, in municipalities and districts located in eight counties directly north of the City. Water quality

protection regulations are enforced within the watershed areas north of the City through a network of overlapping governmental jurisdictions including NYSDEC, NYSDOH, DEP, and local municipal police, engineers, and inspectors. The various jurisdictions maintain physical security, take water samples, monitor construction activities and wastewater treatment in the watershed, and generally oversee the physical condition of, activity on, and operation of water supply lands and facilities. Portions of the overall legislative and regulatory framework governing the watersheds may be found in the City's Administrative Code, Health Code, and Watershed Regulations. Regulatory enforcement within City limits is almost exclusively accomplished through City personnel. Provisions incorporating and augmenting the substance of the SDWA, related regulations, and the State Sanitary Code, are contained in the Health Code and the City's Building and Building Construction Codes. These provisions are enforced by personnel from DEP, NYCDOH, and DOB.

Water Pollution Control Plants

The Water System includes six City-owned surface discharging water pollution control plants in the watershed, one City-owned subsurface discharging water pollution control plant in the watershed, and one additional City-owned surface discharging water pollution control plant in the City of Port Jervis.

Shandaken Tunnel SPDES Permit

As a result of the federal court's determination in 2003 that a State Pollution Discharge Elimination System ("SPDES") permit is required for the City's transfer of water through the Shandaken Tunnel, DEP applied for and obtained a SPDES permit for the Shandaken Tunnel in 2006. As a result of State Court litigation challenging the terms of the SPDES permit, in 2008, DEP applied for variances with respect to the permit's temperature and turbidity limits. The State has not acted on DEP's variance application. Under USEPA's Water Transfers Rule, adopted in 2008 as the State Court litigation was concluding, the Clean Water Act permit program does not apply to transfers of untreated water (such as the Shandaken Tunnel). Several entities brought litigation challenging the Water Transfers Rule. On January 18, 2017, the Second Circuit Court of Appeals reversed the Southern District of New York's 2014 decision vacating the Water Transfers Rule, finding that the rule reflects a reasonable interpretation of the Clean Water Act and therefore reinstating it. On February 26, 2018, the U.S. Supreme Court denied two petitions seeking review of the Second Circuit decision. Accordingly, the Water Transfers Rule is in effect, and the City does not believe it is required to maintain a SPDES permit for this water transfer under federal law. However, the SPDES permit is still in place. Additional conditions on the Shandaken Tunnel could require DEP to undertake costly capital projects.

1.3.6 Drought Management

From time to time the Water System experiences drought conditions caused by significantly below-normal precipitation in the watershed areas. The last drought was in 2002. As of April 15, 2019, the System's reservoirs were filled to 99.2% of capacity. Normal levels as of that date are approximately 98.1% of capacity.

Throughout even the most extreme droughts, the Water System has continued to supply sufficient quantities of water to the City and its water supply customers north of the City. To ensure adequate water supply during drought conditions, DEP, in conjunction with other City, State, and interstate agencies, maintains a Drought Management Plan. The Drought Management Plan defines various drought phases that trigger specific management and operational action. Three defined phases are: "Drought Watch", "Drought Warning", and "Drought Emergency". A Drought Emergency is further subdivided in four stages based on the projected severity of the drought and provides increasingly stringent and restrictive measures.

A Drought Watch is declared when there is less than a 50% probability, based on the existing record since 1927, that either the Catskill or Delaware Reservoir System will be filled by the following June 1. This phase maximizes the pumping of water from the Croton System. In addition, during this phase, a public awareness program begins, and users, including upstate communities taking water from the System, are requested to initiate conservation measures. NYSDOH, NYSDEC, and the DRBC are advised of the Water System's status, and discussions are held with City agencies concerning their prospective participation in the event of a declaration of a Drought Warning.

A Drought Warning is declared when there is less than a 33% probability that either the Catskill or the Delaware Reservoir System will fill by June 1. All previous efforts are continued or expanded and additional programs are initiated, including the coordination of specific water saving measures by other City agencies.

A Drought Emergency is declared when it becomes necessary to reduce consumption by imposing even more stringent measures. In addition to the imposition of restrictions, DEP may enhance existing System management and public awareness programs, expand its inspection force, and perform additional leak and waste surveys in public and private buildings. DEP may also require communities outside of the City that are served by the System to adopt similar conservation measures.

1.3.7 Pending Litigation

The following paragraphs describe certain legal proceedings and claims against the Water System. No assurances are provided that the following information is complete or identifies all of the potential litigation against the System. The ultimate outcome of these proceedings and other claims is unpredictable and could result in substantial judgments that would have to be borne by all customers of the System.

DEP adds alum to the Catskill Aqueduct upstream of Kensico Reservoir when necessary to control turbidity levels. The diversions of water containing alum into Kensico Reservoir are authorized under a SPDES permit for the Catskill Influent Chamber ("Catalum SPDES Permit"). Among other things, the Catalum SPDES permit requires DEP to take measures to reduce the use

of alum. One such measure is DEP's use of the Ashokan Release Channel to release water from Ashokan Reservoir through a release channel into the lower Esopus Creek. This release of water from the west basin of Ashokan Reservoir helps prevent the transfer of turbid water to the east basin but can result in an increase in both flow and turbidity in the lower Esopus Creek, which some stakeholders have opposed. NYSDEC served the City with an administrative complaint in February 2011, alleging a number of violations of the Catalum SPDES Permit. DEP and NYSDEC executed an administrative consent order in October 2013, which requires, among other things, that DEP will seek a modification of the Catalum SPDES Permit to incorporate a protocol for operating the Ashokan Release Channel.

On October 30, 2013, various upstate communities filed a petition against the Water Board with the New York State Public Service Commission ("PSC") for a declaratory ruling that the rate charged by the Water Board for water supplied in excess of the statutory entitlement of water (the "Excess Rate") in Fiscal Year 2014 was unreasonably high. The same entities filed a Supplemental Joint Petition on June 30, 2015 to challenge the Excess Rates for Fiscal Years 2015 and 2016. The Water Board believes that the Excess Rates are reasonable and established in compliance with all statutory and regulatory requirements. The Water Board also believes that the PSC lacks jurisdiction over the dispute and is seeking to have the petition dismissed. In addition to challenges to the Excess Rate, on June 30, 2015, upstate communities sought review from NYSDEC of Entitlement Rates for Fiscal Years 2015 and 2016. On August 18, 2016, they filed another petition with NYSDEC seeking review of the Entitlement Rate for Fiscal Year 2017 and seeking to determine whether the PSC or NYSDEC has jurisdiction to review the Excess Rate. On February 9, 2018, the NYSDEC administrative law judge ruled that NYSDEC has jurisdiction to review the Excess Rate. This ruling may be appealed.

In connection with the Water for the Future project, two fatalities occurred as a result of a construction accident that occurred as the prime contractor, Halmar International ("Halmar"), was constructing a mock-up of an aqueduct section at its own facility in Maywood, NY. The accident occurred on December 2, 2013, as a large section of formwork failed while the contractor was pouring concrete. Actions have been brought against the City in connection with the two fatalities, one of which seeks $30 million and the other of which does not specify an amount. An action seeking $10 million by a third plaintiff was also brought in connection with injuries sustained during the accident.

1.3.8 Sandy and Climate Change

On Monday, October 29, 2012, Hurricane Sandy hit the Mid-Atlantic East Coast as a tropical storm ("Sandy"). The City continues to expend funds to address the impact of Sandy on the System, but anticipates that the costs to the System relating to the storm will largely be paid from non-City sources, primarily the federal government.

DEP has been engaged in an ongoing review of the effects of climate change on the System, including the impact of rising sea levels and changes to the intensity and frequency of

precipitation events throughout the System, including the impact on the System's water supply assets. In June 2013, the City released a report, updated in April 2015 with the release of One New York: The Plan for a Strong and Just City, which represents a long-term plan to address the City's, including DEP's, goals of resiliency, sustainability, equity and growth for the City. The City issues progress reports to the OneNYC Report annually, with the most recent issued in April 2018. A new update to the OneNYC Report is expected to be issued in April 2019.

As stated in the section entitled "Vision 4", the City's climate resiliency planning is based on the climate change impact projections from the New York City Panel on Climate Change ("NPCC"), a body of more than a dozen independent climate change and social scientists. The NPCC has identified that the City is already experiencing the impacts of climate change and projects dramatic impacts from climate change on the City in the future. The NPCC is required to make recommendations to the City regarding climate change projections at least every three years, and has published four reports, most recently in March 2019.

In October 2013, DEP released two studies informed by the report issued in June 2013 summarizing certain climate-related impacts on the System's water and sewer assets. The second study, the Phase I Assessment of the Climate Change Integrated Modeling Project, summarized the prospective effects of climate change on the quantity and quality of water on the System's water supply.

Building on the recommendations contained in the reports and plans discussed above, the System is in the process of implementing climate resiliency projects directed toward mitigating the risks identified in the NPCC report, as well as other risks identified by DEP. Such plans include both stand-alone resiliency projects and the integration of resiliency protection into DEP's ongoing investments. Such projects include structural upgrades and improvements to the Ashokan Reservoir. A portion of the cost of completing such projects is included in the CIP. The total cost of these projects is expected to be substantial. These projects are in various stages of feasibility review, design and construction and/or implementation. Some projects are expected to require additional funding to the extent that they are in the planning stages or current funding does not provide for the costs of construction. In addition to such projects, DEP expects that additional resiliency projects will be identified and implemented in the coming years, addressing the risks identified in the NPCC report including coastal storms, sea level rise, extreme heat and intense rainfall, as well as other risks the DEP may identify.

1.4 Water Demand Management

Drought situations have necessitated measures to reduce water use by all customers and, at times, have required the use of the Hudson River as an alternative source of supply. DEP has implemented programs to reduce water use to achieve several goals, including the avoidance of the cost and implementation considerations associated with developing new sources of water supply.

Since 1988, the basis for service charges for residential properties in the City has been in a continuous process of transition from a flat-rate basis of annual billing to a meter-based billing system that relies on the actual measurement of usage. Part of this transition has included a Universal Metering Program for all properties to be metered to improve water conservation, water supply system management, and rate equity. Approximately 99% of total accounts have meters installed. Since July 2000, unmetered properties which have not taken steps to install a meter have been required to pay a surcharge doubling their annual water and sewer charge. Commercial accounts are required by the Board and the City to have meters installed for all water services, and substantially all of these accounts are in compliance with this requirement.

DEP completed a program in the 1990s to replace older toilets in the City, as part of which over 1.3 million toilets were replaced. DEP is currently offering vouchers towards the cost of toilet replacement under a second program that began in 2014 and will run through May 2019. Significant long-term reductions in water use have been achieved due to the metering and toilet retrofit programs as well as other initiatives.

The Board has retained a demand management consultant to work on the development of demand management plans with the upstate customers that consume the most water from the System. As of the date of this Report, nine upstate customers have executed agreements and are utilizing the professional services being offered by the Board. Upstate customers may be eligible to receive DEP funding for initiatives developed in their plans.

Additional information concerning water demand management initiatives is provided in Section 4.8.2 of this Report.

1.5 The Roles of the Authority, the Board, and the City in the Water System

Through mid-1985, capital improvements to the water and sewer system of the City were financed through general obligation bonds of the City. In 1984, State law authorized the creation of the Authority and the Board. The Authority's function is to issue revenue bonds, the proceeds of which are used to finance capital improvements to the water and sewer system, including the Water System. The Board sets rates and charges to meet the annual revenue requirements of the water and sewer system. The revenue requirements include debt service (principal and interest) on the debt obligations of the Authority as well as the operation and maintenance expenses of the City. Under an agreement between the Authority, the Board, and the City, the City operates and maintains the water and sewer system and is responsible for implementing capital improvements to the System.

The Authority issued its first revenue bonds in December 1985. As of April 1, 2019, the Authority has approximately $1.6 billion in principal outstanding for its First Resolution revenue bonds and $29.4 billion in principal outstanding for its Second Resolution revenue bonds for the water and sewer system of the City, not including $27.6 million in draws on Bond Anticipation Notes issued to the New York State Environmental Facilities Corporation (“NYSEFC”). In

addition, the Authority currently has a $600 million commercial paper program, none of which is currently outstanding. Included within the Second Resolution debt are loans obtained by the Authority at below market interest rates from the state revolving fund ("SRF"). The SRF program is administered by NYSEFC. Tables 5A and 5B in the Appendix to this Report show the original amounts of debt issued by the Authority and NYSEFC, which differ from the amounts noted above as being outstanding.

As of June 30, 2018 (the end of the 2018 fiscal year), the net value of the water and sewer system assets for accounting purposes (i.e., original cost less depreciation) was $30.1 billion. The preceding figures for outstanding debt and net asset value clearly demonstrate that the Authority is amortizing the cost of the assets over the long-term life of the assets.

A portion of the proceeds of the Authority's bonds and the SRF loans has been used to finance capital improvements for water supply projects in upstate regions. Section 4.2.2 of the Report provides information concerning previous capital investments in the Water System. Under the CIP, additional capital improvements are ongoing and planned for the future to preserve the Water System for all customers.

1.6 Additional Information on the Water System, the Board, and the Authority

Information on the System and its operations and maintenance is available on DEP's website:

http://www.nyc.gov/dep

Information on the Board and past reports on the cost of service are available on the Board's website:

http://www.nyc.gov/waterboard

Information on the Authority and the outstanding debt of the System can be found in the Authority's Bond Official Statements, which are available on the Authority's website:

http://www.nyc.gov/nyw

2.0 The Sale of Water to Customers North of the City

2.1 Background

The New York State Water Supply Act of 1905 ("The Act") and subsequent amendments granted the City permission to develop the Catskill and Delaware watershed systems. In return for these development rights, the City was required, upon request, to furnish supplies of fresh water to municipalities and water districts in eight counties directly north of the City in which City water supply facilities and watersheds are located. The Act limits the quantity of water that may be taken or received to the quantity calculated by multiplying the number of inhabitants in the municipality or water district as shown by the last United States, State, or official municipal census by the daily per capita consumption in the City.

Water is supplied to customers north of the City (hereinafter, "upstate customers") on a wholesale basis, i.e., the City delivers water to one or more central locations, and the upstate customers (typically municipalities or water districts) are responsible for distributing the water to individual users such as residential buildings and commercial properties. For the period of 1985 through 2018 inclusive, the City provided an average of 42,999 MG per year of water to upstate customers, or 117.7 MGD. This represented approximately 9.01% of all water supplied to both in-City and upstate customers. The percentage of the annual water supply being used by upstate customers has generally increased from 1985 to the present time, although there may be fluctuations from year to year. In 2017 and 2018, the percentage of the annual water supply being used by upstate customers was 10.19% and 9.87%, respectively.

2.2 Rates and Charges for Upstate Customers

The regulated rate for water service to upstate municipalities and water districts is determined on the basis of the actual total cost of water to the City less the capital and operating costs incurred within the City limits in connection with the distribution and delivery of water within the City. In no event may the regulated rate exceed the rate charged to customers within the City.

Prior to 2000, the rates adopted by the Board were based on historical costs and did not reflect the increasing actual cost of service. In order to utilize rates that more appropriately reflected the cost of water supply, the rates adopted by the Board since 2000 have been developed based on the anticipated cost of service in the upcoming fiscal years.

The historical water rates charged to upstate customers for the period 2008 through 2019 are provided in the table on the following page. The reconciliation of revenues and costs from prior years was used by the Board for the first time in setting the 2010 rate based on the actual revenues and costs for 2008. Sections 4.6 and 4.7 of this Report provide information concerning the calculation of the annual reconciliation.

Historical Billing Rates and Computed Actual Costs ($) Per Million Gallons

Fiscal Year	Adopted Rate Billed to Upstate Customers		Computed Actual Unit Cost to the Board	
	Including effects of reconciliation & the stipulation in 2012		Excluding the effects of reconciliation & the stipulation in 2012	Including the effects of reconciliation & the stipulation in 2012
2008	798.62		703.73	N/A
2009	900.31		882.91	N/A
2010	922.23		973.86	869.62
2011	1,149.72		1,121.04	1,103.65
2012	1,213.84		1,283.45	1,206.06
2013	1,332.30		1,389.42	1,342.15
2014	1,496.76		1,604.43	1,596.62
2015	1,573.61		1,670.85	1,680.78
2016	1,728.99		1,769.49	1,794.55
2017	1,728.99		1,862.60	1,914.52
2018	1,728.99		1,846.08	1,914.27
2019 (Current)	1,728.99		N/A	N/A

(a) The computed actual cost to the Board shown above for 2011 through 2018 includes the upstate share of the costs of defeasance of certain Authority bonds in those years as well as the resulting benefits of defeasance in those years. The basis for this cost is explained in Section 4 of the Report. There were no costs for defeasance in 2008 through 2010.

(b) The rates adopted by the Board for 2010 through 2016 were based on the projected cost and consumption for each respective year and the effects of the reconciliation for the year that was two years' prior to the rate year. The computed actual cost to the Board is shown for those years both excluding and including the effects of the cost reconciliation.

(c) The computed actual cost to the Board in 2012 takes into account the effects of the stipulation credit of $10 million in the column that includes cost reconciliation and excludes the stipulation credit in the column that excludes the cost reconciliation.

(d) The regulated rate of $1,750.52 per MG that was adopted by the Board for 2017 was not implemented.

(e) There was no action taken by the Board for the regulated rate in 2018 and 2019. The unit rate that was used in 2019 for billing purposes is the same as the regulated rate that was adopted on July 1, 2015 of $1,728.99 per MG.

The cost to the Board per MG for 2018, using actual cost of service and excluding the reconciliation, is $1,846.08, which is higher than the unit rate that was adopted by the Board effective July 1, 2015 of $1,728.99. After application of the reconciliation cost, the net computed cost to the Board is $1,914.27 per MG. The actual costs for 2018 were slightly higher (i.e., less than 1%) than the projected costs for 2018 (both before and after reconciliation) at the time when 2016 rates were prepared (the Amawalk report of May 2015). It is apparent that a combination of factors impacted the actual cost per MG as summarized below.

- Other Than Personal Services costs for facilities north of the City were lower than anticipated;
- Debt service costs were lower than anticipated;

- Cash used for the defeasance of debt, which increases the cost of service in the year defeasance funds are used but serves to lower future debt service costs in multiple years, was higher than anticipated;
- Personal service costs were higher than anticipated;
- Miscellaneous revenues of the water supply system, which serve as an offset to the cost of service, were lower than anticipated; and
- Water consumption was higher than projected, which serves to lower the unit cost per MG.

The following paragraphs address the reconciliation or "true-up" of costs and revenues.

The reconciliation amount for 2014 of about $40.7 million, i.e., the difference between the cost of water supply service (including the 2012 reconciliation) and the total revenues generated by the regulated rate (for both in-City and upstate consumption), was phased-in over four years by applying the amount due in four equal annual installments to the cost of service for 2016 through 2019 (about $10.2 million per year for each of the four years). The effects of this reconciliation increased the actual unit cost for 2016; although the impact is much less than if the entire reconciliation amount of $40.7 million was applied to the cost of service in 2016. The unit cost in 2016 with and without the effects of reconciliation is higher than the unit rate that was adopted by the Board.

The reconciliation amount for 2015 of about $43.6 million was phased-in over four years by applying the amount due in four equal annual installments of about $10.9 million to the cost of service for 2017 through 2020. The effects of this reconciliation increased the actual unit cost for 2017; although once again the impact is much less than if the entire reconciliation amount was applied to the cost of service in 2017. The unit cost in 2017 with and without the effects of reconciliation is higher than the unit rate that was charged by the Board.

The reconciliation amount for 2016 of about $26.6 million is phased-in over four years by applying the amount due in four equal annual installments of about $6.7 million to the cost of service for 2018 through 2021. In a similar manner, the reconciliation amount for 2017 of about $75.3 million is phased-in over four years by applying the amount due in four equal annual installments of about $18.8 million to the cost of service for 2019 through 2022. The reconciliation amount for 2018 of about $75.3 million is also phased-in over four years by applying the amount due in four equal annual installments of about $18.8 million to the cost of service for 2020 through 2023. The unit cost with and without the effects of reconciliation is higher each year in 2016 through 2018 than the unit rate that was charged by the Board.

As of the date of this Report, it is estimated that the 2019 computed unit cost to the Board will be higher than the unit rate that was in effect for billing purposes (with or without the effects of reconciliation). The principal reason is that the cost of service has been increasing in recent years but the regulated rate has not increased since July 1, 2015.

Debt defeasance that was completed in previous years reduced debt service in multiple years beginning in 2012. The cost of defeasance together with the projected lower debt service payments that result from defeasance are incorporated in the estimated costs of water supply service in 2016 through 2023 as presented in this Report.

Apart from the effects of defeasance, the Authority has successfully sold bonds and commercial paper in recent years and sold bonds again in 2018 and in the year-to-date 2019 at average interest rates that were lower than those previously assumed, which serves to reduce the projected debt service and benefits the cost of service in 2018, 2019 and subsequent years.

The calculated unit rate is also affected by projections of total water use. The current estimate of the cost per MG for 2019 is based on the estimated annual costs divided by the full-year water consumption estimate that is derived from a 5-year regression analysis. A 10-year regression analysis was used in prior years. Given the relatively flat to slow pace of decline in consumption in recent years, a 5-year regression is used to better project current and upcoming consumption patterns. If the water demand for the full year is higher than projected, the unit cost per MG (i.e., Total Costs for Facilities North of the City divided by the Total of in-City and Upstate Consumption) will be reduced. The actual cost of service and the actual unit rate for the supply of water for 2019 will not be known until after the fall of 2019.

This Report again proposes that a reconciliation and "true-up" be applied towards the cost of service in 2020 to reflect the calculated difference between the 2018 computed actual cost of service and the actual costs recovered through the adopted rate of the Board, which is computed by multiplying the unit rate charged by the Board in 2018 times System-wide water consumption. The reconciliation of 2018 revenues and costs results in a charge which will be added to the projected cost of service for 2020. The proposed "true-up" methodology for the 2018 reconciliation again spreads the incremental cost over a four-year period. The calculations are presented in Sections 4.6 and 4.7 herein.

3.0 Cost of Service Methodology

3.1 Overview

This Section of the Report provides a summary of the steps that were followed to calculate the cost of service for water supply. The cost of service is calculated in accordance with the cash basis methodology used and approved by NYSDEC in 1972 and 1995. The methodology is also consistent with that used to calculate the regulated rates, which were adopted and implemented for 1993 through the current year. Pursuant to the Act, the cost of service methodology excludes all capital and operating costs incurred for transmission and distribution mains, repair yards, tunnels, shafts, and related facilities within the City in connection with the distribution and delivery of water within the City. The cost of service takes into account offsetting revenues from hydropower and permit fees. The cash basis methodology is consistent with industry guidance provided by the American Water Works Association ("AWWA").

3.2 Procedures for Calculating the Cost of Service

Several steps are required to calculate the total cost of providing water to upstate customers and the regulated rate. These steps account for the many types of costs incurred by the City in establishing and maintaining reliable sources of drinking water. The approach that is used in this Report, as required by the 1905 Act, specifically excludes costs incurred within the City that are associated with the transmission and distribution of water in the City.

The six steps that were followed in developing the cost of service and the calculated regulated rate for upstate water supply are outlined herein. The first five steps relate to the computation of the cost of service and regulated rate for 2016 through 2018. The sixth step includes the development of the projected cost of service and regulated rates for 2019 and 2020 (the current year). In addition, this Report includes a preliminary projection of the regulated rate for water supply service for the years 2021 through 2023. The projections are preliminary and subject to change. Changes in System-wide water consumption as well as assumptions concerning increased costs for property taxes, watershed protection, required capital improvements, and other factors have been taken into consideration in developing the projected cost of service and rates. Nonetheless, rising commodity prices and other factors affecting operating expenses and capital costs as well as changes in consumption may result in a larger increase in the cost of water supply in future years than is currently reflected in the 2019 through 2023 projections. The Water System costs, offsetting revenues, and related information corresponding to each of the steps can be found in Section 4.0 and the Appendix of this Report.

3.2.1 Step A

The initial step includes the determination of all direct costs and offsetting revenues that relate solely to facilities located north of the City.

The components of this analysis include the following:

1. Other Than Personal Services ("OTPS")
2. Debt Service
3. Judgments and Claims
4. Miscellaneous Revenue
5. Personal Services ("PS"), which include:
    a. Field Worker Personnel
    b. Executive and Administrative Personnel

It is noted that the reference to Debt Service above includes not only debt service but also cash-financed construction and defeasance.

3.2.2 Step B

The second step includes the calculation of the allocation percentages to be used in Steps C and D. The allocation percentages are based upon total salaries, or the number of vehicles, depending upon which allocation methodology is most appropriate to the costs being allocated. The methodologies used in the allocation process have previously been accepted by NYSDEC in its 1995 decision and upheld by the Appellate Division of the Third Department concerning the regulated rates for 1993 and 1994.

3.2.3 Step C

The next step in the cost of service process is to determine the costs of DEP support services and other essential functions that must be allocated to the cost of supplying water. These costs fall into two categories:

1. Personal Services
2. Other Than Personal Services

The cost of support services and related functions of DEP must be shared by all customers who benefit from its services. Therefore, the costs must be allocated to facilities located north of the City using the appropriate allocation percentage calculated in Step B.

3.2.4 Step D

The fourth step involves the identification of the City's Central Service costs that must be allocated to the cost of water supply. The City's Central Service costs are those related to general City services (e.g., accounting, budgeting, personnel, legal) that are provided to the Water System as well as to DEP as a whole and to other City agencies. Therefore, these costs are allocated first among all City departments. The DEP share (calculated using an allocation percentage developed in Step B) is then allocated to facilities located north of the City.

3.2.5 Step E

The total cost of supplying water to both in-City and upstate customers, exclusive of in-City distribution costs, is determined by adding the cost of service elements, which are calculated in Steps A, C, and D. Dividing the total cost of service by total water consumption determines the unit cost per MG related to the supply of water. The upstate water consumption times the unit cost or regulated rate per MG results in the total costs attributable to upstate customers.

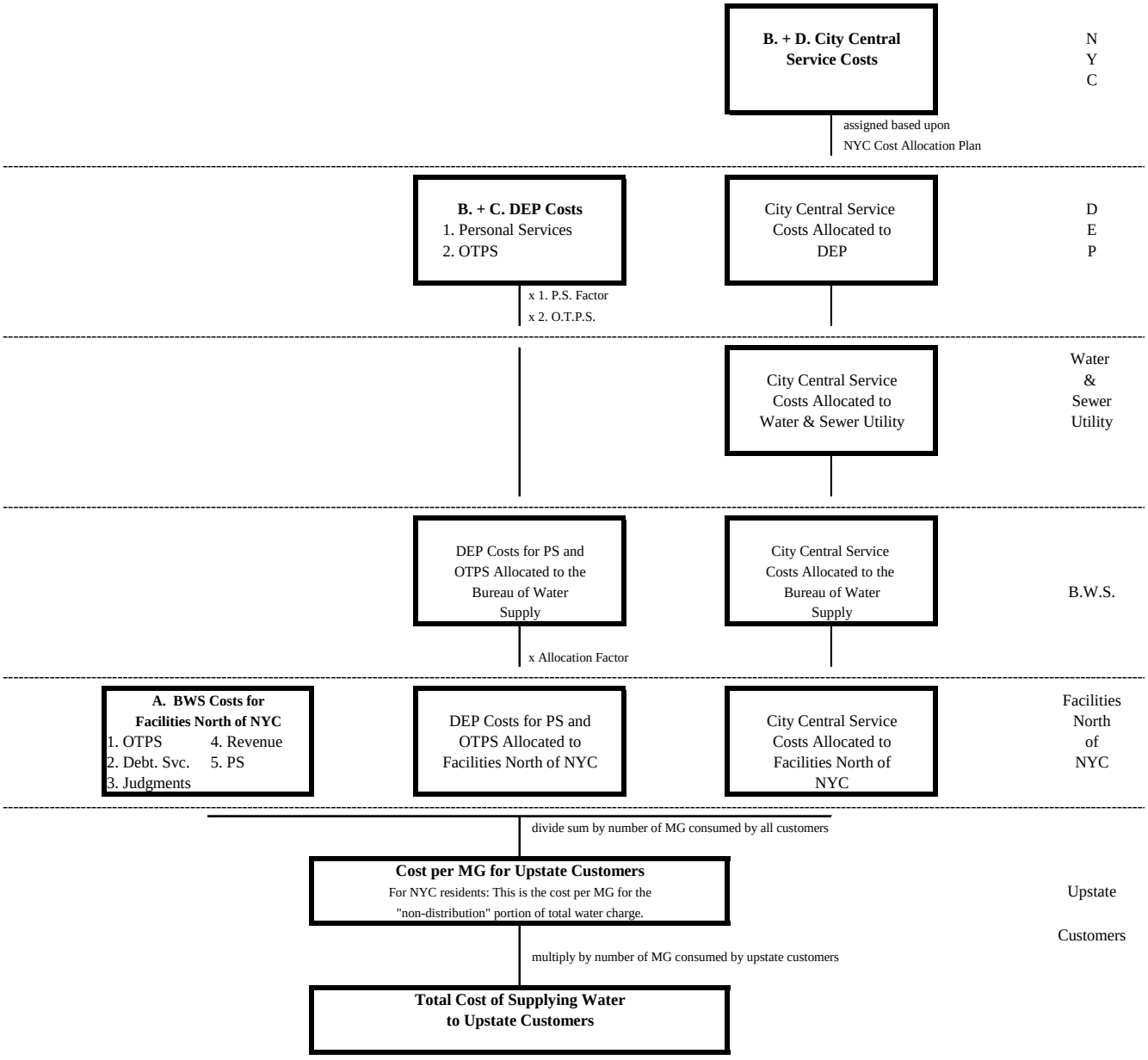
3.2.6 Step F

Steps A through E are primarily used to develop the actual cash basis cost of service for 2016 through 2018. To develop the projected cost of service for 2019 and 2020 (the current year), known debt service costs are added to anticipated future debt service plus cash-financed capital and/or defeasance costs plus anticipated operation and maintenance expenses, less expected offsetting revenues. Projections of future expenses and revenues are based on historical experience as well as known changes in programs and costs that are expected in 2019 and 2020. This is a standard and accepted practice in the industry and is consistent with the methodology used to develop water and sewer rates for in-City customers. The projected cost of service is divided by the estimated water consumption to determine the regulated rate. Step F is carried out simultaneously with the work performed in Steps A through E.

3.2.7 Graphical Overview

Figure 2 on the following page provides a graphical presentation of how various components of the cost of service are allocated in the development of the cost of providing water to upstate customers.

Figure 2 Diagram of Calculation



3.3 Computation of the Regulated Rate

The regulated rate per MG of water use is computed on the basis of the total cost of service (including the effects of prior year reconciliations) divided by the total water consumption:

Total Cost of Service *divided by* Total Water Consumption = Unit Cost of Service or Regulated Rate

The costs, and thus the revenue requirements, attributable to upstate customers are computed on the basis of the total annual quantity of water used by upstate customers multiplied by the unit rate per MG:

Upstate Consumption *multiplied by* Unit Cost of Service or Regulated Rate = Upstate Cost of Service

The total cost of service for water supply, or revenue requirements, is allocated between upstate and in-City customers as follows:

Upstate: **Total Cost of Water Supply Service *multiplied by*:** $\frac{\text{Upstate Consumption}}{\text{Total System Consumption}}$

In-City: **Total Cost of Water Supply Service *multiplied by:*** $\frac{\text{In-City Consumption}}{\text{Total System Consumption}}$

3.4 Sources of Data and Basis of Presentation

Information presented in this report was obtained from records of the City. The City utilizes a modified accrual basis of accounting for its costs. Operation and maintenance expense information, including cost allocation factors, was provided by DEP. Debt service, defeasance, cash-financed construction and interest earnings information was obtained from the Authority. Pension and fringe benefit cost factors were provided by the New York City Office of Management and Budget. Water consumption information was provided by DEP.

4.0 Computation of the Cost of Service and the Regulated Rate

4.1 Introduction

This Section of the Report describes the individual elements of the cost of service. The most recent fiscal year for which complete information is available is 2018; thus, the costs for 2018 serve as a base for projecting costs in 2019 and subsequent years.

The anticipated cost of service for 2019 and 2020 is presented using the following components of cost: scheduled debt service payments on outstanding bonds for these years, the anticipated debt service from additional bonds of the Authority that are expected to be issued, the expected payments for cash-financed construction or defeasance, and projections of operating expenses and all other components of the cost of service. Additional bonds reflect the expected future issuance of debt by the Authority, the proceeds of which will be used, in part, to fund capital improvements in the Water System. The projected debt service reflects the expected portion of the bond proceeds that will be used for the Water System. The findings of each significant step of the analysis are presented in this Section, and the basis for projecting the cost of service for 2019 and 2020 is also provided. Where appropriate, we normalize the cost of service to take into consideration one-time or recurring increases or decreases in costs.

Supporting tables for each step of the analysis are referenced in this Section and presented in detail in the Appendix to the Report.

4.2 Bureau of Water Supply Costs Related to Facilities Located North of the City - Step A

BWS has the responsibility to operate and maintain the Water System of the City. This responsibility also includes the development and implementation of capital improvements to the System so that a reliable supply of quality water can be maintained for customers both within the City and in upstate communities.

BWS carries out its water supply responsibilities through personnel and equipment located at facilities throughout the watershed. BWS personnel include engineers, laboratory technicians, security personnel, water quality experts, and management and support personnel. The vast majority of BWS's costs relate solely to facilities located north of the City.

4.2.1 Other Than Personal Services Costs

By definition, OTPS costs include all operating expenses other than labor including, but not limited to: supplies, equipment, contracted maintenance and repairs, power, chemicals, real estate taxes paid to upstate communities, and other purchased goods and services. Direct OTPS costs have generally increased over the years through 2018, as illustrated in the table shown herein. In 2010, 2015 and again in 2018, there were small decreases in expenses relative to the prior years. The average annual increase from 2009 to 2018 is 4.3%. However, the pace of the changes has slowed in 2015 through 2018. The average annual increase from 2014 to 2018 is

1.1%. OTPS costs increased by 2.4% from 2016 to 2017 and then decreased by 0.7% from 2017 to 2018.

Property taxes constituted about 63.4% and 65.2% of total OTPS costs allocable to the cost of water supply and the unit rate in 2017 and in 2018, respectively. OTPS expenses include certain costs associated with filtration avoidance and environmental health and safety in the watershed. The expenses also include the estimated costs associated with Hillview Reservoir, which were approved by NYSDEC for inclusion in the cost of service in April 1997. Additional information concerning these expenses is presented in this Section of this Report.

Historical OTPS Expenses

Fiscal Year	OTPS Expense ($)	Annual Increase (%)
2009	171,280,256	13.4
2010	169,955,116	-0.8
2011	191,435,944	12.6
2012	202,687,321	5.9
2013	221,323,950	9.2
2014	239,487,897	8.2
2015	236,831,336	-1.1
2016	245,811,541	3.8
2017	251,744,977	2.4
2018	250,053,638	-0.7

The fluctuations in expenses from year to year are primarily driven by changes in: property taxes, the UV Facility, FAD-related costs, Hillview expenses, contractual services, environmental health and safety programs, fuels, chemicals, and utilities.

Recent expenses and current and ongoing programs were considered in estimating the anticipated 2019 and 2020 OTPS expenses. The findings of the analysis are presented in the following categories:

1. Real Estate Taxes
2. Chemicals
3. Hillview Reservoir
4. Contractual Services
5. UV Facility
6. Filtration Avoidance
7. Other OTPS Expenses

The analysis considered the historical experience in each of these categories together with current and expected future changes so that such costs can be normalized, where appropriate, to exclude unusual increases or decreases that may have affected recent experience. Overall, OTPS

expenses are expected to increase in future years due to rising property taxes, continuing expenses related to FAD, the cost of operating and maintaining the UV Facility, and other factors. The classification of certain filtration avoidance costs and other costs previously paid for through the proceeds of debt as operating expenses instead of capital costs also contributes to the anticipated increases in the cost of service since such costs must be expensed in the year they are incurred instead of being amortized over the term of the debt.

Upcoming changes are briefly outlined in this paragraph. In 2019, DEP expects to begin operating a new Catskill Chlorination Facility, with full operations expected in 2021. In 2020, DEP expects to begin operating a new chlorine dioxide facility located at the New Croton Reservoir. Finally, DEP anticipates leasing a new office building located in Arkville, with occupancy expected in 2020. The estimated operating expenses for the new facilities are shown herein in Table 4B.

As part of the Water for the Future Program, DEP has undertaken a series of water conservation programs both with the upstate communities and in anticipation of Delaware Aqueduct shutdown starting in 2022.

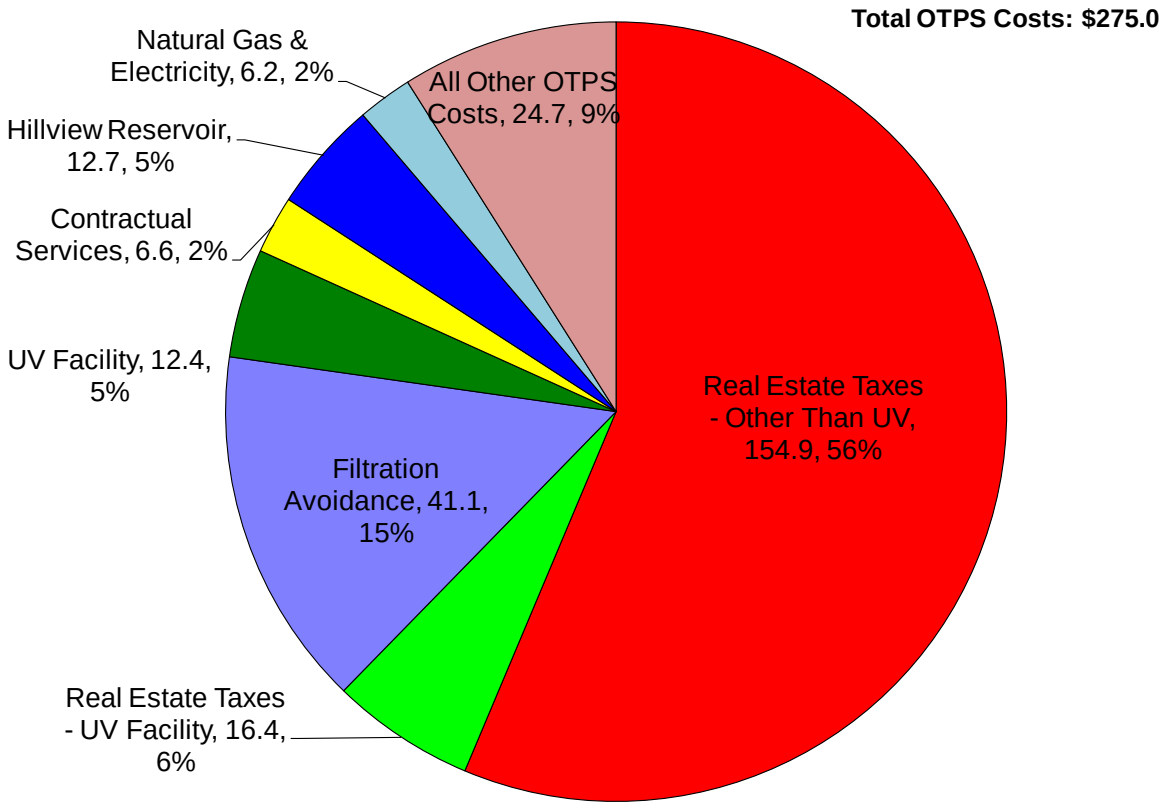
The major components of the anticipated 2020 OTPS costs are summarized in Figure 3. Table 4A of the Appendix presents a detailed listing of historical OTPS expenses while Table 4B provides a detailed listing of the projected OTPS expenses.

It is noted that the cost of chemicals used at Hillview Reservoir is included in the total costs for Hillview and is not included in the cost category for chemicals used at all other water supply facilities. Electricity costs for the UV facility are also reported separately from other heat, light and power costs.

Oil prices increased significantly from around the beginning of calendar year 2016 to the beginning of October 2018 before declining substantially through the beginning of January 2019. In the past few months, oil prices have risen. It is not known whether past increases or decreases are temporary or permanent and the effect such fluctuations might have on the cost of fuel oil, gasoline, chemicals and other commodities.

Figure 3 Projected 2020 Other Than Personal Services Costs

(all amounts in millions)



4.2.1.1 Real Estate Taxes

Real estate taxes for all water supply properties, including the UV Facility, have increased at the average annual rate of about 4.0% from 2009 to 2018. Including the taxes on the UV Facility, property taxes have increased at the average annual rate of 1.9% from 2015 through 2018. Given the slower rate of increase in recent years, this Report has reduced the projected 3% per year annual property tax increase that was assumed in prior reports to 2.5% per year. This change applies to all properties except the UV Facility in 2019 through 2023. The assumed annual percentage increase in taxes on the UV Facility is 3.2% as budgeted by DEP for 2019 and then 2.5% per year thereafter. The overall increase in recent years reflects a combination of both increases in the local tax rates applied to water supply properties as well as taxes on newly purchased properties in the watershed. Historical property tax payments, which include property taxes for the UV Facility beginning in 2010, are shown in the next table.

In 2017 and in 2018, the City received about $985,000 and $42,000, respectively, in refunds from upstate taxing jurisdictions (for taxes paid in prior years). Although such refunds have occasionally been reflected in prior reports in Table 7, the tax refunds received in 2017 and 2018 were used to reduce the 2017 and 2018 property tax expenses; so they are not shown separately but are reflected instead as an offset to expenses in Table 4A (This is the typical method of applying the proceeds of tax refunds). Tax refunds are not assumed to occur in future years.

Historical Property Tax Payments

Fiscal Year	Property Tax Expense ($)	Annual Increase (%)
2009	114,958,441	4.9
2010	126,320,846	9.9
2011	131,663,054	4.2
2012	139,186,474	5.7
2013	147,798,234	6.2
2014	155,494,475	5.2
2015	153,957,580	-1.0
2016	157,879,279	2.5
2017	159,563,884	1.1
2018	162,966,465	2.1

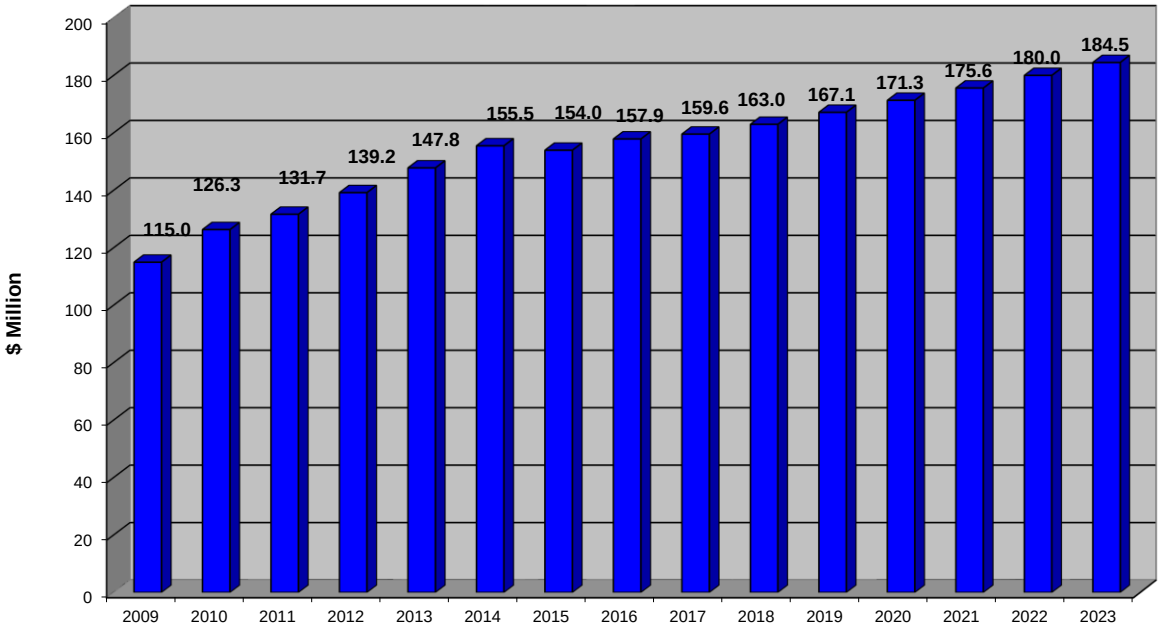
The projected real estate taxes for 2019 and 2020, including the taxes on the UV Facility, are $167.1 million and $171.3 million, respectively. Both estimates reflect an allowance for the expected increases in property tax rates and the taxes on newly-purchased land. To protect water quality in the watershed and comply with the 2017 FAD, the City is required to increase the number of acres of land that are either owned by the City or otherwise restricted in terms of land use. Increasing the number of acres owned by the City results in increased property taxes.

While the current rate consideration by the Board will only address 2020, projections for 2021 through 2023 are shown for illustrative purposes. The actual and estimated real estate taxes payable to upstate communities for watershed properties from 2009 through 2023, including the UV Facility, are summarized in Figure 4.

It is important to note that property taxes associated with the UV Facility are included in a separate line item for UV real estate taxes in Tables 4A and 4B. Section 4.2.1.5 provides additional information concerning the UV Facility.

Figure 4 **Real Estate Taxes for the Water System**

(all amounts in $ millions)



Real Estate Taxes for the years 2019 through 2023 are projected

4.2.1.2 Chemicals

Several chemicals are used by the City to treat the water supply, including chlorine that is used for disinfection and other purposes. This part of the Report addresses the chemicals used in the watershed, except for those used at Hillview Reservoir, which are presented separately in Section 4.2.1.3. As illustrated by the following table, the total cost of chemicals varies from year to year.

Historical Chemical Costs

Fiscal Year	Chemical Costs ($)	Annual Rate of Change (%)	Chemical Costs as a % of Total
2009	8,035,776	50.4	4.7
2010	7,813,168	-2.8	4.6
2011	6,744,998	-13.7	3.5
2012	6,008,103	-10.9	3.0
2013	3,033,060	-49.5	1.4
2014	3,611,336	19.1	1.5
2015	4,095,234	13.4	1.7
2016	3,681,482	-10.1	1.5
2017	3,649,465	-0.9	1.4
2018	2,106,988	-42.3	0.8

The cost of chemicals for water supply in a given year is dependent upon both the quantities of chemicals that must be used as well as the unit price per ton. There were significant increases in prices for fluoride and chlorine for the System, excluding Hillview Reservoir, starting in 2008. Unit prices declined significantly beginning in 2010 for chlorine and in 2012 for fluoride. Following approvals from the NYCDOH, DEP reduced the fluoride dosage from 1.0 milligrams per liter to 0.8 milligrams per liter in February 2012 and then to 0.7 milligrams per liter in May 2015. In 2013, chemical deliveries to the System were slowed due to System repairs. The quantities of chemicals used and the applicable unit prices in recent years are summarized in the following tables.

Historical Chemical Use

Fiscal Year	Chlorine (Lbs)	Fluoride (Tons)
2009	2,859	2,203
2010	3,170	1,691
2011	3,036	1,393
2012	3,177	1,512
2013	2,058	787
2014	1,647	1,313
2015	1,567	1,531
2016	1,938	1,257
2017	1,993	1,211
2018	2,140	1,449

Historical Unit Prices for Chemicals

Fiscal Year	Chlorine ($)/Lb	Fluoride ($)/Ton (1)
2009	620.05	2,934.78
2010	456.68	3,800.00
2011	474.98	3,797.88
2012	504.84	2,944.14
2013	480.00	2,600.00
2014	467.18	2,165.17
2015	459.63	2,159.67
2016	499.65	2,159.29
2017	524.51	2,150.43
2018	319.37	982.43

The assumed rate of increase in chemical costs in 2019 through 2023 is 3.0% per year. This assumption recognizes that the actual expenses in 2013 through 2018 were much lower than in the previous five years; thus, such expenses could increase beyond the 3.0% allowance for inflation (as they did in 2008 and 2009 and then again in 2014 and 2015). It is not certain at this time whether prices will stay the same, increase, or decline in future periods. Chemical addition that solely benefits in-City customers is excluded from this cost of service analysis.

4.2.1.3 Operating Expenses Associated with Hillview Reservoir

The principal expenses incurred in the operation of Hillview Reservoir are associated with chemical addition and security. Caustic soda is added for water quality purposes to adjust the pH of the water entering Hillview. Orthophosphate is added for lead and copper control. In 2017, the costs for caustic soda and orthophosphate were $4.3 million and $4.5 million, respectively. In 2018, the costs for caustic soda and orthophosphate were $4.2 million and $4.7 million, respectively. These costs will fluctuate due to market prices. The unit bid prices for orthophosphate effective June 1, 2015, June 1, 2016 and June 1, 2017 were $2.74 per gallon, $2.78 per gallon and $2.83 per gallon, respectively. The unit bid price for orthophosphate effective June 1, 2018 is $2.77 per gallon during weekdays between 6 am to 11:59 pm, and $2.74 per gallon during weekday nights, weekends and holidays. DEP estimates that the unit bid price for orthophosphate effective June 1, 2019 will be $2.74 per gallon.

All OTPS expenses at Hillview, including chemical costs, are assumed to increase at the rate of 3.0% per year in 2019 through 2023. Market conditions and recent and upcoming bid prices will dictate the actual prices for chemical costs. Future increases in expenses at Hillview could be significantly affected by fluctuations in the price of chemicals and other factors.

The non-labor expenses attributable to Hillview Reservoir in Tables 4A and 4B are exclusive of property taxes, which are included in the “Real Estate Taxes – Existing Properties” line item

(line 17). Labor costs for Hillview are included in the personal services costs described in Section 4.2.5 of this Report.

4.2.1.4 Contractual Services

The City was required by the MOA to fund a number of capital projects and operating programs to support the protection of the watershed. Programs to be paid from operating funds began in 1997, and beginning in 2004, the expenses related to the MOA declined as the programs it called for ended or were scaled down. The future expenses for MOA-related programs are reflected in the "Contractual Services – General" line item of the projected OTPS expenses in Tables 4A and 4B. Contractual services expenses are assumed to increase at the rate of 3.0% annually. Other expenses related to filtration avoidance are addressed in Section 4.2.1.6.

4.2.1.5 UV Facility

The UV Facility provides treatment for Catskill and Delaware water. Operating expenses other than labor associated with the UV Facility are shown on line 27 of Tables 4A and 4B with the exception of property taxes (shown on line 18).

DEP began to pay property taxes for the UV Facility in 2010. OTPS expenses other than property taxes were incurred beginning in 2012. The projected operational expenses associated with the UV Facility in 2019, including property taxes, are based on DEP budgeted amounts. OTPS expenses are then assumed to increase at the rate of 3.0% per year while property taxes are assumed to increase at the rate of 2.5% per year in 2020 through 2023.

4.2.1.6 Filtration Avoidance

OTPS expenses in 2016 through 2018 and future years include DEP costs associated with filtration avoidance programs in the watershed. These are shown in lines 28 and 29 of Tables 4A and 4B. Included within the costs of filtration avoidance are payments for the operation and maintenance of certain wastewater treatment facilities that are not owned by DEP. The operation and maintenance of such facilities is intended to protect the water quality in the watershed.

Payments from DEP to watershed communities under the MOA and the cost of other initiatives that help support the avoidance of filtration are also included within the filtration avoidance line items. Some program costs for filtration avoidance were historically funded through the proceeds of debt and then paid back through debt service on the bonds that were issued. As a result of a decision by the New York City Office of the Comptroller, such costs are assumed to be funded as operating expenses in the current year and future years. It is assumed that the percentage of debt attributable to the Water System will be affected slightly in future years as a result of this policy; an adjustment is outlined in Section 4.2.2.2 of this report. The expenses associated with program funding of filtration avoidance in both lines 28 and 29 are assumed to increase at the rate of 3.0% per year.

4.2.1.7 Other OTPS Expenses

It is anticipated that there will be new facilities in the watershed in 2019 and 2020: a new Catskill Chlorination Facility located in Ulster County will begin operations in 2019, a new chlorine dioxide facility located at New Croton Reservoir is expected to begin operations in 2020, and a new office building located in Arkville will be leased in early 2020. The projected costs for the new facilities are included in line 30 of Tables 4A and 4B starting in 2019.

The projected costs for the Water for the Future Program, as provided by DEP, are included in line 31 of Tables 4A and 4B starting in 2018. As part of the Water for the Future Program, DEP has undertaken a series of water conservation programs both with the upstate communities in anticipation of Delaware Aqueduct shutdown starting in 2023.

In recent years, DEP has undertaken a comprehensive program of environmental health and safety; the water supply-related costs of this program are included in line 32 of Tables 4A and 4B. The expenses for environmental health and safety programs in the watershed and the costs of other categories of expense (except cost of service and rate studies as discussed below) are assumed to increase at the rate of 3.0% per year.

The annual costs associated with performing the cost of service and rate study and related work for establishing the regulated rate for upstate customers, including, but not limited to, the distribution of documents, posting of notices, and the rate hearing, are included in line 25 of Tables 4A and 4B. In 2018, the actual expenses for the cost of service and rate study as well as consulting assistance relative to the petition of upstate customers were $136,401. In 2019, it was assumed that the total expense of the cost of service and rate study will be $75,000; this cost is assumed to increase thereafter at the rate of 3.0% annually.

4.2.2 Debt Service/Capital Improvement Financing

Capital improvements to the System are financed principally through proceeds from the sale of bonds. The use of long-term bonds as a source of financing spreads the cost (in the form of debt service) over the life of the facilities, which enables the long-term users of the water supply system to contribute to its cost. A relatively small portion of the capital improvements are financed on a cash basis using funds from revenues of the System. This part of the Report describes the methodology that is used to develop the annual debt service requirements (i.e., the principal and interest payments on bonds) of the Water System as well as the annual revenues raised for use in the CIP. Table 5C provides a summary of the actual debt service for 2016 through 2018, as well as the projected amounts for 2019 through 2023, with the net debt service attributable to the Water System in line 26. The debt service amounts are then reflected in line 2 of Tables 1A and 1B, which summarize the annual cost of water supply service and the regulated rate. Lines 3a and 3b of Table 1A and line 3 of Table 1B present the water supply portion of the amounts used (if any) for cash-financed construction and to defease Authority bonds. The costs and benefits of defeasance are described later in this section.

4.2.2.1 Historical Investments in the Water System

Prior to the formation of the Authority, the development, expansion, and upgrading of the Water System was carried out by the City with funds that were typically provided by the proceeds of General Obligation (G.O.) bonds issued by the City. Since the formation of the Authority, significant investments have been made throughout the Water System principally through the proceeds of bonds issued by the Authority. These capital costs, which are reflected in debt service on bonds of the Authority issued both to the public ("Authority Bonds") and NYSEFC ("NYSEFC Bonds") (collectively the "Bonds"), are a component of the cost of service and regulated rate.

Investments that are either complete or in progress include improvements to: dams, reservoirs, reservoir roads and bridges, City-owned and non-City wastewater treatment plants, agricultural programs (i.e., pollution prevention for watershed protection), security, the UV Facility, and other capital needs, including the Water for the Future Program. The latter program consists of all work related to the Rondout-West Branch Tunnel, as well as supply augmentation projects required to ensure an adequate water supply during the shutdown of the Rondout-West Branch Tunnel. Water supply augmentation includes rehabilitation of the Catskill Aqueduct, and demand management measures to encourage water conservation. Costs for the Croton Plant prior to the approval of the in-City site are also included in the water supply cost of service and are allocated to all water supply customers; costs incurred following the approval of the site are not included in the calculation of the cost of service or the regulated rate.

Land purchases, improvements to wastewater treatment plants, and other investments have been instrumental in maintaining the quality and reliability of the System including the avoidance of filtration for the Catskill and Delaware Systems.

4.2.2.2 Debt Service Related to the Water System

Debt service on the Bonds is computed based on the total net debt service payable for the water and wastewater system of the City in each year times the percentage attributable to the water supply portion of the capital improvements that have been financed with the proceeds of the Bonds. This approach incorporates the savings resulting from refundings of previously-issued Bonds. It also includes the impacts of the defeasance of certain future debt service obligations of the Authority.

The current methodology for computing debt service on outstanding Bonds was first applied in 2005. This methodology begins with the calculation of the percentage of the capital investments beginning in 1986 that are attributable to the System versus other components of the water and sewer system of the City. Since improvements have been financed with the proceeds of Authority Bonds and NYSEFC Bonds, Tables 5A and 5B were prepared to illustrate the proceeds of each bond issue and the upstate portion of such proceeds for Authority Bonds and NYSEFC Bonds, respectively. Since the percentage share for the Water System will change from year to year, a cumulative percentage (beginning with the first bonds issued in 1986) is computed in each year through the beginning of 2019. For example, the cumulative percentage to be used

in 2017 for Authority debt reflects the sum of all Authority bond proceeds used for water supply projects from 1986 through 2016 divided by the sum of all proceeds from bonds issued from 1986 through 2016. Similarly, the cumulative percentage to be used in 2018 for Authority debt reflects the sum of all Authority bond proceeds used for water supply projects from 1986 through 2017 divided by the sum of all proceeds from bonds issued from 1986 through 2017. The calculated percentage that is used in 2018 is again applied in Table 5C to the appropriate debt service, interest earnings, etc. for 2019. Not all of the proceeds of the 2018 and 2019 debt may have been spent at the time the data was prepared for this Report; the figures presented are subject to change.

The water supply share of debt service and net offsets are computed by multiplying the System-wide totals for each category times the applicable percentage in each year. The three percentages shown in Table 5C are: (1) line 27, which shows water supply capital costs funded through Authority Bond proceeds as a percentage of total capital costs funded through Authority Bond proceeds; (2) line 28, which shows water supply capital costs funded through both Authority Bond proceeds and NYSEFC Bond proceeds as a percentage of total capital costs funded through both Authority Bond proceeds and NYSEFC Bond proceeds; and (3) line 29, which shows water supply capital costs funded through NYSEFC Bond proceeds as a percentage of total capital costs funded through NYSEFC Bond proceeds.

Starting in the rate report for Fiscal Year 2014, we used the average of the percentages from the two prior historical years for debt service in future years. Thus, for 2020 through 2023, we use the average of the calculated percentages for 2017 and 2018. No further increases in the allocation percentage are assumed at the time of this Report for the following reasons: (1) previous years included debt issued for the UV Facility, which is now in operation; and (2) the classification of certain filtration avoidance programs as operating expenses instead of capital projects results in an increase in operating expenses but also a reduction in the amount of bond proceeds that will be needed for filtration avoidance expenses in the Water System. The computed percentages for 2019 through 2023 are preliminary and subject to change.

Table 5C illustrates the current projections of debt service on outstanding bonds and anticipated future bonds for the Projection Period as of March 7, 2019. The amounts shown are net of all refundings and defeasance of debt that have been undertaken by the Authority prior to that date. Authority debt service is shown as First Resolution and Second Resolution. The Second Resolution debt is subordinate to the First Resolution debt. Table 5C also presents the estimated interest on commercial paper shown as “Interest on Short-Term Debt”. Historically, the Authority initially finances capital improvements through the proceeds of short-term commercial paper sales and then redeems the commercial paper with the proceeds of long-term bonds. Interest rates on commercial paper and the variable rate debt of the Authority have been low in recent periods compared to historical conditions, resulting in actual interest costs that are lower than projections. There is no assurance that such market conditions will continue in future years. As a result, projections of future debt service payments assume that interest rates on commercial

paper, variable rate debt, and future fixed rate debt will be higher than current market rates. At the time of this Report, the Authority had no commercial paper outstanding.

The debt service on Build America Bonds ("BABs") is net of the interest subsidy payments from the U.S. Treasury for those bonds. The BABs were issued on a taxable basis, and beginning in 2010, the U.S. Treasury has generally provided interest subsidy payments in each year equal to 32% to 35% of the interest payable. The figures shown for "Authority Debt Service – Second Resolution" (line 3) and "NYSEFC Outstanding Debt Service" (line 6) in Table 5C of this report reflect the application of the BABs subsidy payments so the debt service is net of such payments. At the time of this report, federal sequestration is continuing to reduce somewhat the actual payment of BABs subsidies by the federal government. It is not known at this time how long the sequestration will last, whether reductions in BABs payments will continue or whether any reductions will be made up through payments at a later date. The projected debt service in 2019 and subsequent years assumes that BABs subsidy payments are reduced in each year from the previously expected amount (which was based on a 35% rate of assistance).

Interest earnings on available funds (i.e., the Authority's Debt Service Fund, the Debt Service Reserve Fund, the Construction Fund, and the Subordinate Debt Service Fund), together with Authority expenses related to debt, collectively form either a net offset to a portion of the debt service or a net addition. Interest earnings have generally been low in recent years due to conditions in the financial markets that have resulted in relatively low rates of interest earnings on secure investments. That factor plus increasing Authority expenses have resulted in a net addition to debt service in each year from 2016 through 2018, and the expectation that net additions will continue in each year through 2023. Authority expenses related to debt include administrative expenses charged by NYSEFC for the low-interest loan program; liquidity fees, and other expenses related to variable rate debt; swap payments; arbitrage rebate payments; the cost of auditors, financial advisors and consultants; and other expenses.

4.2.2.3 Cash-Financed Construction and Cash Used for the Defeasance of Bonds

Portions of the capital improvements to the Water System may be financed through cash in lieu of the proceeds of Bonds; alternatively, such cash may also be used to defease outstanding bonds. The use of cash to either pay directly for construction or to defease debt is a common practice in the industry. No cash-financed construction deposits were made in 2010 through 2013 and in 2016 through 2017. In 2014, the Authority spent $225.0 million for cash-financed construction needs. In 2015, there was a release of $253.0 million from the debt service reserve fund of the Authority that was used for cash-financed construction[1]. This Report does not include any portion of the $253.0 million as a cost of water supply in 2015 nor does it include the amount in calculating the anticipated unit rate for that year because these capital dollars are

[1] The Debt Service Reserve Fund for First Resolution Bonds must be at least equal to the maximum debt service on such Bonds in any future year. Following the refunding and defeasance of certain First Resolution Bonds the maximum debt service in a future year had declined from previous levels, thus allowing the release of a portion of the moneys in the Debt Service Reserve Fund.

already accounted for in the debt service of the Authority. In 2018, the Authority spent $75.0 million for cash-financed construction needs.

In 2011 through 2018, cash from the System was used to defease Authority Bonds by paying future debt service in advance of the years in which such debt service was payable. This was done to both reduce the System's debt burden and optimize future debt service payments by stabilizing annual changes to debt service. The amounts used for defeasance in recent years are summarized below.

- $299.99 million in 2013,
- $399.08 million in 2014,
- $802.67 million in 2015,
- $948.59 million in 2016,
- $991.95 million in 2017, and
- $824.98 million in 2018.

See Table 5D for the amounts used in each year and the computed water supply share.

Since all water supply customers share in the benefit of lower future debt service due to the defeasance, the costs of the defeasance are included in the cost of service just as the defeased debt service had previously been included, and these costs are apportioned to all water supply customers. While the use of moneys for defeasance results in a short-term increase in the cost of service, it produces long-term reductions in debt service that are much greater than the costs incurred. The table below summarizes the actual (2011 through 2018) amounts for defeasance together with the reduction in total debt service expected to be achieved in each year based on actual results for the defeasances in 2011 through 2018 defeasance.

Debt Defeasance

Fiscal Year	Amounts Used For Defeasance ($)	Reduction in Debt Service ($)
2011	260,000,000	
2012	239,600,000	17,036,000
2013	299,990,000	44,835,000
2014	399,079,000	138,138,000
2015	802,671,000	243,044,000
2016	748,591,000	240,107,000
2017	796,951,000	296,881,000
2018	824,983,000	341,921,000
2019		349,053,000
2020		298,373,000
2021		291,108,000
2022		253,257,000
	4,371,865,000	2,513,753,000
2023 and Beyond		4,555,936,000
Total	4,371,865,000	7,069,689,000

Notes:

The amounts used for defeasance and debt service reductions shown above exclude the effects of economic defeasance of $200.0 million in 2016 and $195.0 million in 2017. The reductions in future debt service payments would be greater than the $395.0 million used for economic defeasance if the effects of economic defeasance were included above.
All figures above are rounded to the nearest thousand dollars.

The annual debt service figures shown in lines 1 and 3 of Table 5C are net of the debt service reductions show in the table above. The benefits of economic defeasance from 2016 and 2017 are not shown in the table above; however, the annual debt service figures shown in line 6 of Table 5C are net of the annual savings attributable to economic defeasance.

The annual revenue requirements for cash-financed construction and/or cash defeasance in future years are currently assumed to be $725.0 million in 2019, $400.0 million in each year in 2020 through 2022, and $300 million in 2023. These amounts are shown as annual deposits in the Cash Used for Capital Construction/Defeasance column in Table 5D. The projected amounts for each year may increase or decrease in the future, as the Board and the Authority may decide to modify the amount used for cash-financed capital contributions or the defeasance of outstanding bonds depending on financial results, market conditions, and forecasts. The water supply share of such costs in Table 5D is based on the total cash contribution in each year times the Water System capital costs as a percentage of total capital costs funded through the proceeds of both Authority Bonds and NYSEFC Bonds.

The projected debt service of the Authority that is used in Table 5C and in the calculation of the projected cost of water supply service reflects the actual impacts of the defeasance of debt that has taken place in prior years as well as the anticipated effects of the planned defeasance in 2019. It is important to note that if the defeasance of debt had not taken place, debt service in each year

for 2016 through 2023 would be higher than shown in this Report. The Authority's use of defeasance is an important part of its efforts to maintain strong credit ratings, which reduce the cost of borrowing for all debt to the benefit of all customers. The Authority's current credit ratings are shown below.

NYC Municipal Water Finance Authority Bond Ratings as of 3/29/2019

	First Resolution Bonds	Second Resolution Bonds
Standard & Poor's	AAA	AA+
Moody's Investors Service	Aa1	Aa1
Fitch Ratings	AA+	AA+

4.2.2.4 Ongoing and Future Capital Improvements

Ongoing capital improvements in the System to be funded through the proceeds of bonds in 2019 through 2023 include: rehabilitation of the Gilboa Dam; improvements to Ashokan Reservoir and related facilities; purchases of land; the Water for the Future Program; reconstruction or upgrading of other water supply infrastructure, filtration avoidance measures north of the City, and other projects and programs.

4.2.2.5 Capital Cost Summary

Favorable market conditions in 2017, 2018 and year-to-date in 2019 resulted in actual debt service on bonds issued and interest on variable rate debt and commercial paper that were lower than anticipated prior to the beginning of each year. Based on the year-to-date experience of the Authority in the financial markets, preliminary changes for 2019 have been taken into consideration in the projected debt service for 2019 and subsequent years. There is no assurance that such conditions will continue in the future.

An overall net increase in debt service is projected in the upcoming years to reflect the debt service for capital improvements being funded through the proceeds of Authority bonds. Table 5C summarizes the historical and expected future annual costs attributable to debt service.

4.2.3 Judgments and Claims

Judgments and claims represent the amount of judgments rendered against the System or claims paid by the City for water supply-related matters in areas north of the City. Actual and projected judgments and claims are illustrated in Table 6. There are years in which no judgments or claims were paid for the Water System north of the City. Except for 2007, payments made in other years have ranged from $3,695 in 2008 to $916,350 in 2011. A payment of about $5.5 million was made in 2007 to settle litigation relating to the Shandaken Tunnel. There may be additional expenses related to this matter. The payment amount in 2018 was $9,781. The cost of service

analysis assumes that the fifteen-year (2004 through 2018) average of $541,553 will provide a reasonable allowance for judgments and claims in 2019 and in future years. This assumption recognizes that the City will have to pay $1 million in 2019 as a result of the Hillview Consent Order.

4.2.4 Miscellaneous Revenue

Miscellaneous revenues received from upstate sources are used to offset the total cost of supplying water to both in-City and upstate customers. As indicated in Table 7, miscellaneous revenues are derived from hydropower generated at upstate dams and from miscellaneous charges for permit use and related services provided in the Water System. In addition, miscellaneous revenues may include tax refunds when such refunds are made and when such refunds are not already reflected in the expense of real estate taxes paid. Miscellaneous revenues have been inconsistent over the years, declining in some years and increasing in others.

Hydropower revenues are shown for 2004 through 2018. Hydropower revenues in future years may differ from the historical experience. The City took ownership of the East Delaware (Grahamsville) and Neversink hydroelectric facilities in October 2006, which resulted in an overall increase in annual revenues (compared to historical experience) as well as increased costs for capital improvements and operation and maintenance expenses, including property taxes. The City also receives a relatively small amount of revenue from the operator of the West Delaware hydroelectric facility. No revenues are considered in the calculations for the Ashokan and Kensico facilities because no revenues are actually expected to be received by the City in 2019 or any future year.

With the exception of 2015, hydropower revenues as illustrated in Table 7 represent gross revenues prior to the application of offsetting expenses, and the offsetting expenses are included in the historical OTPS and personal services expenses shown in the tables of this report. The 2015 hydropower revenue is shown net of expenses; therefore, hydropower-related expenses are not included in the OTPS and personal services expenses calculations for 2015.

Table 14 shows the anticipated gross hydropower revenues by source. In 2018, April and May invoices were processed as FY 2019 expenses instead of FY 2018. The 2019 base from which future projections are made were adjusted to account for this change. In 2019 and 2020, gross revenues are projected to be approximately $8.5 million and $7.6 million, respectively, which, together with other miscellaneous revenues, will be applied as a credit towards the cost of water supply service.

For purposes of estimating future miscellaneous revenues, the fifteen-year average (2004 through 2018) of permit/services revenues has been used. With the exception of 2013, DEP has recently used tax refunds received to reduce real estate taxes, as shown in the $0 amount for tax refunds in 2010 through 2012 and again in 2014 through 2018. In 2013, DEP paid the tax bill in full prior to settlement, resulting in a $209,232 tax refund. At this time, the projections assume no refunds

in future years. In lieu of tax refunds, DEP has advised that it may continue to apply credits against property taxes due in future years.

4.2.5 Personal Service Costs

Personal services expenses directly allocable to water supply services are shown in Tables 8A, 8B, 9A, and 9B. These expenses represent salary, pension, and fringe benefit costs associated with all BWS field personnel working in water supply facilities located north of the City as well as support and administrative personnel. Field personnel, for purposes of this report, are defined as DEP personnel with non-supervisory or non-management titles, working directly with the Water System. Thus, field personnel do not include personnel classified as management and/or administrative support. Irrespective of the "field" or "administrative support" designation, these costs are all entirely related to water supply. The methodology for classifying personnel between field personnel and support/administrative categories of cost is consistent with the City's indirect cost plan for federal and State grant programs. Prior indirect cost plans of the City that use this methodology have been approved by the federal government. Personal Services costs in Tables 8A, 8B, 9A, and 9B are categorized based on location. The categories can vary somewhat from previous year reports as locations have been consolidated or eliminated from a budgetary perspective. This does not necessarily indicate a physical change in location of the associated salaries.

Labor expenses for Hillview Reservoir include day-to-day operations, maintenance, and security. Security costs, in terms of both labor and non-labor expenses, have risen significantly in recent years as initiatives to protect the Water System have been implemented. Pension and fringe benefit rates that are applied to salaries and wages are expected to change in each year as summarized herein.

The source documents for the above referenced costs are DEP records, which identify salary and related costs by employee name and work location. Pension and fringe benefit factors reflect City-wide percentages of direct salary and wages. Pension and fringe benefit rates used in the Report, which are applied to salary and wage expenses, are summarized below. The rates for 2019 through 2023 are subject to change.

Pension/Fringe Benefit Rates (as a % of Salary & Wage $)

Year	Rate (%)
2016	48.1
2017	46.75
2018	50.11
2019-2023	47.91

The preceding pension and fringe benefit rates are applied to all projected labor costs related to the supply of water. The projected labor costs for 2019 through 2023 incorporate an assumed

3.0% per year increase from the 2018 base of personal salary and wage costs. The reconciliation of actual water supply costs and revenues in future reports will utilize the actual salaries and wages, as well as pension and fringe benefits of applicable personnel.

Approximately 95% of DEP's employees are members of labor unions which represent such employees in collective bargaining with the City. The majority of DEP employees who are members of unions are members of District Council 37 of the American Federation of State, County and Municipal Employees ("DC 37"). Those DEP employees who are not members of labor unions have generally received salary and benefit increases consistent with DC 37. An agreement with DC 37, covering the period from September 26, 2017 through May 25, 2021, was ratified on August 14, 2018. The agreement provides for a retroactive increase of 2% effective September 26, 2017, followed by increases of 2.25% effective September 26, 2018 and 3% effective October 26, 2019. The report assumption of a 3% annual increase in salaries and wages covers both the increases in salaries and wages as well as changes in overtime, staffing levels and other factors.

4.3 Calculation of Allocation Percentages - Step B

The remaining elements of the cost of service, i.e., those not directly or fully allocable to facilities north of the City, must undergo one or a series of allocations before an appropriate assignment of costs can be made. Accordingly, allocation percentages are developed for the purpose of apportioning a fair share of costs incurred by one bureau, unit, or location to the benefiting entity. For example, DEP incurs many costs in support of the Water System. The DEP cost burden must then be shared by the Water System through the use of an allocation percentage. The computation of the allocation percentages used in this report is based on data provided by DEP as presented in Table 10. The allocation factors presented in Table 10 specifically exclude employees working within the City in the wastewater system or the water distribution system in the numerator.

4.4 Allocation of Department of Environmental Protection Costs - Step C

Expenses of DEP that are covered by Step C represent personnel and other expenditures of DEP that are allocable to management, administration, and support services needed to operate and maintain the water supply facilities located north of the City. Again, City water distribution costs are specifically excluded.

Tables 11A and 11B illustrate allocated personal services costs, while Tables 12A and 12B present the allocation of a portion of DEP OTPS costs to facilities north of the City. Examples of the services provided include fleet administration, data processing, and personnel recruiting and management. The total costs to be allocated are multiplied by allocation percentages to obtain the costs for facilities located north of the City.

Allocated DEP personal services costs in 2019 through 2023 reflect the same assumptions identified in Section 4.2.5. OTPS costs are assumed to increase at an annual rate of 3.0%.

4.5 Allocation of City Central Service Costs - Step D

The City incurs costs that must be distributed among all of its operating entities. Such costs include planning, budgeting, accounting, purchasing, legal services, and other related activities. A cost allocation plan is developed to distribute the City-wide costs. The plan is approved by the federal government in connection with federal aid received by the City. After the City-wide allocation process, the DEP portion of the City's costs is divided further between non-utility and water and sewer utility components. The water and sewer utility-related costs are then distributed among the various DEP water and sewer functions using headcount allocation percentages. BWS is one of the functions to which costs are allocated. This cost is then further allocated to relate to facilities located north of the City. The allocated Central Service costs were $1,791,678 in 2017. While the 2018 allocation percentage was available, the actual Central Service costs for 2018 were not available at the time of this Report. Therefore, the 2018 costs were estimated using 2017 costs and 2018 allocation percentage, resulting in estimated costs of $1,732,138. Overall City support service costs to DEP are expected to be relatively stable in future years. Thus, such costs attributable to water supply are assumed to be $1,732,138 in 2019 and each year thereafter.

4.6 Cost of Service - Step E

The calculations of the total cost of water supply and the cost of water supply attributable to upstate customers are presented for 2016 through 2018 in Table 1A and for 2019 through 2023 in Table 1B. Additional tables are referenced to support the various categories of costs and offsetting revenues. These additional tables provide a detailed breakdown of the components of each step of the cost of service analysis.

The total cost of service (excluding reconciliations) is calculated to be $755,998,422 in 2017 and $750,525,026 in 2018. With or without the reconciliation amounts from prior years, the revenues generated in those years are less than the cost of service.

The total cost of service (excluding reconciliations) is estimated to be $759,652,940 in 2019 and $756,059,550 in 2020. Of these amounts, $624,019,211 in 2019 and $615,188,679 in 2020, or about 82% in 2019 and 81% in 2020 (excluding the effects of the reconciliation), is for debt service, defeasance/cash-financed construction, and direct out-of-pocket expenses (OTPS costs) associated with operating and maintaining the water supply facilities located north of the City. As illustrated in Table 4B, the largest item of OTPS expense for the supply of water is real estate taxes paid to upstate communities for watershed properties. Excluding the reconciliations, upstate taxes (included with OTPS expenses) will represent approximately 22% of all water supply costs in 2019 and in 2020.

Direct salary, pension costs, and fringe benefits for personnel directly and indirectly related to the water supply facilities located north of the City account for about another 17% and 18% of all costs, respectively, excluding the effects of the reconciliation, in 2019 and in 2020.

After accounting for the reconciliation, the net total cost of water supply as presented in Table 1B (line 19) is $806,202,407 for 2019 and $811,268,782 for 2020. The amount in 2019 includes the effects of the net charges of $10,172,039, $10,899,560, $6,652,370, and $18,825,499 that are added to the total cost of service for the 2014, 2015, 2016 and 2017 reconciliations, the recovery of which is spread over four years for each reconciliation. In 2020, the total includes the net charges of $10,899,560, $6,652,370, $18,825,499, and $18,831,804 that are added to the total cost of service for the 2015, 2016, 2017, and 2018 reconciliations.

The above charges reflect the effect of the four-year allocation or phase-in of the following reconciliations:

- $40,688,154 in 2014 (applied to the cost of service in 2016, 2017, 2018 & 2019);
- $43,598,241 in 2015 (applied to the cost of service in 2017, 2018, 2019 & 2020);
- $26,609,479 in 2016 (applied to the cost of service in 2018, 2019, 2020 & 2021);
- $75,301,994 in 2017 (applied to the cost of service in 2019, 2020, 2021 & 2022); and
- $75,327,217 in 2018 (applied to the cost of service in 2020, 2021, 2022 & 2023).

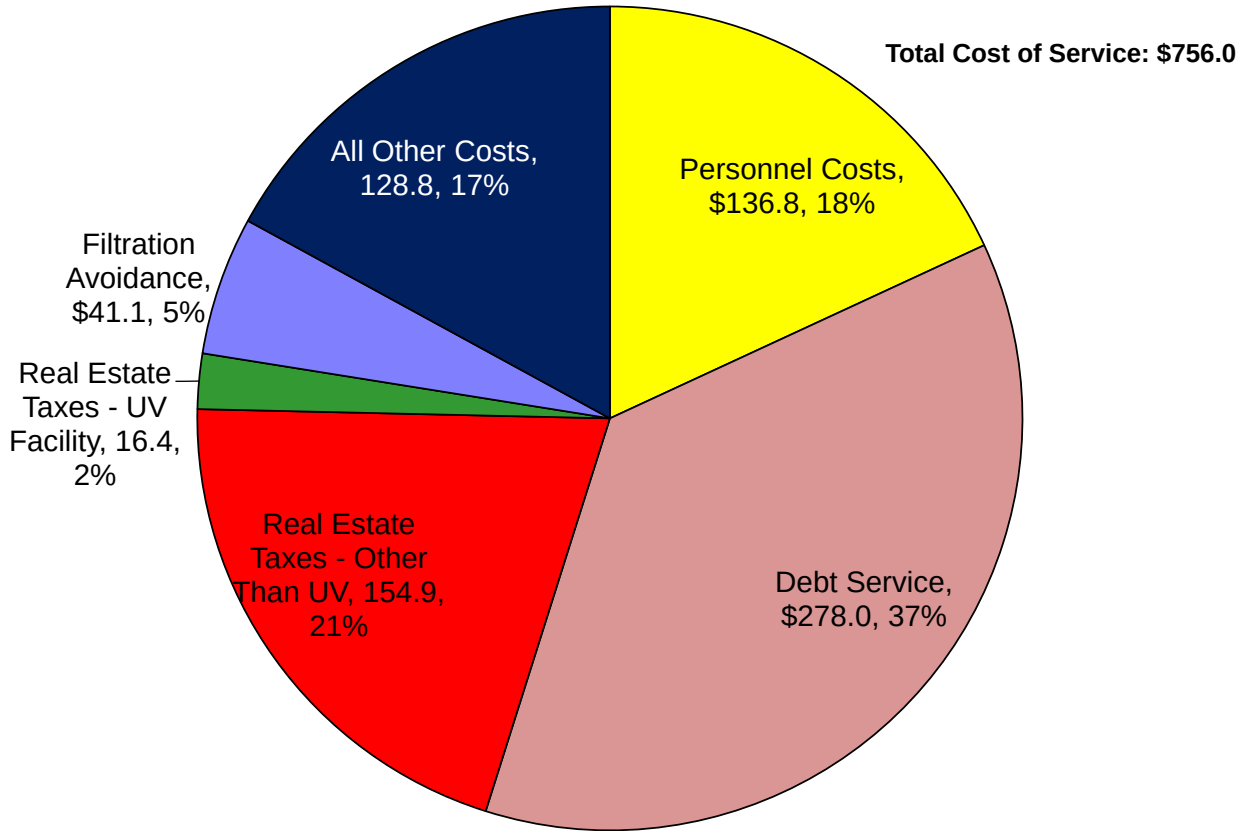
The four-year allocation or phase-in was recommended by Amawalk and adopted by the Board, at its discretion, to spread out the impact on the cost of service and rates.

The cost of water supply service as presented herein does not take into consideration the need to maintain an operation and maintenance reserve fund, to provide working capital to pay construction costs before being reimbursed through the proceeds of commercial paper, or to ensure liquidity in operating funds. If the costs of such needs were included, the cost of service and the regulated rate would be higher than is shown in this Report. The cost of service and the regulated rate also assume that all upstate customers pay their bills for water service on a timely basis, thus avoiding the need to include an allowance in the cost of service for late payments.

The chart below illustrates the breakdown of the total cost of service for the 2020 rate year excluding the effects of the reconciliation of prior year costs.

Figure 5 Projected 2020 Cost of Service Components

(all amounts in $ millions)



4.7 Calculation of the Regulated Rate - Step F

Table 1A presents both a net cost of service (line 19) and an actual unit rate net of the reconciliation (line 21) for 2016 through 2018. Table 1B shows the projected net cost of service and a unit rate net of the reconciliation for 2019 through 2023.

The 2020 rate includes the effects of the reconciliation of costs for 2015, 2016, 2017, and 2018. The cost of service recovered in 2015, 2016 and 2017 (based on the adopted rate for each year and the actual quantity of water consumed) was less than the actual cost of service in each year; thus, the reconciled amount was identified and proposed to be recovered over a four year period. In a similar manner, a reconciliation of the 2018 projected and actual costs of service, consumption, and rates was prepared with the resulting shortfall in costs recovered through the rate being applied towards the cost of service for the upcoming rate year of 2020 and the following three years as discussed in Section 4.6.

Given the potential for variations in financing and commodities costs as well as changes in water consumption, this "true-up" approach is intended to ensure that both upstate and in-City customers pay their appropriate shares of the cost of water supply service.

Table 1B summarizes the calculation of the projected 2020 regulated rate and upstate cost of service. The regulated rate per MG of water use is computed by first calculating the total cost of service in line 13 and then dividing by the total water consumption shown on line 14. An excerpt from Table 1B is provided below to show the calculation of the rate.

Summary of the Calculation of the 2020 Unit Rate

13	Total Costs Related to Facilities North of the City	$	756,059,550
14	System Usage	MG	405,431
15	Unit Rate to Recover Total Costs (line 13 divided by 14)	$/MG	1,864.83
16	Unit Rate Charged	$/MG	1,888.06
18a	Phasing of 2016 Reconciliation for FY 2014	$	0
18b	Phasing of 2017 Reconciliation for FY 2015	$	10,899,560
18c	Phasing of 2018 Reconciliation for FY 2016	$	6,652,370
18d	Phasing of 2019 Reconciliation for FY 2017	$	18,825,499
18e	Phasing of 2020 Reconciliation for FY 2018 (Preliminary)	$	18,831,804
19	Net Total Costs for Facilities North of the City (line 13+18s)	$	811,268,782
21	Unit Rate Net of Reconciliation (line 19 / line 14)	$/MG	2,001.00
22	Upstate New York Usage	MG	40,669
23	Total Upstate Cost Including Reconciliation (line 21 x line 22)	$	81,379,438

After taking into account the reconciliation, the resulting unit rate, shown on line 21, is $2,001.00 per MG in 2020. The cost of service attributable to upstate customers (including the cost reconciliation) is calculated by multiplying the calculated unit rate of $2,001.00 by the projected annual upstate water consumption shown on line 22 of Table 1B. The resulting upstate cost is approximately $81.4 million for 2020. The remaining cost of water supply, approximately $730.0 million, will be recovered from in-City water customers through rates and charges. These figures assume that the calculated rate is in effect for the entire fiscal year.

In an effort to mitigate a portion of the transition to the higher unit rate, this Report proposes a delay in the recovery of a portion of the cost of service. The effect of the recommended delay is to modify the proposed regulated rate for Fiscal Year 2020 to $1,888.06 per MG, which represents an increase of $159.07 per MG from the current unit rate of $1,728.99, or an increase of 9.2%.

Beginning with the report for the 2016 cost of service and rate, the reconciliation methodology uses a four-year allocation of the true-up amount instead of applying the full amount to the cost of service in the proposed rate year. For example, for the 2020 reconciliation, the use of the full 2018 shortfall of $75,327,217 instead of the $18,831,804 amount under the phased approach would have increased the cost of service by an additional $56,495,413 or $139.35 per MG.

The size of the reconciliation from 2018 and thus the significant increase in the total cost of service and regulated rate for 2020 is being driven to a large degree by the cost of defeasance of debt. The use of defeasance produces substantial debt service savings, which will reduce the cost of service in future years for both upstate and in-City ratepayers as outlined previously. Defeasance produces other substantial benefits as noted previously.

In recognition of the size of the reconciliation amounts, the calculations in this Report spread recovery of the reconciliation amount for these years over a four-year period so as to moderate the resulting increase (or decrease) in the regulated rate. The Board may consider whether or not to use this methodology in the reconciliation for the cost of service in any future year on a case-by-case basis. It is not recommended that a reconciliation period longer than four years be used since in-City ratepayers are essentially paying for the increased costs in the year in which such moneys are spent. The four-year maximum period recognizes the need to recover such costs promptly while avoiding overly substantial fluctuations in the unit rates for water supply from year to year. As illustrated in the subparts of line 18 in Table 1B, there is currently a significant amount of the previous cost of service to be recovered in future years through the phasing of reconciliations.

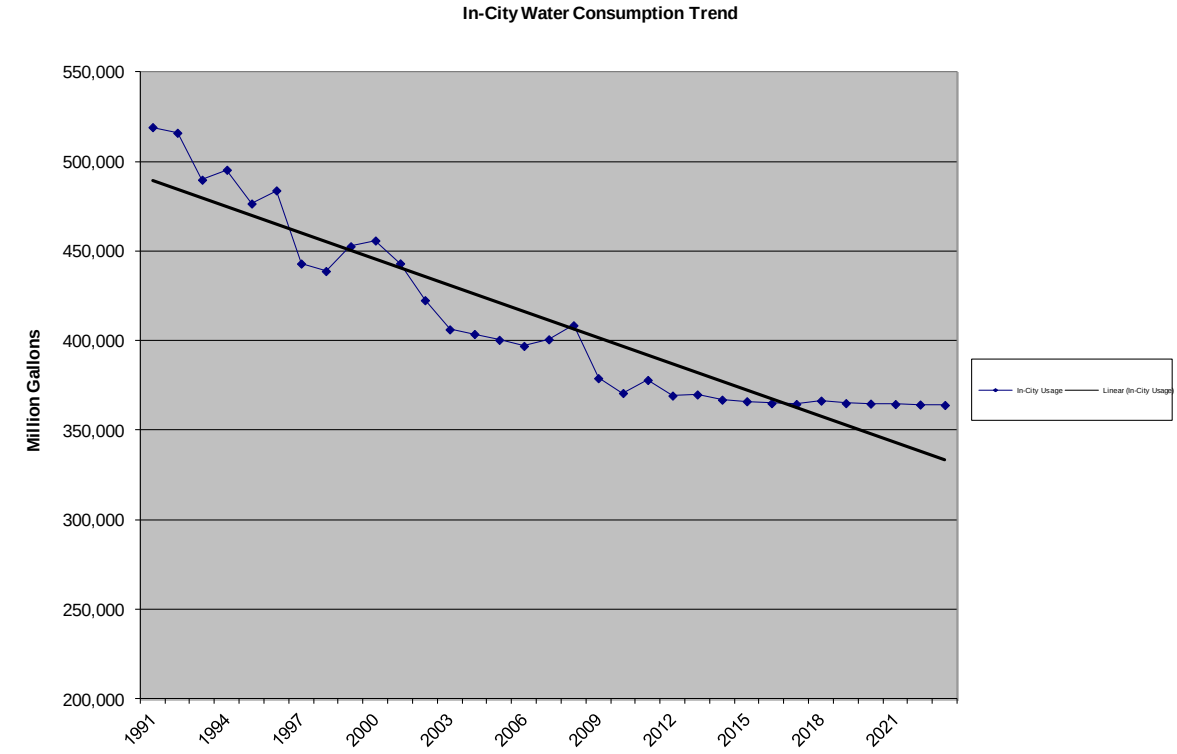
The water consumption used in calculating the regulated rate reflects a calculated decline in demand based on the results of a regression analysis. Water consumption data since 1985 is presented in Table 13. The use of the 10-year regression analysis was previously agreed-to by the City and representatives of upstate customers as a means to estimate future consumption. However, a 5-year regression analysis is used in this Report in estimating future water demand by both in-City and upstate customers. This is a change from previous reports which utilized a 10-year regression which produces a faster pace of decline than has been experienced in the City and upstate in recent years. The results of a 5-year regression analysis show a more gradual decline in annual consumption in-City and System-wide, which appears to reflect recent consumption more appropriately. The projected System-wide demand of 405,431 MG is used in developing the projected unit rate for 2020. By comparison, the use of the 10-year regression would have resulted in projected demand of 400,679 MG. The higher the projected System-wide consumption, the lower the projected unit rate.

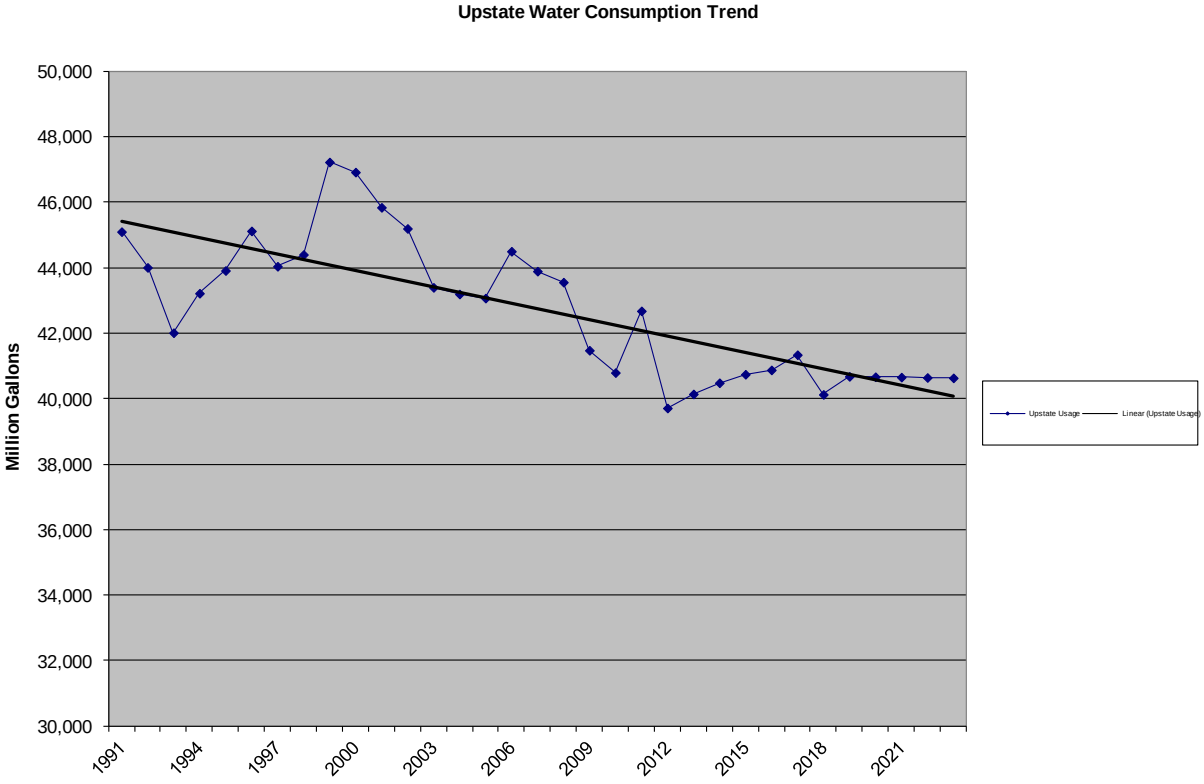
The results of the 5-year regression analysis provide an anticipated System-wide water consumption of 405,431 MG in 2020. The upstate share of total water consumption using the 5-year regression analysis is estimated to be 40,669 MG in 2020. In Figure 6, a line graph illustrates the projected consumption for both in-City and upstate customers.

Water consumption decreased in the City in 2016 compared to 2015 while upstate consumption was relatively unchanged. Total City consumption was relatively flat in 2017 compared to 2016 within the City but was higher upstate compared to the prior year. In 2018, consumption increased slightly in-City and was 2.9% lower in upstate communities.

The regression results show an annual pace of System-wide decline that ranges from 0.43% in 2019 to about 0.07% in 2020 through 2023. Current in-City assumptions utilize a 1.0% annual rate of decline in 2020 through 2023.

Figure 6 Comparison of Water System Consumption





4.8 Additional Issues Relating to the Cost of Service and the Regulated Rate

There are other issues relevant to the Board's deliberations on the cost of service and regulated rate for 2020. Certain of these issues are summarized herein.

4.8.1 Operating Risks

The cost of service computations are presented on the cash basis methodology as required by NYSDEC. The cost of service analysis and regulated rate calculated for 2020 reflect no allowance for the risks being borne by the City as the owner and operator of the Water System. Other large water systems are permitted to earn a premium over the cost of service to provide an allowance for such risks.

4.8.2 Water Demand Management Initiatives

DEP has invested and continues to invest substantial amounts of money in water demand management initiatives, and such investments will help reduce the need to develop new supplies of water in the future and ensure that the Water System has sufficient capacity during the period when the Delaware Aqueduct is shut down for repairs. (See Sections 1.3.1.7 and 1.3.2.1.)

On May 4, 2012, the Board adopted a modified Multiple-family Conservation Program ("MCP"), pursuant to which the majority of the accounts that had been billed on the frontage basis were converted to a flat rate per dwelling unit per year. Currently, approximately 24,000 accounts are billed on MCP. All accounts enrolled in the MCP were required to have meters, automatic meter reading ("AMR") devices, and high-efficiency plumbing fixtures installed, or by December 31, 2018 to have taken reasonable steps to comply with MCP requirements. Accounts which have failed to comply or take reasonable steps to comply with the MCP requirements by December 31, 2018 will be subject to an additional ten percent surcharge on their fiscal year 2020 annual bill.

Since 2009, DEP has implemented an automated meter reading system that utilized New York City's wireless network. Approximately 99% of all water and sewer accounts have meters installed. All customers whose accounts have been upgraded for automated meter reading can view their daily water consumption via DEP's website; this consumption information is automatically updated at least four times per day. With the installation of automatic meter readers, DEP has seen a large decrease in estimated bills. DEP is continuing its Universal Metering Program.

DEP is undertaking a Municipal Water Efficiency Program to install spray showers in City parks and replace plumbing fixtures in public schools. Examples of other programs being used by DEP include the following:

- Sonar Leak Detection Program
- Meter Slippage Testing
- Hydrant Locking Devices
- Residential Water Survey Program
- School Water Conservation

The cost of service and regulated rate, as presented herein, do not include the costs of the funds invested in metering in-City customers or any of the other programs listed above even though such investments benefit the water supply for all users of the System.

North of the City, the Board is providing demand management consulting services to analyze and make recommendations regarding water demand for the ten upstate customers that have executed agreements with the Board and one customer with a pending agreement. These customers are:

- Town of Greenburgh;
- City of Mt. Vernon;
- Town of New Windsor;
- Village of Ossining;
- Village of Scarsdale;
- SUEZ Water Westchester;
- Village of Tarrytown;
- Westchester Joint Water Works;
- City of White Plains; and
- City of Yonkers.

Such upstate customers may be eligible to receive DEP funding for initiatives developed in their plans. The cost of studies and such initiatives paid for by DEP are not included in this Report; however, the City reserves the right to include such costs at a future date.

4.8.3 Upstate Wastewater Treatment Plants

In addition to non-City owned plants, the City owns and operates wastewater treatment plants in the watershed and is responsible for capital improvements in those facilities. Given the absence of a mechanism to recover the operating and capital costs of these facilities directly from the users of these systems, such costs are included within the cost of water supply service and the calculation of the regulated rate.

5.0 Impacts on Customers of the Calculated Regulated Rate

It is noted that adopted 2017 regulated rate of $1,750.52 per MG was not implemented and there was no rate action for 2018 and 2019; thus, the current regulated rate in place is the 2016 rate of $1,728.99 per MG. The calculated regulated rate for 2020 is $2,001.00 per MG including the effects of the 2018 reconciliation spread over four years and if the rate were in effect for the entire fiscal year. However, in an effort to mitigate a portion of the transition to the higher unit rate, this Report proposes a delay in the recovery of part of the increase in the cost of service. The effect of the recommended delay is to modify the proposed regulated rate for Fiscal Year 2020, effective July 1, 2019, to $1,888.06 per MG, which represents an increase of $159.07 per MG from the current unit rate of $1,728.99, or an increase of 9.2%. The impact on a typical single family homeowner of the calculated unit rate would be modest. The increase in charges attributable to a single family residence using 70,000 gallons of water per year[2] would be $11.13 for the entire year or about three cents per day.

Prior to the effects of the reconciliation, the current estimate of the unit cost of service for 2019 is $1,872.44 per MG. After the effect of the reconciliation is taken into consideration, the preliminary calculated net unit cost of service for 2019 at the time of this report is $1,987.18 per MG which is higher than the rate in effect during 2019 of $1,728.99 per MG. The current estimate of the unit cost of service for 2019 will change based on actual costs incurred and will be reflected in a future report.

For 2021 through 2023, Figure 7 outlines the anticipated percentage change in the unit cost of water supply and the portions of the change attributable to increases or decreases in the cost of service and water consumption. If consumption declines at a pace that is faster than expected, the unit rate for water supply will increase in order to recover the estimated cost of service. As noted above, the unit cost of service in 2019 will likely higher than the unit rate that was charged by the Board. If the final results for 2019 confirm this expectation, the percentage change in the unit rate due to the cost of service and the percentage change in the calculated unit rate for water supply in 2021 may increase from the amounts shown in Figure 7 due to the effects of the reconciliation for 2019.

[2] The average single family residence in New York City is estimated to use about 70,000 gallons of water per year. Previous reports had used 80,000 gallons of water per year but more recent data shows a continuing decline in average single family residential use.

Figure 7 Impact of Cost of Service and Consumption on Unit Rate

New York City Water Board
Cost of Supplying Water to Upstate Customers

	2021	*2022*	*2023*
Percentage Change in the Unit Rate due to Increase in Cost of Service (Net of Reconciliation)	5.0%	5.9%	0.6%
Percentage Change in the Unit Rate due to Fluctuations in Consumption	0.1%	0.1%	0.1%
Percentage Change in the Calculated Unit Rate for Water Supply (Net of Reconciliation)	5.1%	6.0%	0.7%

The percentage change shown in 2021 assumes that the full cost of service is charged in 2020. If the Board adopts the proposed rate for 2020 that incorporates a delay in recovering the full cost of service, the percentage difference between the calculated rate in 2021 and the proposed rate (with delayed recovery) in 2020 is 11.4%. All figures are projected and totals may not add due to rounding.

The potential impact of the calculated regulated rate on the actual rate schedules for upstate customers will depend to a large extent on the upstate suppliers' cost of purchased water in relation to the total cost of service experienced by these suppliers. To illustrate the potential effects on the overall charges to customers, Tables 2A and 2B present the rate structures of several upstate communities that purchase water from the City. The annual single family residential water charge is computed for each community using an 70,000 gallon per year allowance. Table 3 illustrates the computed single family charge and the estimated percentage increase in that charge that would occur with the calculated regulated rate for 2020.

Additional rate increases are anticipated in future years based on the need to protect the water supply for all customers and to avoid the costly possibility of having to filter Catskill and Delaware System water. Future changes in rates are dependent upon whether or not the overall declining trend in consumption continues as well as changes in debt service for capital improvements and the costs of watershed protection.

Prior to 2008, the rates and charges of the Board that were assessed to upstate customers for water supply service were generally less than the actual cost to the City. Table 15 illustrates the charges to upstate customers versus the computed cost to the City of serving those customers. The figures shown in Table 15 do not consider the effects of the reconciliation of the cost of service from prior years.

Appendices

Table 1A Historical Cost of Service

TABLE 1A
New York City Water Board
Cost of Supplying Water to Upstate Customers
Historical Cost of Service

No.	Description		FY 2016	FY 2017	FY 2018
	Bureau of Water Supply Direct				
	Costs for Facilities North of the City				
1	Other Than Personal Services	$	245,811,541	251,744,977	250,053,638
2	Debt Service	$	213,140,672	219,696,860	225,320,908
3a	Cash Used for Capital Construction	$	0	0	11,663,543
3b	Cash Used for the Defeasance of Debt	$	144,869,625	154,088,807	128,296,300
4	Judgment and Claims	$	44,517	5,015	9,781
5	Less Miscellaneous Revenue	$	(7,420,573)	(7,415,536)	(8,077,748)
	Personal Services				
6	Field Personnel	$	79,986,430	93,740,081	97,089,768
7	Support and Administrative Personnel	$	21,245,719	22,889,807	24,192,038
8	Total Costs Directly Related to Facilities North of the City	$	697,677,931	734,750,011	728,548,227
	Upstate Share of NYC DEP Costs				
9	Personal Services	$	8,663,357	9,391,684	9,586,411
10	Other Than Personal Services	$	10,105,381	10,065,050	10,658,251
11	Total NYC DEP Costs Allocated to Facilities North of the City	$	18,768,738	19,456,733	20,244,661
12	***Upstate Share of City Central Service Costs*** [(1)]	$	1,746,340	1,791,678	1,732,138
13	Total Costs Related to Facilities North of the City	$	718,193,009	755,998,422	750,525,026
14	System Usage	MG	405,876	405,883	406,551
15	***Unit Rate to Recover the Total Costs (line 13 divided by 14)***	$/MG	1,769.49	1,862.60	1,846.08
16	Unit Rate Charged	$	1,728.99	1,728.99	1,728.99
17	Revenue Raised (line 14 times 16)	$	701,755,569	701,768,026	702,921,778
		$			
18	Cost Reconciliation for Prior Years, No phasing	$			
18a	Phasing of 2016 Reconciliation for FY 2014		10,172,039	10,172,039	10,172,039
18b	Phasing of 2017 Reconciliation for FY 2015			10,899,560	10,899,560
18c	Phasing of 2018 Reconciliation for FY 2016				6,652,370
19	Net Total Costs for Facilities North of the City (line 13+18)	$	728,365,047	777,070,021	778,248,995
20	Difference in Revenue Less Net Total Costs (line 17 minus 19)	$	(26,609,479)	(75,301,994)	(75,327,217)
21	***Unit Rate Net of Reconciliation (line 19 / line 14)***	$	1,794.55	1,914.52	1,914.27
22	Upstate New York Usage	MG	40,878	41,342	40,129
23	Total Upstate Cost Including Reconciliation (line 21 x line 22)	$	73,357,305	79,150,350	76,816,968

Notes:
(1) Based on factors allocating a portion of central city service costs.
(2) Starting with FY 2016 rates, cost reconciliations for prior years are spread over a four-year period.
(3) 2018 actual upstate share of City central service costs were not available at time of this report. 2017 costs and 2018 headcount are used.

Table 1B Cost of Service Projections

TABLE 1B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Cost of Service Projections

Line No.	Description		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
	Bureau of Water Supply Direct						
	Costs for Facilities North of the City						
1	Other Than Personal Services	$	267,371,454	274,994,129	290,356,201	310,811,300	323,721,809
2	Debt Service	$	243,963,552	278,023,955	283,642,860	303,961,557	325,065,879
3	Cash Used for Capital Construction or Debt Defeasance	$	112,684,204	62,170,595	62,170,595	62,170,595	46,627,947
4	Judgment and Claims	$	541,553	541,553	541,553	541,553	541,553
5	Less Miscellaneous Revenue	$	(10,437,700)	(9,514,490)	(9,666,450)	(9,821,450)	(9,979,549)
	Personal Services						
6	Field Personnel	$	98,536,833	101,492,938	104,537,727	107,673,858	110,904,074
7	Support and Administrative Personnel	$	24,552,605	25,289,184	26,047,859	26,829,295	27,634,174
8	Total Costs Directly Related to Facilities North of the City	$	737,212,503	732,997,864	757,630,345	802,166,708	824,515,887
	Upstate Share of NYC DEP Costs						
9	Personal Services	$	9,729,290	10,021,169	10,321,804	10,631,458	10,950,402
10	Other Than Personal Services	$	10,979,008	11,308,379	11,647,630	11,997,059	12,356,971
11	Total NYC DEP Costs Allocated to Facilities North of the	$	20,708,299	21,329,548	21,969,434	22,628,517	23,307,373
12	***Upstate Share of City Central Service Costs***	$	1,732,138	1,732,138	1,732,138	1,732,138	1,732,138
13	Total Costs Related to Facilities North of the City	$	759,652,940	756,059,550	781,331,917	826,527,363	849,555,398
14	System Usage	MG	405,701	405,431	405,161	404,890	404,620
15	***Unit Rate to Recover Total Costs (line 13 divided by 14)***	$/MG	1,872.44	1,864.83	1,928.45	2,041.36	2,099.64
16	Unit Rate Charged	$/MG	1,728.99	1,888.06			
17	Revenue Raised (line 14 times 16)	$	701,453,415				
18a	Phasing of 2016 Reconciliation for FY 2014	$	10,172,039				
18b	Phasing of 2017 Reconciliation for FY 2015		10,899,560	10,899,560			
18c	Phasing of 2018 Reconciliation for FY 2016		6,652,370	6,652,370	6,652,370		
18d	Phasing of 2019 Reconciliation for FY 2017		18,825,499	18,825,499	18,825,499	18,825,499	
18e	Phasing of 2020 Reconciliation for FY 2018 (Preliminary)			18,831,804	18,831,804	18,831,804	18,831,804
18f	Phasing of 2021 Reconciliation for FY 2019 (Preliminary)				26,187,248	26,187,248	26,187,248
18g	Phasing of 2022 Reconciliation for FY 2020 (Preliminary)					11,448,001	11,448,001
19	Net Total Costs for Facilities North of the City (line 13+18s)	$	806,202,407	811,268,782	851,828,838	901,819,915	906,022,451
20	Difference in Revenue Less Net Total Costs (line 17 minus 19)	$	(104,748,992)	N/A	N/A	N/A	N/A
21	***Unit Rate Net of Reconciliation (line 19 / line 14)***	$/MG	1,987.18	2,001.00	2,102.45	2,227.32	2,239.19
22	Upstate New York Usage	MG	40,681	40,669	40,658	40,646	40,634
23	Total Upstate Cost Including Reconciliation (line 21 x line 22)	$	80,840,402	81,379,438	85,480,681	90,531,835	90,988,496

Notes:
(1) The rate in place as of July 1, 2018 is the rate adopted by the Board for FY 2016 which is $1,728.99 per million gallons; no change since July 1, 2015.

Table 2A Current Water Rates for Upstate New York Communities

TABLE 2A
New York City Water Board
Cost of Supplying Water to Upstate Customers
Current Water Rates for Upstate New York Communities

	City of White Plains	Village of Scarsdale
Current Water Rates	$2.67/Ccf - 1st 50 Ccf $2.97/Ccf - Next 100 Ccf $3.36/Ccf - Next 200 Ccf (Rates are semi-annual; additional blocks for greater consumption) Plus fixed charge of $37.39 for residential meters 1" or less, per 6 mths	$3.20/Ccf - 1st 50 Ccf (qtrly accts) or 500 Ccf (monthly accts); $9.60 for consumption greater than those amounts. Plus service charge based on meter size: $9.00/qtr for 5/8"; $13.50/qtr for 3/4"; etc.
Avg. Annual Residential Use (Gal.)	70,000	70,000
Avg. Annual Residential Use (Ccf)	93.58	93.58
Avg. Residential Water Bill	$325	$344

	Village of Mamaroneck	Town of Harrison
Current Water Rates	$5.07/Ccf - 1st 22 Ccf per Mth $5.88/Ccf - Next 50 Ccf per Mth Plus service charge based on meter size: $9.70/mth for 5/8"; $11.57/mth for 3/4"; etc.	$4.45/Ccf - 1st 22 Ccf per Mth $5.36/Ccf - Next 50 Ccf per Mth Plus service charge based on meter size: $14.20/mth for 5/8"; $15.46/mth for 3/4"; etc.
Avg. Annual Residential Use (Gal.)	70,000	70,000
Avg. Annual Residential Use (Ccf)	93.58	93.58
Avg. Residential Water Bill	$602	$594

	New Rochelle Suez Water Westchester	City of Mount Vernon
Current Water Rates	Delivery charge: $4.0167 / Ccf Purchased Water Charge: $2.2881 / Ccf Plus facility charge based on meter size: $12.00/mth for 5/8"; $17.88/mth for 3/4"; etc.	$3.75/Ccf - per quarter
Avg. Annual Residential Use (Gal.)	70,000	70,000
Avg. Annual Residential Use (Ccf)	93.58	93.58
Avg. Residential Water Bill	$769	$351

Notes:
The above rates and charges reflect the rate schedules of each community in April 2019.
Calculated average residential water bill excludes taxes and surcharges, if any.

Table 2B Current Water Rates for Upstate New York Communities

TABLE 2B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Current Water Rates for Upstate New York Communities

	Town of Carmel	**City of Yonkers**
Current Water Rates	$63.80 per 1,000 cf (Water District #1) $34.50 per 1,000 cf (Water District #2)	$3.79 / Ccf Min service charge is $95.19 semiannually for water
Avg. Annual Residential Use (Gal.)	70,000	70,000
Avg. Annual Residential Use (Ccf)	93.58	93.58
Avg. Residential Water Bill	$323 - $597	$355

	City of Newburgh	**Village of Cornwall**
Current Water Rates	$6.13 per 1,000 Gal over Minimum Water Facility Fee of $8.31 Per Quarter Minimum charge based on meter size: $36.78/qtr for 5/8" Minimum Charge up to 6,000 gals $85.82/qtr for 3/4" Minimum Charge up to 14,000 gals	$11.00 per 1,000 Gal
Avg. Annual Residential Use (Gal.)	70,000	70,000
Avg. Annual Residential Use (Ccf)	93.58	93.58
Avg. Residential Water Bill	$462	$770

Notes:
The above rates and charges reflect the rate schedules of each community in April 2019.
Calculated average residential water bill excludes taxes and surcharges, if any.

Table 3 Summary of Impacts on Upstate Customers

TABLE 3
New York City Water Board
Cost of Supplying Water to Upstate Customers
Summary of Impacts on Upstate Customers

Water System Customer	Typical Single Family Charges	Increase Attributable to Proposed 2020 Regulated Rate	% Change to a Homeowner
City of White Plains	$325	$11.13	3.4%
Village of Scarsdale	$344	$11.13	3.2%
City of New Rochelle	$769	$11.13	1.4%
City of Yonkers	$355	$11.13	3.1%
Village of Mamaroneck	$602	$11.13	1.8%
Town of Harrison	$594	$11.13	1.9%
City of Mount Vernon	$351	$11.13	3.2%
Town of Carmel	$323 - $597	$11.13	1.9% to 3.4%
City of Newburgh	$462	$11.13	2.4%
Village of Cornwall	$770	$11.13	1.4%
New York City	$373	$11.13	3.0%

Notes:
(1) The Typical Single Family Charge for selected communities is based on 70,000 gallons of annual water use and the rate schedules of each community in March 2019.
(2) The proposed increase in annual water charges for New York City in FY 2020 to the New York City Water Board is %. The change within the City reflects increases in the cost of water supply and increases in water costs within the City.

Table 4A Historical Upstate Other Than Personal Services Costs

TABLE 4A
New York City Water Board
Historical Cost of Supplying Water to Upstate Customers
Upstate New York Other Than Personal Services Costs

Line No.	Description	FY 2016 $	FY 2017 $	FY 2018 $
	Budget			
1	Supplies and Materials - General	3,476,350	3,264,282	3,952,639
2	Automotive Supplies and Materials	282,509	417,554	423,282
3	Fuel Oil	1,352,352	1,656,624	2,191,287
4	Equipment - General	936,868	1,243,440	1,369,538
5	Telecommunications Equipment	128,700	88,047	53,343
6	Office Equipment	177,222	119,142	151,420
7	Contractual Services - General	5,944,354	8,601,856	6,192,029
8	Telephone and Other Communications	280,612	263,001	265,245
9	Office Services	112,055	151,804	160,475
10	Maintenance and Repairs - Motor Vehicles	315,443	285,122	293,508
11	Maintenance and Repairs - General	1,519,103	1,226,980	1,541,734
12	Rentals - Miscellaneous Equipment	2,938,147	2,857,350	2,760,656
13	Advertising	127,365	100,109	113,065
14	Cleaning Services	433,410	503,789	684,362
15	Licenses (1)	0	0	0
16	Chemicals	3,681,482	3,649,465	2,106,988
17	Real Estate Taxes - Existing Properties	142,750,787	144,400,490	147,459,939
18	Real Estate Taxes - UV Facility	15,128,492	15,163,394	15,506,526
19	NYS DEC Permits (1)	0	0	0
20	Motor Maintenance Supplies	1,024,836	879,999	1,270,885
21	Gasoline (1)	0	0	0
22	Lab and Limnology	139,683	82,187	97,661
23	Natural Gas & Electricity (2)	3,800,391	7,350,052	5,878,983
24	Heat, Light & Power (2)	2,900,000	860,000	2,077,316
25	Upstate Cost of Service/Rate Studies	94,091	113,170	136,401
26	Hillview Reservoir	10,793,583	11,610,847	11,947,626
27	UV Facility (2)	3,301,063	3,036,682	3,205,233
28	Filtration Avoidance - O&M Payments	12,276,024	13,188,103	12,438,094
29	Filtration Avoidance - Program Funding	30,198,504	29,305,841	26,299,380
30	New Facilities (3)	0	0	0
31	Water for the Future (4)	0	0	55,817
32	Water Supply Environmental Health & Safety	1,698,114	1,325,646	1,420,207
33	Totals	245,811,541	251,744,977	250,053,638

Notes:

(1) Actual costs were not available at the publishing of this report. The City reserves the right to include such expenses in calculating the cost of service and regulated rate at a future date.

(2) Natural Gas & Electricity costs were centralized until FY 2013. Starting in FY 2014, electricity costs for the UV facility and Water Supply Heat, Light & Power were separately tracked.

(3) New facilities include a new Catskill Chlorination Facility located in Ulster County, a new chlorine dioxide facility at the Croton Gatehouse, and a new office building at Arkville.

(4) Water for the Future program includes expenses affiliated with the Wholesale Customers Program in regards to water conservati assistance and expenses related to the Delaware Aqueduct shutdown.

Table 4B Projected Upstate Other Than Personal Services Costs

TABLE 4B
New York City Water Board
Projected Cost of Supplying Water to Upstate Customers
Upstate New York Other Than Personal Services Costs

Line No.	Description	*Projected Years* FY 2019 $	FY 2020 $	FY 2021 $	FY 2022 $	FY 2023 $
1	Supplies and Materials - General	4,071,218	4,193,355	4,319,155	4,448,730	4,582,192
2	Automotive Supplies and Materials	435,980	449,059	462,531	476,407	490,699
3	Fuel Oil	2,257,026	2,324,736	2,394,478	2,466,313	2,540,302
4	Equipment - General	1,410,624	1,452,943	1,496,531	1,541,427	1,587,670
5	Telecommunications Equipment	54,943	56,591	58,289	60,038	61,839
6	Office Equipment	155,963	160,642	165,461	170,425	175,537
7	Contractual Services - General	6,377,790	6,569,123	6,766,197	6,969,183	7,178,259
8	Telephone and Other Communications	273,203	281,399	289,841	298,536	307,492
9	Office Services	165,289	170,248	175,355	180,616	186,035
10	Maintenance and Repairs - Motor Vehicles	302,313	311,382	320,724	330,346	340,256
11	Maintenance and Repairs - General	1,587,986	1,635,625	1,684,694	1,735,235	1,787,292
12	Rentals - Miscellaneous Equipment	2,843,476	2,928,780	3,016,643	3,107,143	3,200,357
13	Advertising	116,457	119,951	123,550	127,256	131,074
14	Cleaning Services	704,893	726,040	747,821	770,256	793,363
15	Licenses (1)	0	0	0	0	0
16	Chemicals	2,170,197	2,235,303	2,302,362	2,371,433	2,442,576
17	Real Estate Taxes - Existing Properties	151,146,437	154,925,098	158,798,226	162,768,181	166,837,386
18	Real Estate Taxes - UV Facility	16,002,889	16,402,961	16,813,035	17,233,361	17,664,195
19	NYS DEC Permits (1)	0	0	0	0	0
20	Motor Maintenance Supplies	1,309,011	1,348,282	1,388,730	1,430,392	1,473,304
21	Gasoline (1)	0	0	0	0	0
22	Lab and Limnology	100,591	103,608	106,716	109,918	113,216
23	Natural Gas & Electricity	6,055,353	6,237,013	6,424,124	6,616,847	6,815,353
24	Heat, Light & Power	2,139,635	2,203,825	2,269,939	2,338,037	2,408,179
25	Upstate Cost of Service/Rate Studies	75,000	77,250	79,568	81,955	84,413
26	Hillview Reservoir	12,306,055	12,675,236	13,055,493	13,447,158	13,850,573
27	UV Facility	12,056,714	12,418,415	12,790,968	13,174,697	13,569,938
28	Filtration Avoidance - O&M Payments	12,811,237	13,195,574	13,591,442	13,999,185	14,419,160
29	Filtration Avoidance - Program Funding	27,088,361	27,901,012	28,738,042	29,600,184	30,488,189
30	New Facilities (2)	1,540,000	2,383,978	10,312,752	10,312,752	10,312,752
31	Water for the Future (3)	350,000	0	111,634	13,046,834	18,233,800
32	Water Supply Environmental Health & Safety	1,462,814	1,506,698	1,551,899	1,598,456	1,646,410
33	Totals	267,371,454	274,994,129	290,356,201	310,811,300	323,721,809

Notes:

(1) Actual costs were not available at the publishing of this report. The City reserves the right to include such expenses at a future date.

(2) New facilities include a new Catskill Chlorination Facility located in Ulster County, a new chlorine dioxide facility at the Croton Lake Gatehouse, and a new office building at Arkville.

(3) Water for the Future program includes expenses affiliated with the Wholesale Customers Program in regards to water conservation assistance and expenses related to the Delaware Aqueduct shutdown.

Table 5A Authority Bond Proceeds

Table 5A
New York City Water Board
Cost of Supplying Water to Upstate Customers
Proceeds of Authority Bonds Used for Upstate Projects

Line	Bond Issue	Total Principal ($)	Total Upstate Allocation	Upstate Principal ($)
1	1986 through 2014	27,292,482,298	16.33%	4,457,302,623
2	FY 2014 Series AA	650,870,000	26.13%	170,095,641
3	FY 2014 Series BB	397,085,000	13.09%	51,984,538
4	FY 2014 Series CC	351,240,000	20.91%	73,429,272
5	**2015 Total**	28,691,677,298	16.57%	4,752,812,075
6	FY 2015 Series AA	200,000,000	21.12%	42,249,215
7	FY 2015 Series BB	400,000,000	19.03%	76,115,880
8	FY 2015 Series CC	200,000,000	9.64%	19,281,713
9	FY 2015 Series EE	136,135,000	25.94%	35,317,950
10	**2016 Total**	29,627,812,298	16.63%	4,925,776,833
11	FY 2016 AA-1, AA-2, AA-3	250,000,000	13.28%	33,193,059
12	FY 2016 BB	328,030,000	17.52%	57,466,192
13	**2017 Total**	30,205,842,298	16.61%	5,016,436,084
14	FY 2017 Series AA	201,000,000	17.28%	34,739,463
15	FY 2017 Series BB	289,500,000	18.47%	53,471,437
16	FY 2017 Series CC	327,310,000	14.11%	46,194,454
17	FY 2017 Series DD	336,540,000	16.68%	56,150,220
18	**2018 Total**	31,360,192,298	16.60%	5,206,991,657
19	FY 2018 Series BB	219,555,000	15.17%	33,308,623
20	FY 2018 Series CC	338,960,000	11.70%	39,673,692
21	FY 2018 Series DD	275,000,000	19.16%	52,677,550
22	**2019 Total**	32,193,707,298	16.56%	5,332,651,522
23	FY 2019 Series BB	100,000,000	2.24%	2,240,277
24	FY 2019 Series CC	300,000,000	9.85%	29,535,924
		32,593,707,298	16.46%	5,364,427,723
20	**2020-2023 Total**		16.61%	

Notes:
(A) The 1991 C Bonds were not included in the calculations used in the report. The total principal was $4,650,000.
(B) Figures for recent bond issues are preliminary; the upstate portion may change after all bond proceeds are spent.

Table 5B NYSEFC Bond Proceeds

Table 5B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Proceeds of NYSEFC Bonds Used for Upstate Projects

Line No.	Bond Issue	Total Principal ($)	Upstate Allocation	Upstate Principal ($)
1	1986 through 2007	5,229,488,675	5.61%	293,549,848
2	FY 2008 Series 1,2	399,690,401	19.01%	75,989,525
3	**2009 Total**	5,629,179,076	6.56%	369,539,373
4	FY 2009 Series 1,2	448,435,268	27.23%	122,116,226
5	**2010 Total**	6,077,614,344	8.09%	491,655,599
6	FY 2010 Series 2,3,4	406,684,607	26.75%	108,800,028
7	**2011 Total**	6,484,298,951	9.26%	600,455,626
8	FY 2011 Series 1	478,881,733	18.80%	90,032,698
9	**2012-2014 Total**	6,963,180,684	9.92%	690,488,324
10	FY 2014 Series 2	209,380,000	16.20%	33,914,464
11	**2015 Total**	7,172,560,684	10.10%	724,402,788
12	FY 2016 Series 1,2	302,210,000	27.17%	82,100,990
13	FY 2016 Series 5,6	562,965,000	20.92%	117,781,965
14	**2017 Total**	8,037,735,684	11.50%	924,285,743
15	FY 2017 Series 3,4	569,448,000	14.79%	84,205,418
16	**2018 Total**	8,607,183,684	11.72%	1,008,491,161
17	FY 2018 Series 1,2	669,436,000	12.56%	84,073,070
	2019 Total	9,276,619,684	11.78%	1,092,564,231
18	FY 2019 Series 1,2	485,144,000	6.01%	29,151,210
		9,761,763,684	11.49%	1,121,715,441
19	**2020-2023 Total**		11.61%	

Notes:
(A) Figures for recent bond issues are preliminary; the upstate portion may change after all bond proceeds are spent.

Table 5C Debt Service

Table 5C
New York City Water Board
Cost of Supplying Water to Upstate Customers
Debt Service

Line No.	Description		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
				Actual				*Projected*		
				$	$	$	$	$	$	$
	System Totals - Capital-Related Costs									
1	Authority Debt Service - First Resolution (A.)	A	120,698,697	107,700,987	59,267,073	93,870,031	144,173,000	111,968,000	146,123,000	95,011,000
2	Anticipated Debt Service - First Resolution	B	-	-	-	-	11,000,000	34,000,000	58,000,000	85,000,000
3	Authority Debt Service - Second Resolution (A.)	C	914,243,922	907,813,728	986,386,515	1,030,869,352	1,096,740,439	1,149,252,223	1,131,404,823	1,179,105,823
4	Anticipated Debt Service - Second Resolution	D	-	-	-	5,260,000	61,865,000	125,701,452	191,755,701	265,228,286
5	Interest on Short-Term Debt	E	271,941	404,254	-	-	17,000,000	17,000,000	17,000,000	17,000,000
6	NYS EFC Outstanding Debt Service	F	395,743,301	423,024,780	439,183,737	438,202,777	438,316,256	317,388,821	320,988,860	342,507,808
7	NYS EFC Projected Debt Service	G	-	-	-	-	5,979,750	21,767,448	37,630,312	53,572,815
	System Totals - Interest Earnings & Expenses									
8	Debt Service Fund	H	(2,746,010)	(4,799,882)	(7,990,618)	-	-	-	(564,018)	-
9	Debt Service Reserve Fund	I	(28,626,087)	(23,774,073)	(20,168,263)	(18,801,611)	(17,107,147)	(16,207,147)	(15,934,647)	(15,282,276)
10	Construction Fund	J	(199,412)	(854,904)	(7,245,303)	(1,222,136)	(750,000)	(1,500,000)	(1,500,000)	(1,500,000)
11	Subordinated Debt Service Fund	K	-	-	-	(1,704,501)	(2,543,498)	(5,385,508)	(5,559,801)	(5,946,678)
12	Miscellaneous Income & Expenses	L	(5,841,599)	(4,636,205)	(13,994,367)	-	-	-	-	-
13	Less: Authority Debt-Related Expenses	M	46,955,124	50,922,893	52,464,728	55,087,965	57,842,363	60,734,481	63,771,205	66,959,766
	Water Supply - Capital-Related Costs									
14	Authority Debt Service - First Resolution (A.)	A x N	20,066,440	17,886,444	9,840,601	15,586,016	23,940,884	18,593,030	24,264,695	15,777,208
15	Anticipated Debt Service - First Resolution	B x N	-	-	-	-	1,826,623	5,645,926	9,631,285	14,114,815
16	Authority Debt Service - Second Resolution (A.)	C x N	151,995,188	150,765,190	163,777,897	171,163,750	182,121,034	190,840,965	187,877,286	195,798,353
17	Anticipated Debt Service - Second Resolution	D x N	-	-	-	873,361	10,273,094	20,873,561	31,842,308	44,042,919
18	Interest on Short-Term Debt	E x O	41,531	62,796	-	-	2,642,250	2,642,250	2,642,250	2,642,250
19	NYS EFC Debt Service	(F+G)xP	39,968,648	48,645,015	51,458,518	51,343,580	51,574,289	39,369,572	41,628,844	45,977,403
	Water Supply - Interest Earnings									
20	Debt Service Fund	H x N	(456,531)	(797,141)	(1,326,748)	-	-	-	(93,659)	-
21	Debt Service Reserve Fund	I x N	(4,759,154)	(3,948,280)	(3,348,703)	(3,121,787)	(2,840,755)	(2,691,304)	(2,646,054)	(2,537,723)
22	Construction Fund	J x O	(30,454)	(132,800)	(1,126,745)	(190,059)	(116,570)	(233,140)	(233,140)	(233,140)
23	Subordinated Debt Service Fund	KxNxP	-	-	-	(258,254)	(387,131)	(837,747)	(863,993)	(923,526)
24	Miscellaneous Income & Expenses	LxNxP	(856,020)	(694,680)	(2,112,907)	-	-	-	-	-
25	Less: Authority Debt-Related Expenses	M x O	7,171,024	7,910,315	8,158,995	8,566,945	8,990,235	9,439,747	9,911,735	10,407,321
26	Net Water Supply Debt Service		213,140,672	219,696,860	225,320,908	243,963,552	278,023,955	283,642,860	303,961,557	325,065,879
			FY 2016	**FY 2017**	**FY 2018**	**FY 2019 (B.)**	**FY 2020-23(C.)**			
27	Upstate Authority $ as a % of Total Authority CI	N	16.63%	16.61%	16.60%	16.60%	16.61%			
28	Upstate Total CIP $ as a % of Total CIP $	O	15.27%	15.53%	15.55%	15.55%	15.54%			
29	Upstate NYS EFC $ as a % of Total NYS EFC C	P	10.10%	11.50%	11.72%	11.72%	11.61%			

(A.) Includes the estimated effects of the proposed FY 2019 defeasance/cash-financed construction in FY 2020 through FY 2023.
(B.) Uses the same percentages as for 2018 since not all proceeds of 2019 bonds were spent as of the date of this report

Table 5D Cash Used for Construction and the Defeasance of Debt

TABLE 5D
New York City Water Board
Cost of Supplying Water to Upstate Customers
Cash Used for Capital Construction and the Defeasance of Debt
All Amounts in $

	Cash Used for Capital Construction/ Defeasance	Cash Used for Capital Construction	Cash Used for the Defeasance of Debt	Upstate CIP as a % of Water/Sewer CIP (1)
FY 2016	948,591,359	0	948,591,359	15.27%
FY 2017	991,951,393	0	991,951,393	15.53%
FY 2018	899,982,803	75,000,000	824,982,803	15.55%
FY 2019	725,000,000	N/A	N/A	15.54%
FY 2020	400,000,000	N/A	N/A	15.54%
FY 2021	400,000,000	N/A	N/A	15.54%
FY 2022	400,000,000	N/A	N/A	15.54%
FY 2023	300,000,000	N/A	N/A	15.54%

	Upstate Portion of Cash Used for Capital Construction/ Defeasance	Upstate Portion of Cash Used for Capital Construction	Upstate Portion of Cash Used for the Defeasance of Debt
FY 2016	144,869,625	0	144,869,625
FY 2017	154,088,807	0	154,088,807
FY 2018	139,959,843	11,663,543	128,296,300
FY 2019	112,684,204	N/A	N/A
FY 2020	62,170,595	N/A	N/A
FY 2021	62,170,595	N/A	N/A
FY 2022	62,170,595	N/A	N/A
FY 2023	46,627,947	N/A	N/A

(1) Upstate CIP % is from Table 5C for FY 2016 - FY 2023.
(2) The amounts shown for FY 2019 through FY 2023 are preliminary and subject to change.

Table 6 Judgments and Claims

TABLE 6
New York City Water Board
Cost of Supplying Water to Upstate Customers
Judgments and Claims

Year	Historical Costs ($)
2004	0
2005	0
2006	0
2007	5,513,361
2008	3,695
2009	26,925
2010	668,221
2011	916,350
2012	240,320
2013	526,166
2014	42,626
2015	126,319
2016	44,517
2017	5,015
2018	9,781
Average (2004-2018)	541,553
Projection Years (2019-2023)	541,553

Note:
The City reached a settlement for the Hillview cover consent order and agreed to pay the Federal Department of Justice a $1 million civil penalt in 2019. This amount has not been incorporated in the projection above.

Table 7 Miscellaneous Revenue

TABLE 7
New York City Water Board
Cost of Supplying Water to Upstate Customers
Miscellaneous Revenue
All Amounts in $

Year	Hydropower	Rents (Permits)	Tax Refunds	Total
2004	1,105,639	1,348,358	50,686	2,504,683
2005	1,396,145	1,788,012	0	3,184,157
2006	1,321,881	2,379,307	0	3,701,188
2007	4,987,041	2,300,515	0	7,287,556
2008	7,239,859	995,209	0	8,235,068
2009	6,086,074	1,800,000	248,145	8,134,219
2010	5,117,222	1,855,183	0	6,972,405
2011	8,299,784	1,568,273	0	9,868,057
2012	4,388,471	2,021,826	0	6,410,297
2013	5,540,899	3,420,571	209,232	9,170,702
2014	10,466,857	1,811,900	0	12,278,757
2015	6,307,979	1,831,585	0	8,139,564
2016	4,981,644	2,438,929	0	7,420,573
2017	4,882,340	2,533,196	0	7,415,536
2018	6,230,775	1,846,973	0	8,077,748
Average (2004-2018)		1,916,486		
Projection Years (2019-2023)				
2019	8,521,214	1,916,486	0	10,437,700
2020	7,598,004	1,916,486	0	9,514,490
2021	7,749,964	1,916,486	0	9,666,450
2022	7,904,964	1,916,486	0	9,821,450
2023	8,063,063	1,916,486	0	9,979,549

Notes:

(1) Certain historical revenues for hydropower and rents have changed from prior reports based on updated information from the City.

(2) FY 2015 hydropower revenue is shown net of expenses. Hydropower revenue in other years and projected hydropower revenue for FY 2019 - FY 2023 excludes expenses which are included in Tables 4A and 4B for those years.

Table 8A Historical Upstate Direct Personal Services Costs

TABLE 8A
New York City Water Board
Historical Cost of Supplying Water to Upstate Customers
Upstate New York Field Personnel Costs

Line No.	Description	FY 2016 $	FY 2017 $	FY 2018 $
	Divisional and Sectional Offices			
1	Katonah Resource Protection	239,340	886,204	459,489
2	Carmel Section	3,760,081	3,674,004	3,586,663
3	Prattsville/Schoharie	2,132,625	2,161,988	2,364,401
4	Ashokan	5,077,095	5,535,102	5,610,535
5	Grahamsville	6,416,680	6,609,719	6,805,407
6	Port Jervis	637,533	656,383	721,838
7	E. Division Hudson River P/S	1,904,628	1,916,619	2,389,184
	Laboratories			
8	Hawthorne (1)	3,065,255	3,306,292	3,311,996
9	Grahamsville	1,380,983	1,447,323	1,401,597
	Other Services			
10	Downsville	3,543,250	3,775,907	3,868,856
11	Sutton Park (2)	8,961,934	9,387,257	8,588,557
12	Kingston	11,154,526	11,437,662	11,724,247
13	Watershed Security (3)	18,389,146	20,925,438	22,794,225
14	Watershed-East of Hudson	4,975,751	3,904,375	4,459,706
15	Downsville/Water Plan and Protect	245,749	239,353	265,906
16	Mahopac	2,131,031	2,251,462	2,300,846
17	IT (4)	141,419	144,934	150,331
18	Hillview Reservoir (5)	7,054,033	6,950,823	6,934,670
19	UV Facility	4,458,077	4,597,144	5,115,014
20	Direct Personnel Overtime Costs	2,746,122	3,932,092	4,236,298
21	Credit for Prior Year Personnel Payments (6)	(8,428,828)		
22	**Total Personal Services Costs**	**79,986,430**	**93,740,081**	**97,089,768**

Notes:

(1) Beginning in FY 2016, the Kensico and Brewster labs were combined and renamed as Hawthorne Lab
(2) Sutton Park expenses include costs for laboratories.
(3) Hillview, Croton, Ashokan, Schoharie, Kingston, Downsville, Neversink, Beerston & other watershed locations.
(4) The employees in the OIT/ BWS group are a part of the Bureau of Water Supply, located north of the City. In prior years, the group was included in personnel service costs for Water Supply but within the City.
(5) Hillview Reservoir costs include overtime expenses, which are not included in Line 20.
(6) Personnel expenses in years prior to FY 2016 included an overpayment of collective bargaining costs. The overpayment covers both direct and indirect personnel; the total overpayment is reflected here in FY 2016 as a one-time credit.
(7) Personal service costs include salary, wages and a fringe benefit rate of 48.1% in FY 2016, 46.75% in FY 2017, and 50.11% in FY
(8) Upward or downward changes from year to year in a particular category of costs may reflect shifts in classifications for accounting purposes as opposed to changes in personnel functions or responsibilities.

Table 8B Projected Upstate Direct Personal Services Costs

TABLE 8B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Upstate New York Field Personnel Costs

Line No.	Description	*Projected Years* FY 2019 $	FY 2020 $	FY 2021 $	FY 2022 $	FY 2023 $
	Divisional and Sectional Offices					
1	Katonah Resource Protection	466,337	480,327	494,737	509,579	524,867
2	Carmel Section	3,640,121	3,749,324	3,861,804	3,977,658	4,096,988
3	Prattsville/Schoharie	2,399,641	2,471,631	2,545,779	2,622,153	2,700,817
4	Ashokan	5,694,157	5,864,982	6,040,931	6,222,159	6,408,824
5	Grahamsville	6,906,838	7,114,043	7,327,464	7,547,288	7,773,707
6	Port Jervis	732,596	754,574	777,211	800,528	824,544
7	E. Division Hudson River P/S	2,424,794	2,497,538	2,572,464	2,649,638	2,729,127
	Laboratories					
8	Hawthorne (1)	3,361,360	3,462,201	3,566,067	3,673,049	3,783,240
9	Grahamsville	1,422,487	1,465,161	1,509,116	1,554,390	1,601,021
	Other Services					
10	Downsville	3,926,519	4,044,315	4,165,644	4,290,614	4,419,332
11	Sutton Park (2)	8,716,564	8,978,061	9,247,403	9,524,825	9,810,570
12	Kingston	11,898,990	12,255,959	12,623,638	13,002,347	13,392,418
13	Watershed Security (3)	23,133,959	23,827,978	24,542,817	25,279,102	26,037,475
14	Watershed-East of Hudson	4,526,176	4,661,961	4,801,820	4,945,874	5,094,251
15	Downsville/Water Plan and Protect	269,869	277,966	286,305	294,894	303,740
16	Mahopac	2,335,139	2,405,193	2,477,349	2,551,669	2,628,219
17	IT (4)	152,572	157,149	161,864	166,719	171,721
18	Hillview Reservoir (5)	7,038,027	7,249,168	7,466,643	7,690,642	7,921,361
19	UV Facility	5,191,251	5,346,988	5,507,398	5,672,620	5,842,798
20	Direct Personnel Overtime Costs	4,299,438	4,428,421	4,561,274	4,698,112	4,839,055
21	**Total Personal Services Costs**	**98,536,833**	**101,492,938**	**104,537,727**	**107,673,858**	**110,904,074**

Notes:

(1) Beginning in FY 2016, the Kensico and Brewster labs were combined and renamed as Hawthorne Lab
(2) Sutton Park expenses include costs for laboratories.
(3) Hillview, Croton, Ashokan, Schoharie, Kingston, Downsville, Neversink, Beerston & other watershed locations.
(4) The employees in the OIT/ BWS group are a part of the Bureau of Water Supply, located north of the City. In prior years, the group was included in personnel service costs for Water Supply but within the City.
(5) Hillview Reservoir costs include overtime expenses, which are not included in Line 20.
(6) Personal service costs include an assumed fringe benefit rate of 47.91% in FY 2019- FY 2023.
(7) It is assumed that personal services costs will increase 3.0% per year in FY 2019 - FY 2023, exclusive of changes in the fringe benefit rate.
(8) Upward or downward changes from year to year in a particular category of costs may reflect shifts in classifications for accounting purposes as opposed to changes in personal functions or responsibilities.

Table 9A Historical Upstate Indirect Personal Services Costs

TABLE 9A
New York City Water Board
Historical Cost of Supplying Water to Upstate Customers
Upstate New York Support & Administrative Personnel Costs

Line No.	Description	FY 2016 $	FY 2017 $	FY 2018 $
	Divisional and Sectional Offices			
1	Katonah Resource Protection	532,300	392,632	415,032
2	Carmel Section	92,613	95,352	100,317
3	Ashokan	348,716	280,557	258,772
4	Grahamsville	2,203,558	2,351,956	2,380,239
5	E. Division Hudson River P/S	176,993	182,786	187,107
	Laboratories			
6	Hawthorne (1)	683,549	551,381	793,641
7	Grahamsville	311,820	317,948	331,429
	Other Services			
8	Downsville	286,875	148,623	308,411
9	Sutton Park (2)	5,209,405	6,270,814	6,397,648
10	Kingston Office	6,091,751	6,616,519	6,892,334
11	Watershed Security (3)	1,656,658	1,871,967	1,943,881
12	East of Hudson Fleet	184,680	180,424	291,788
13	Shokan Fleet Admin.	358,088	308,408	413,494
14	Downsville Fleet Admin.	113,326	114,274	127,456
15	Grahmsville Fleet Admin.	223,741	370,724	397,084
16	Watershed-East of Hudson	379,806	3,772	0
17	IT (4)	1,525,641	1,588,894	1,643,252
18	Other	2,393	3,772	5,464
19	UV Facility	328,536	554,436	835,681
20	Indirect Personnel Overtime Costs	535,273	684,568	469,010
21	**Total Personal Services Costs**	**21,245,719**	**22,889,807**	**24,192,038**

Notes:

(1) Beginning in FY 2016, the Kensico and Brewster labs were combined and renamed as Hawthorne Lab
(2) Sutton Park expenses include costs for laboratories.
(3) Hillview, Croton, Ashokan, Schoharie, Kingston, Downsville, Neversink, Beerston & other watershed locations.
(4) The employees in the OIT/ BWS group are a part of the Bureau of Water Supply, located north of the City. In prior years, the group was included in personnel service costs for Water Supply but within the City.
(5) Personal service costs include salary, wages & fringe benefit rates of 48.1% in FY 2016, 46.75% in FY 2017, and 50.11% in FY 2018.
(6) Upward or downward changes from year to year in a particular category of costs may reflect shifts in classifications for accounting purposes as opposed to changes in personal functions or responsibilities.

Table 9B Projected Upstate Indirect Personal Services Costs

TABLE 9B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Upstate New York Support & Administrative Personnel Costs

Line No.	Description	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
			Projected Years			
		$	$	$	$	$
	Divisional and Sectional Offices					
1	Katonah Resource Protection	421,218	433,854	446,870	460,276	474,084
2	Carmel Section	101,812	104,866	108,012	111,253	114,590
3	Ashokan	262,629	270,508	278,623	286,981	295,591
4	Grahamsville	2,415,715	2,488,186	2,562,832	2,639,717	2,718,908
5	E. Division Hudson River P/S	189,896	195,593	201,460	207,504	213,729
	Laboratories					
6	Hawthorne (1)	805,470	829,634	854,523	880,159	906,563
7	Grahamsville	336,369	346,460	356,853	367,559	378,586
	Other Services					
8	Downsville	313,008	322,398	332,070	342,032	352,293
9	Sutton Park (2)	6,493,001	6,687,791	6,888,425	7,095,078	7,307,930
10	Kingston Office	6,995,060	7,204,912	7,421,059	7,643,691	7,873,001
11	Watershed Security (3)	1,972,853	2,032,038	2,093,000	2,155,790	2,220,463
12	East of Hudson Fleet	296,137	305,021	314,171	323,596	333,304
13	Ashokan Fleet Admin.	419,656	432,246	445,214	458,570	472,327
14	Downsville Fleet Admin.	129,356	133,237	137,234	141,351	145,591
15	Grahmsville Fleet Admin.	403,003	415,093	427,546	440,372	453,583
16	Watershed-East of Hudson	0	0	0	0	0
17	IT (4)	1,667,744	1,717,776	1,769,309	1,822,388	1,877,060
18	Other	5,545	5,712	5,883	6,060	6,241
19	UV Facility	848,136	873,580	899,787	926,781	954,584
20	Indirect Personnel Overtime Costs	476,000	490,280	504,988	520,138	535,742
21	**Total Personal Services Costs**	**24,552,605**	**25,289,184**	**26,047,859**	**26,829,295**	**27,634,174**

Notes:

(1) Beginning in FY 2016, the Kensico and Brewster labs were combined and renamed as Hawthorne Lab
(2) Sutton Park expenses include costs for laboratories.
(3) Hillview, Croton, Ashokan, Schoharie, Kingston, Downsville, Neversink, Beerston & other watershed locations.
(4) The employees in the OIT/ BWS group are a part of the Bureau of Water Supply, located north of the City. In prior years, the group was included in personnel service costs for Water Supply but within the City.
(5) Personal service costs include an assumed fringe benefit rate of 47.91% in FY 2019- FY 2023.
(6) It is assumed that personal services costs will increase 3.0% per year in FY 2019 - FY 2023, exclusive of changes in the fringe benefit rate.
(7) Upward or downward changes from year to year in a particular category of costs may reflect shifts in classifications for accounting purposes as opposed to changes in personal functions or responsibilities.

Table 10 Development of Allocation Factors

TABLE 10
New York City Water Board
Cost of Supplying Water to Upstate Customers
Development of Allocation Factors

Line No.	Description	2016		2017		2018		Projection Years
1	Total Salaries - Employees North of the City	99,325,550		105,062,405		109,641,828		
2		---------- =	56.93%	---------- =	57.23%	---------- =	56.95%	56.95%
3	Total Salaries - All Water Supply Employees	174,462,966		183,570,788		192,514,956		
4	Total Salaries - Employees North of the City	99,325,550		105,062,405		109,641,828		
5		---------- =	17.29%	---------- =	17.60%	---------- =	17.24%	17.24%
6	Total Salaries - All NYC DEP Employees	574,452,759		596,866,547		636,153,473		

(1) The Total Salaries exclude salaries, wages and fringe benefits for personnel assigned to Hurricane Sandy and Grant Programs.
(2) The Total Salaries - Employees North of the City on Line 1 excludes salaries for employees at the Hillview facility. The Water Board may, at its discretion, add such costs to Line 1.

Table 11A Historical Allocation of DEP Personal Services Costs

TABLE 11A
New York City Water Board
Cost of Supplying Water to Upstate Customers
Historical Allocation of DEP Personal Services
Costs to Facilities North of the City

Line No.	Description	FY 2016 $	FY 2017 $	FY 2018 $
1	Executive	9,141,999	8,936,175	9,273,742
2	General Counsel	4,552,552	5,929,242	5,983,708
3	Communications	3,280,115	2,227,151	2,577,317
4	Env. Health & Safety	3,615,327	3,825,977	4,086,009
5	Environ. Planning	6,372,222	6,472,643	6,334,680
6	Budget Office	3,652,964	3,671,079	3,480,251
7	Facilities Mgt & Constr	6,612,863	6,500,472	7,094,520
8	Human Res & Labor Rel	8,762,484	10,028,807	10,969,212
9	Chief Contract Office	2,466,118	3,688,841	3,653,462
10	Addt'l Exec & Support	1,648,183	2,074,396	2,168,467
11	Total DEP Executive and Support Personal Services Costs	50,104,827	53,354,783	55,621,367
12	Allocation to Water Supply North of NYC (1)	17.29%	17.60%	17.24%
13	**Personal Services Costs Related to Facilities North of the City**	**8,663,357**	**9,391,684**	**9,586,411**

Notes:
(1) From Table 10.
(2) Personal service costs include salary and a fringe benefit rate of 48.1% in FY 2016, 46.75% in FY 2017, and 50.11% in FY 2018.

Table 11B Projected Allocation of DEP Personal Services Costs

TABLE 11B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Projected Allocation of DEP Personal Services
Costs to Facilities North of the City

Line No.	Description	*Projected Years* FY 2019 $	FY 2020 $	FY 2021 $	FY 2022 $	FY 2023 $
1	Executive	9,411,962	9,694,321	9,985,150	10,284,705	10,593,246
2	General Counsel	6,072,891	6,255,078	6,442,731	6,636,012	6,835,093
3	Public Affairs	2,615,730	2,694,202	2,775,028	2,858,279	2,944,027
4	Env. Health & Safety	4,146,908	4,271,316	4,399,455	4,531,439	4,667,382
5	Environ. Planning	6,429,095	6,621,968	6,820,627	7,025,245	7,236,003
6	Budget Office	3,532,122	3,638,086	3,747,229	3,859,645	3,975,435
7	Facilities Mgt & Constr	7,200,259	7,416,267	7,638,755	7,867,918	8,103,955
8	Human Res & Labor Rel	11,132,701	11,466,682	11,810,683	12,165,003	12,529,953
9	Chief Contract Office	3,707,914	3,819,152	3,933,726	4,051,738	4,173,290
10	Addt'l Exec & Support	2,200,787	2,266,811	2,334,815	2,404,859	2,477,005
11	Total DEP Personal Services Costs	56,450,370	58,143,881	59,888,198	61,684,844	63,535,389
12	Allocation to Water Supply North of NYC (1)	17.24%	17.24%	17.24%	17.24%	17.24%
13	**Personal Services Costs - Facilities North of the City**	**9,729,290**	**10,021,169**	**10,321,804**	**10,631,458**	**10,950,402**

Notes:
(1) From Table 10, Projection Years.
(2) Personal service costs include a fringe benefit rate of 47.91% in FY 2019 - FY 2023.
(3) It is assumed that personal services costs will increase 3.0% per year in FY 2019 - FY 2023, exclusive of changes in the fringe benefit rate.
(4) Upward or downward changes from year to year in a particular category of costs may reflect shifts in classifications for accounting purposes as opposed to changes in personal functions or responsibilities.

Table 12A Historical Allocation of DEP Other Than Personal Services Costs

TABLE 12A
New York City Water Board
Historical Cost of Supplying Water to Upstate Customers
Allocation of DEP Other Than Personal Services
Costs to Facilities North of the City

Line No.	Description	FY 2016 $	FY 2017 $	FY 2018 $
1	Accounting	74,564	73,500	74,874
2	Executive and Support	105,542	65,626	47,122
3	Fleet Administration	10,120,306	9,138,509	7,949,020
4	Public Affairs	459,719	348,023	248,068
5	Facilities Management and Construction	772,206	712,236	778,283
6	Management and Budget	3,636,765	3,635,922	3,622,221
7	Management Information Systems	11,569,281	11,894,476	14,805,019
8	Chief Engineer	29,678	277,324	690,288
9	Legal	51,105	70,008	81,207
10	Environmental Assessment	862,181	2,551,990	2,702,413
11	Telephone	7,114,635	6,415,502	6,793,817
12	Lefrak Administration Rents	5,283,948	5,313,717	5,467,595
13	Facility Management Rents	491,757	516,487	532,782
14	Management and Budget Environmental Health/Safety	329,101	321,614	328,303
15	Security Services	1,528,108	1,539,371	1,698,157
16	DEP Online Store	(4,718)	23,124	(5,689)
17	PC Purchasing Consolidation Administration	118,986	120,091	153,824
18	LeFrak Carpet Installation (1)	310,561	(310,561)	0
19	Total OTPS to be Allocated	42,853,725	42,706,956	45,967,304
20	Allocation (2)	17.29%	17.60%	17.24%
21	OTPS Allocation (line 19 X line 20)	7,409,608	7,517,418	7,922,521
22	Rents Other Than Lefrak	2,724,975	2,665,434	3,013,453
23	Lefrak Water Supply Rents	1,914,777	1,682,904	1,673,035
24	Total Rents (line 22 + line 23)	4,639,753	4,348,338	4,686,489
25	Motor Vehicle Parking	396,750	396,750	442,438
26	Allocation in Each Year	24.02%	25.97%	26.46%
27	Total Motor Vehicle Parking (line 25 X line 26)	95,308	103,023	117,051
28	Rent & Motor Vehicles Costs Allocated to Water Supply at DEP (3)	4,735,061	4,451,361	4,803,540
29	Allocation to Facilities North of NYC (2)	56.93%	57.23%	56.95%
30	Rent & Motor Vehicles Costs Related to Facilities North of the City (4)	2,695,773	2,547,631	2,735,730
31	**OTPS Costs Related to Facilities North of the City (5)**	**10,105,381**	**10,065,050**	**10,658,251**

Notes:
(1) LeFrak carpet installation costs are reimbursed.
(2) From Table 10.
(3) Rent & motor vehicles costs allocated to Water Supply are equal to the sum of lines 24 and 27.
(4) Rent & motor vehicles costs allocated to north of the City are equal to line 28 X line 29.
(5) OTPS costs related to facilities north of the City are equal to sum of lines 21 and 30.

Table 12B Projected Allocation of DEP Other Than Personal Services Costs

TABLE 12B
New York City Water Board
Cost of Supplying Water to Upstate Customers
Allocation of DEP Other Than Personal Services
Costs to Facilities North of the City

Line No.	Description	*Projected Years* FY 2019 $	FY 2020 $	FY 2021 $	FY 2022 $	FY 2023 $
1	Accounting	77,121	79,434	81,817	84,272	86,800
2	Executive and Support	48,536	49,992	51,491	53,036	54,627
3	Fleet Administration	8,187,491	8,433,115	8,686,109	8,946,692	9,215,093
4	Public Affairs	255,510	263,175	271,070	279,202	287,578
5	Facilities Management and Construction	801,632	825,681	850,451	875,965	902,244
6	Management and Budget	3,730,888	3,842,814	3,958,099	4,076,842	4,199,147
7	Management Information Systems	15,249,170	15,706,645	16,177,844	16,663,180	17,163,075
8	Chief Engineer	710,997	732,327	754,297	776,926	800,234
9	Legal	83,643	86,152	88,737	91,399	94,141
10	Environmental Assessment	2,783,485	2,866,990	2,952,999	3,041,589	3,132,837
11	Telephone	6,997,631	7,207,560	7,423,787	7,646,501	7,875,896
12	Lefrak Administration Rents	5,631,623	5,800,572	5,974,589	6,153,827	6,338,442
13	Facility Management Rents	548,765	565,228	582,185	599,651	617,640
14	Management and Budget Environmental Health/Safety	338,152	348,297	358,746	369,508	380,593
15	Security Services	1,749,102	1,801,575	1,855,622	1,911,291	1,968,629
16	DEP Online Store	0	0	0	0	0
17	PC Purchasing Consolidation Administration	158,439	163,192	168,088	173,130	178,324
18	LeFrak Carpet Installation	0	0	0	0	0
19	Total OTPS to be Allocated	47,352,184	48,772,749	50,235,932	51,743,009	53,295,300
20	Allocation (1)	17.24%	17.24%	17.24%	17.24%	17.24%
21	OTPS Allocation (line 19 X line 20)	8,161,207	8,406,043	8,658,224	8,917,971	9,185,510
22	Rents Other Than Lefrak	3,103,857	3,196,973	3,292,882	3,391,668	3,493,418
23	Lefrak Water Supply Rents	1,723,227	1,774,923	1,828,171	1,883,016	1,939,507
24	Total Rents (line 22 + line 23)	4,827,084	4,971,896	5,121,053	5,274,684	5,432,925
25	Motor Vehicle Parking	455,711	469,382	483,463	497,967	512,906
26	Allocation	26.46%	26.46%	26.46%	26.46%	26.46%
27	Total Motor Vehicle Parking (line 25 X line 26)	120,563	124,179	127,905	131,742	135,694
28	Rent & Motor Vehicles Costs Allocated to Water Supply at DEP (2)	4,947,646	5,096,075	5,248,958	5,406,426	5,568,619
29	Allocation to Facilities North of NYC (1)	56.95%	56.95%	56.95%	56.95%	56.95%
30	Rent & Motor Vehicles Costs Related to Facilities North of the City (3)	2,817,802	2,902,336	2,989,406	3,079,088	3,171,461
31	**OTPS Costs Related to Facilities North of the City (4)**	**10,979,008**	**11,308,379**	**11,647,630**	**11,997,059**	**12,356,971**

Notes:
(1) From Table 10, Projection Years.
(2) Rent & motor vehicles costs allocated to Water Supply are equal to the sum of lines 24 and 27.
(3) Rent & motor vehicles costs allocated to north of the City are equal to line 28 X line 29.
(4) OTPS costs related to facilities north of the City are equal to sum of lines 21 and 30.
(5) It is assumed that OTPS costs, other than Lefrak carpet installation, will increase at the rate of 3% per annum.

Table 13 Annual Water Consumption

TABLE 13
New York City Water Board
Cost of Supplying Water to Upstate Customers
Annual Water Consumption

Line No.	Fiscal Year	(A) System-Wide Consumption mg	(B) Upstate Consumption mg	Upstate as a % of Total [B]/[A]
1	1985	544,025	41,661	7.66%
2	1986	501,019	39,397	7.86%
3	1987	542,870	42,853	7.89%
4	1988	573,679	44,956	7.84%
5	1989	559,669	43,255	7.73%
6	1990	547,522	42,795	7.82%
7	1991	564,234	45,103	7.99%
8	1992	560,014	44,010	7.86%
9	1993	531,796	42,015	7.90%
10	1994	538,558	43,221	8.03%
11	1995	520,410	43,915	8.44%
12	1996	528,938	45,125	8.53%
13	1997	487,012	44,044	9.04%
14	1998	483,182	44,404	9.19%
15	1999	499,849	47,230	9.45%
16	2000	502,758	46,922	9.33%
17	2001	488,909	45,845	9.38%
18	2002	467,705	45,200	9.66%
19	2003	449,606	43,400	9.65%
20	2004	446,822	43,198	9.67%
21	2005	443,445	43,072	9.71%
22	2006	441,477	44,504	10.08%
23	2007	444,553	43,895	9.87%
24	2008	452,048	43,559	9.64%
25	2009	420,438	41,477	9.87%
26	2010	411,482	40,797	9.91%
27	2011	420,635	42,682	10.15%
28	2012	408,954	39,713	9.71%
29	2013	410,006	40,143	9.79%
30	2014	407,436	40,485	9.94%
31	2015	406,815	40,745	10.02%
32	2016	405,876	40,878	10.07%
33	2017	405,883	41,342	10.19%
34	2018	406,551	40,129	9.87%
Projections:				
35	2019	405,701	40,681	10.03%
36	2020	405,431	40,669	10.03%
37	2021	405,161	40,658	10.03%
38	2022	404,890	40,646	10.04%
39	2023	404,620	40,634	10.04%

Notes:

(1) Consumption projections are based on a 5-year regression analysis.

(2) Equation used to calculate System-wide Consumption:
y=m(t)+b. Where (t) is a given year.
m= -270.3041427
b= 951,445.32

(3) Equation used to calculate Upstate Consumption:
y=m(t)+b. Where (t) is a given year.
m= -11.60
b= 64,109.68

Table 14 Projected Revenues From Hydroelectric Facilities

Table 14

NYC Department of Environmental Protection
Gross Revenue Estimates for Upstate Hydro-Electric Facilities
All Amounts in $

Revenues	Fiscal Year 2019	2020	2021	2022	2023
Neversink	3,290,814	3,014,641	3,074,934	3,136,433	3,199,161
West Delaware	28,931	29,510	30,100	30,702	31,316
East Delaware	5,201,468	4,553,853	4,644,930	4,737,829	4,832,585
Summary	8,521,214	7,598,004	7,749,964	7,904,964	8,063,063

Notes:

(1) All figures for Neversink and East Delaware are based on 2018 results reported by the New York City Office of the Comptroller, adjusted for inflation in subsequent years at the rate of 2% per year.

(2) Calendar year revenue data is used to estimate the fiscal year revenue when the fiscal year data is not available at the time of this Report.

(3) April and May 2018 invoices were processed for 2019 instead of 2019. Projections above have been adjusted.

Table 15 Comparison of Upstate Customer Billings vs. Cost of Service

TABLE 15
New York City Water Board
Cost of Supplying Water to Upstate Customers
Cost-of-Service Reconciliation

Fiscal Year	Rate ($) per Million Gallons (MG) Billed to Upstate Customers	Computed Cost to the Board	Upstate Consumption (MG)	Total Billed ($)	Actual Cost ($)	Underpayment ($)
1998	274.93	338.79	44,404	12,208,047	15,043,699	2,835,652
1999	342.97	348.31	47,230	16,198,439	16,450,646	252,208
2000	383.78	385.25	46,922	18,007,764	18,076,739	68,975
2001	414.37	414.88	45,845	18,996,834	19,020,215	23,381
2002	448.83	462.24	45,200	20,287,116	20,893,248	606,132
2003 (a)	485.71	522.99	43,400	21,079,814	22,697,766	1,617,952
2004 (a)	542.36	529.85	43,198	23,428,650	22,888,248	-540,402
2005	591.21	591.91	43,072	25,464,774	25,494,925	30,151
2006	617.79	623.47	44,504	27,494,064	27,746,847	252,782
2007	691.91	691.83	43,895	30,371,597	30,368,104	-3,493
2008	798.62	703.73	43,559	34,786,978	30,653,783	-4,133,195
2009	900.31	882.91	41,477	37,342,472	36,620,683	-721,789
2010	922.23	973.86	40,797	37,624,046	39,730,509	2,106,464
2011	1,149.72	1,121.04	42,682	49,072,562	47,848,489	-1,224,073
2012	1,213.84	1,283.45	39,713	48,205,540	50,970,046	2,764,506
2013	1,332.30	1,389.42	40,143	53,482,864	55,775,883	2,293,019
2014	1,496.76	1,604.43	40,485	60,596,628	64,955,593	4,358,965
2015	1,573.61	1,670.85	40,745	64,116,572	68,078,546	3,961,974
2016	1,728.99	1,769.49	40,878	70,677,331	72,332,828	1,655,497
2017	1,728.99	1,862.60	41,342	71,480,283	77,004,051	5,523,768
2018	1,728.99	1,846.08	40,129	69,381,804	74,080,477	4,698,673
			Total Underpayment 1998-2018			26,427,146
			Total Underpayment 2009-2018			25,417,004

(a)The computed cost to the Board as shown above for 2003 and 2004 does not take into consideration the upstate share of the costs of defeasance of certain Authority bonds. Including the effects of the cost of defeasance, the rate per million gallons is $549.32 in 2003 and $560.58 in 2004.

(b)The rates shown above include the costs of defeasance, where applicable.

(c) The table above does not take into account the application of credits or charges to the cost of service based on prior year reconciliations.