WATER CONSERVATION REPORT

June 2017 Annual Update

NYC Environmental Protection

Bill de Blasio
Mayor
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Acting Commissioner

TABLE OF CONTENTS

INTRODUCTION

New Croton Dam

DEP values the role of water conservation and demand management in the responsible long-term management of New York City's water supply. As a result, water demand is down more than 30% since the 1990s, despite consistent increases in population (Figure 1). With predictions of warmer temperatures and greater variability in precipitation due to climate change, however, DEP must consider this increasing uncertainty in the management of the City's water supply and the corresponding demand. Further, the leaking Delaware Aqueduct and its planned shutdown and repair in 2022 as part of DEP's Water for the Future Program is a known, near-term event that creates an imperative to proactively manage and explicitly reduce existing water demand to ensure adequate water supply through this period.

DEP's Water Demand Management Program is in its fifth full year of implementation. DEP continues to make progress with reducing water demand through establishing partnerships and completing multiyear projects that will continue to reduce water consumption in the future.

To date, DEP completed numerous water challenges with non-residential customers, launched the Toilet Replacement Program, began drafting demand management plans with wholesale customers, and retrofitted more than 400 buildings and 32,000 fixtures throughout the City.

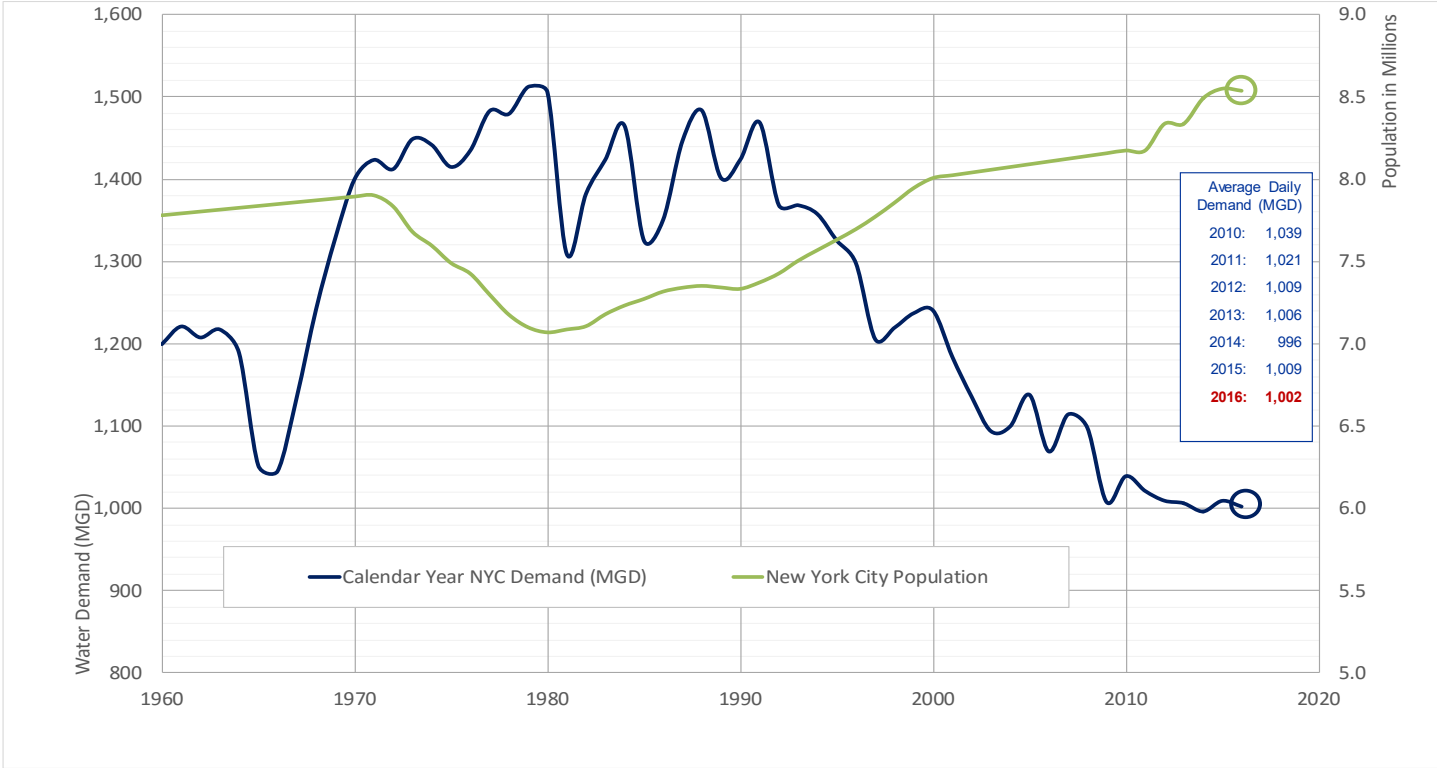
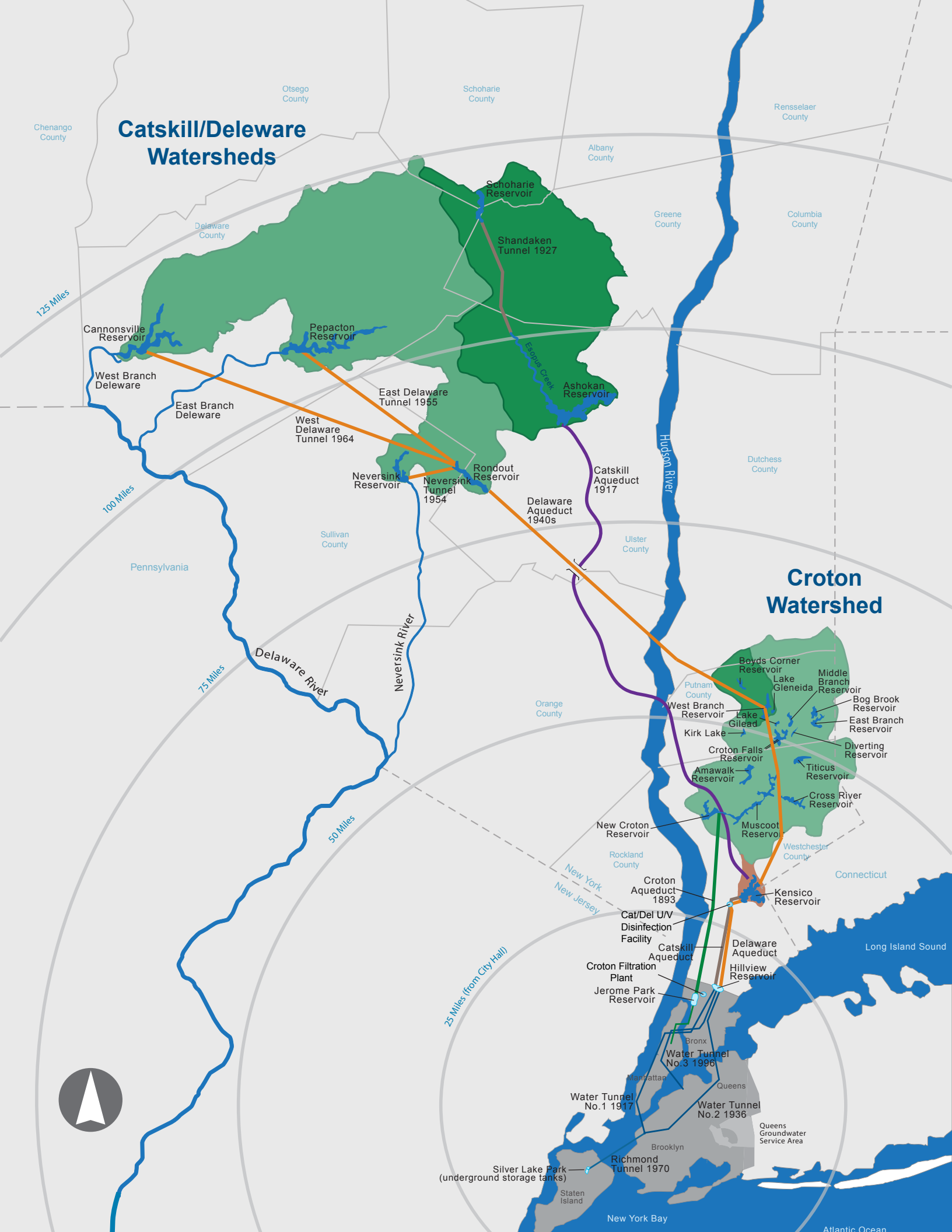


Figure 1: Timeline showing historical water demand and New York City population growth. The six most recent years are highlighted.


Catskill/Deleware Watersheds
Croton Watershed
Otsego County
Schoharie County
Rensselaer County
Chenango County
Albany County
Delaware County
Greene County
Columbia County
Schoharie Reservoir
Shandaken Tunnel 1927
125 Miles
Cannonsville Reservoir
Pepacton Reservoir
Esopus Creek
Ashokan Reservoir
West Branch Deleware
East Delaware Tunnel 1955
East Branch Deleware
West Delaware Tunnel 1964
Hudson River
Dutchess County
Neversink Reservoir
Neversink Tunnel 1954
Rondout Reservoir
Catskill Aqueduct 1917
Delaware Aqueduct 1940s
100 Miles
Sullivan County
Ulster County
Pennsylvania
Neversink River
Delaware River
75 Miles
Putnam County
Orange County
Boyds Corner Reservoir
Lake Gleneida
Middle Branch Reservoir
Bog Brook Reservoir
West Branch Reservoir
Lake Gilead
East Branch Reservoir
Kirk Lake
Diverting Reservoir
Croton Falls Reservoir
Titicus Reservoir
Amawalk Reservoir
Cross River Reservoir
New Croton Reservoir
Muscoot Reservoir
50 Miles
Rockland County
Westchester County
Connecticut
New York
New Jersey
Croton Aqueduct 1893
Kensico Reservoir
Cat/Del U/V Disinfection Facility
Catskill Aqueduct
Delaware Aqueduct
Croton Filtration Plant
Hillview Reservoir
Jerome Park Reservoir
25 Miles (from City Hall)
Long Island Sound
Bronx
Water Tunnel No.3 1996
Manhattan
Queens
Water Tunnel No.1 1917
Water Tunnel No.2 1936
Queens Groundwater Service Area
Brooklyn
Richmond Tunnel 1970
Silver Lake Park (underground storage tanks)
Staten Island
New York Bay
Atlantic Ocean

Tottenville High School in Staten Island

STRATEGY 1

MUNICIPAL WATER EFFICIENCY PROGRAM

Under the Municipal Water Efficiency Program, DEP continues to upgrade city infrastructure and reduce water demand. Several of the individual programmatic initiatives will reach completion by summer 2017.

DEP has made significant progress in advancing water efficiency projects in partnership with municipal agencies, including the Department of Parks and Recreation (DPR), Department of Education (DOE), the Fire Department of New York (FDNY), and the City University of New York (CUNY). DEP has also advanced conservation projects at its wastewater treatment plant facilities. Currently, DEP is completing a study to identify additional municipal conservation projects, partnership opportunities, and demand savings. The study will expand the Municipal Water Efficiency Program and is expected to be completed in June 2017.

DEP will continue to advance wide-ranging efforts that incorporate water efficiency retrofits, education, curriculum development, metering, and water benchmarking to ensure permanent municipal water savings.

Initiative 1: Save Water in Wastewater Treatment Facilities

In January 2017, DEP completed its third Commissioner's Water Challenge with three participating plants: Red Hook, Tallman Island, and Rockaway. Tallman Island won the challenge, with a consumption reduction of 11%, or 15,000 gallons per day. DEP staff at Tallman Island achieved their savings in a unique way, as described in the Case Study on page 7.

In 2016, DEP purchased a new mechanical and pump seal system for the Port Richmond Wastewater Treatment Plant. DEP will continue to monitor this investment and the associated water savings to evaluate if the same system could be implemented at other plants.

DEP will launch its fourth Commissioner's Water Challenge with DEP's four remaining plants in summer 2017. At the completion of the fourth challenge, a fifth challenge that will encourage all 14 plants to reduce demand by 5% will be launched in 2019.

DEP continues to consistently track metered data and long-term trends for all 14 wastewater treatment plants, to ensure that reductions continue after Water Challenge participation. See Figure 2 for updated standard operating proecedures at DEP's wastewater treatment plants.

Standard Operating Procedure on City and Effluent Water Use

1. Meters - City Water

- Record water consumption on a weekly basis and compare to Automated Meter Readings by logging onto "My DEP Account". If there are discrepancies or if the meter(s) appear to be malfunctioning, contact John Sexton, Chief, Energy Analysis & Planning Section.

2. Leaks – City Water

- Immediately isolate and repair in-house or submit Work Request to Engineering.

3. Effluent Water Strainer System

- Clean strainer basket once per day.
- If system is malfunctioning, repair leaks in-house or submit Work Request to engineering.
- Develop maintenance plans and schedules for effluent water pumps. Maintain the effluent water pumps in accordance with the developed plans and schedules and keep an inventory of spares.

4. Pump Packing – Use of Mechanical Seals

- Mechanical seals are only to be used on MSPs and effluent water pumps. They are only to be used in these type pumps if the application meets all applicable manufacturer's criteria. This applies to new pump purchases and when transitioning from traditional packing to mechanical seals.

5. Use of Effluent Water* instead of City Water

- Use effluent water instead of city water in the applications listed below.
- If an application could be sensitive to the use of effluent water instead of city water, contact the Energy Analysis & Planning Section for further evaluation.

MSPs	Ring Flush Water
Foam Control	Aeration Tanks
	Thickeners
	Final Tanks
	Chlorlorine Contact Tanks
Cooling Water	Blowers
	Engines
	Heat Exchangers
	Centrifuges
	AC Chillers
	AC Condensers

Dilution/Mixing	Hypochlorite
	Polymer
Cleaning/Washing	Tanks
Miscellaneous	Grit Washing
	Grit Suspension
	Agitation Water
	Balance Water (Thickeners)
	Flushing (Centrifuges)
	Blockage Removal in Pipes

* For cleaning/washing, utilize effluent water only if there will be no human contact with the surfaces after they have been cleaned with effluent water.

6. Use of City Water

- Do not use city water to freshen up tanks.
- When using any type of hose for washing down areas where city water must be used, a low flow nozzle should be utilized.

NYC Environmental Protection

Commissioner's Water Challenge

Figure 2: Standard Operating Procedures for DEP's wastewater treatment plants

Case Study: Reuse at Tallman Island

During the development of the Water Demand Management Plan, DEP worked to identify large capital projects that would spur water savings at wastewater treatment plants. As part of the third Commissioner's Water Challenge, additional effort was made to work with operations staff to identify water efficiency opportunities that stretch beyond wastewater treatment processes.

Tallman Island discovered an interesting way to reuse water, in an effort to decrease onsite potable water demand. Operations staff recognized that the blower cooling system was discharging water, and worked to improve flow balancing between seal skids and the cooling water tank (Figure 3). The plant now recycles 100% of the cooling water discharge, thus achieving a reduction of 11,000 gallons per day, or an estimated 4 million gallons per year. The work was completed in-house at minimal cost.

Figure 3: New equipment allows water to be recycled rather than discharged

Initiative 2: Save Water in Schools

DEP's partnership with the Department of Education (DOE) has been very successful. Since 2012, 310 school buildings have been retrofitted, accounting for approximately 28,600 fixture replacements (Figure 4). DEP is on track to save the estimated 3.8 MGD for this initiative, as outlined in the Water Demand Management Plan.

In Fiscal Year 2017, DEP replaced 4,300 toilets and 1,300 urinals in 80 schools. For Fiscal Year 2018, DEP plans to retrofit 80 schools and has completed fixture surveys to begin work in summer 2017. Through this anticipated work, DEP will replace approximately 3,900 toilets and 1,100 urinals (Figures 5 and 6).

Where possible, DEP continues to install meters and Automated Meter Reading (AMR) devices in retrofitted schools. Several pilot schools that were metered prior to being retrofitted showed a water use reduction of up to 60%. DEP continues to track this data and is working toward sharing the results with educators, sustainability coordinators, and custodians.

DEP and DOE expanded their partnership in 2015 when DEP co-sponsored DOE's grant proposal for the National Wildlife Federation Eco Schools Program. The grant program places sustainability coordinators at participating schools who show students how to reduce energy and consumption.

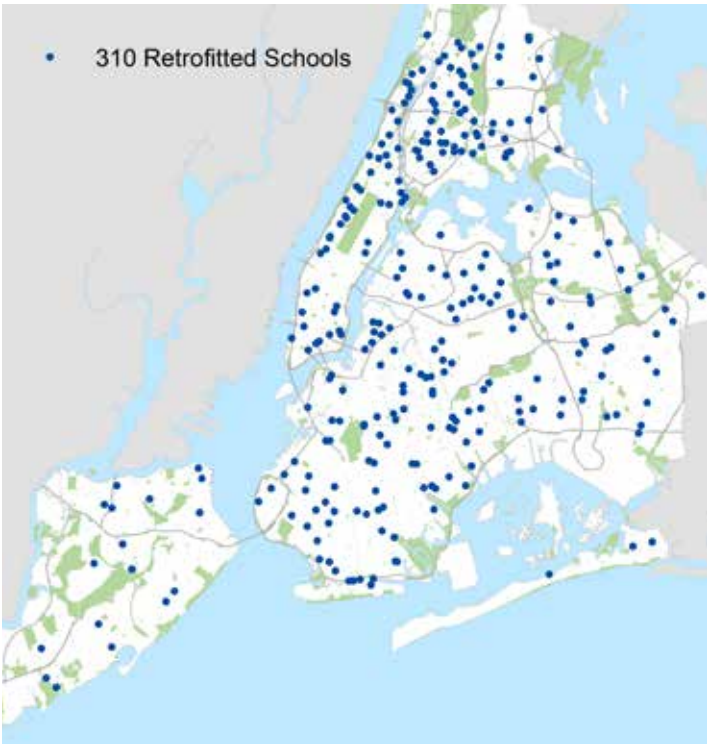


Figure 4: DOE schools retrofitted to date

Figure 5: Retrofitted urinals at P.S.1 in Staten Island

As co-sponsor of the grant, DEP metered and replaced water fixtures at schools included in the grant application. In May 2017, these schools were honored by the National Wildlife Federation by achieving gold star status, the highest award given for sustainability in the Eco Schools Program.

Figure 6: New fixture at I.S. 7 Staten Island

Case Study: Reuse of Discarded Porcelain

The Municipal Water Efficiency Program began in 2012 with four retrofit pilot projects at two schools and two playgrounds. As the program expanded, DEP began replacing old, inefficient toilets with high efficiency models at 100 schools per year. DEP realized that this would create a large waste stream of discarded porcelain and, as outlined in the Water Demand Management Plan, porcelain can be reused.

An opportunity for porcelain reuse was presented when DEP's Office of Ecological Services was awarded a grant in January 2014 to build an artificial oyster reef in Jamaica Bay. DEP discovered that the porcelain, when properly processed, could be used instead of oyster shells to build the artificial reef. As the first step in the reuse process, DEP partnered with Department of Education (DOE) contractors and a management team to generate a recycling plan. The contractors transported the old fixtures back to their warehouse, broke down and washed the porcelain to specifications, and delivered the crushed porcelain to Fountain Avenue Landfill in Brooklyn for storage. Between July 2015 and March 2016, roughly 6,500 fixtures were recycled, crushed, and stored. The crushed porcelain, roughly 125 cubic yards, was then transferred to a barge in Jamaica Bay and installed as part of the artificial oyster reef.

The project was featured in a September 2016 New York Times article, highlighting DEP's ecological restoration and water conservation efforts (Figure 7). With the success of the project, DEP continues to recycle and reuse crushed porcelain. Working with DEP's Office of Green Infrastructure, crushed porcelain is used in place of crushed stone in some rain gardens (Figure 8). To date, four rain gardens were built using crushed porcelain from 400 recycled fixtures (Figure 9).

Figure 8: Rain garden under construction with crushed porcelain

Figure 7: New York Times article on oyster restoration

Figure 9: Photo of a completed rain garden

Initiative 3: Save Water in Parks

DEP continues to partner with the Department of Parks and Recreation (DPR) to reduce water consumption, specifically with spray showers in City parks and in recreational centers. The goal in the Water Demand Management Plan is to reduce consumption in parks by 1.1 MGD over five years, by retrofitting 400 spray showers and replacing inefficient fixtures at recreation centers (Figure 10).

The retrofitted sprayshowers are automated and operated by park users, ensuring that the water runs only when in use, and not all day (see Figure 11 for an example of a retrofitted sprayshower). In 2015, 120 sprayshowers were retrofitted, an additional 100 were retrofitted in 2016, and the final 30 will be completed in 2017, before the start of the summer season. Sprayshower inspections are now included in DPR's maintenance operations and will be maintained going forward. To date, nine recreation centers were retrofitted since 2013. These retrofits included the installation of waterless urinals, a first for such devices on DPR property.

In 2014, DEP partnered with DPR on the Community Park Initiative, a program to rehabilitate parks in underserved neighborhoods throughout New York City. Through the program, green infrastructure will be installed for enhanced stormwater management, and sprayshowers and other fixtures will be retrofitted and installed in rehabilitated parks. The program's first phase includes rehabilitation of 35 sites, and future phases will be evaluated. DEP and DPR are working to rehabilitate these sites in summer 2017 (Figure 12).

Figure 11: Retrofitted Grove Hill Playground in the Bronx

DEP continues to install meters and Automatic Meter Readings (AMR) in parks throughout the City. To date, DEP has successfully installed meters and AMR in over 100 parks throughout the City. DEP is working to meter both Central Park and Prospect Park, which were previously unmetered. This data helps DEP track consumption and learn more about sources of non-revenue water.

Figure 10: DPR spray showers retrofitted to date

Figure 12: Community Parks Iniaitive site under construction

Initiative 4: Save Water in Public Housing

New York City Housing Authority (NYCHA) is the largest public housing authority in the United States, and consequently, is one of DEP's largest customers. More than one million people live in the over 1,100 NYCHA-owned buildings. Providing customer service for NYCHA residents is important, and to that end, DEP has enhanced communication and established partnerships with NYCHA to improve both metering and leak detection in NYCHA properties.

DEP continues to work with NYCHA to transition NYCHA properties to the Multifamily Conservation Program (MCP). An important part of this transition requires that meters and AMR devices are installed. NYCHA has identified several unmetered properties and DEP has completed site assessments of all these developments. To date, DEP has completed installation of large water meters and backflow preventers in 108 of the unmetered properties. DEP is working to install meters and install AMR in the remaining unmetered NYCHA properties by June 2018.

Initiative 5: Save Water in Fire Department Facilities

Under the Water Demand Management Plan, DEP is proposing to reduce consumption at the Fire Department of New York (FDNY) facilities by 0.04 MGD over a period of six years. In Fiscal Year 2013, DEP completed retrofits in 12 of the largest FDNY firehouses (Figure 14).

In addition, after years of coordination and planning, DEP is partnering with FDNY and is co-funding a water recycling and reuse project at the FDNY Chauffeur School on Randall's Island that is estimated to save 30,000 gallons per day (Figure 13). The underground reuse tank will allow FDNY to recycle potable water utilized for testing and calibrating fire engine hoses and pumps, that is currently discharged directly to the East River. The project is expected to be completed in August 2017.

Figure 13: FDNY reuse facility under construction, May 2017

Initiative 6: Save Water in City Universities

DEP is collaborating with the City University of New York (CUNY), the third largest university system in the United States, to reduce consumption in campus facilities. Under the Water Demand Management Plan, DEP is proposing to reduce consumption by 0.75 MGD over a period of seven years in 21 colleges in the CUNY system. In 2014, DEP entered into an agreement with the City College of New York (CCNY) to replace toilets and urinals in 10 campus buildings. Work began in November 2014 and is expected to be completed by July 2017. To date, over 800 toilets and urinals have been retrofitted.

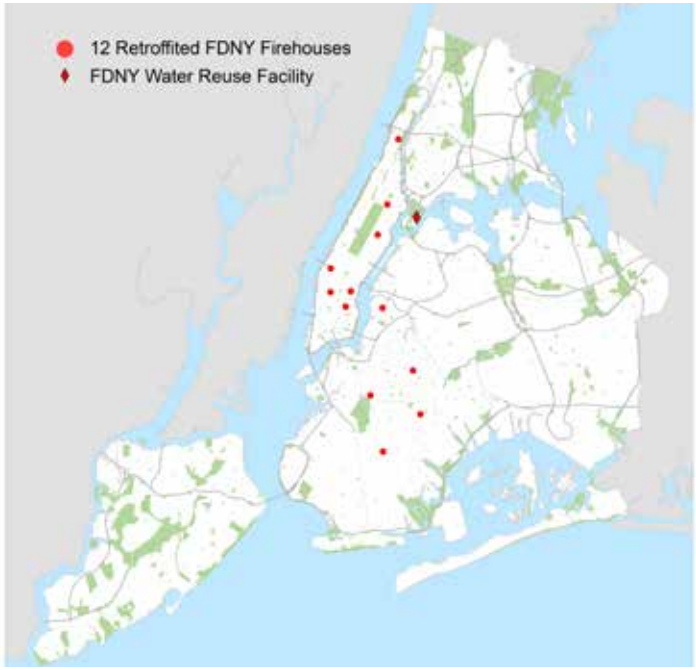


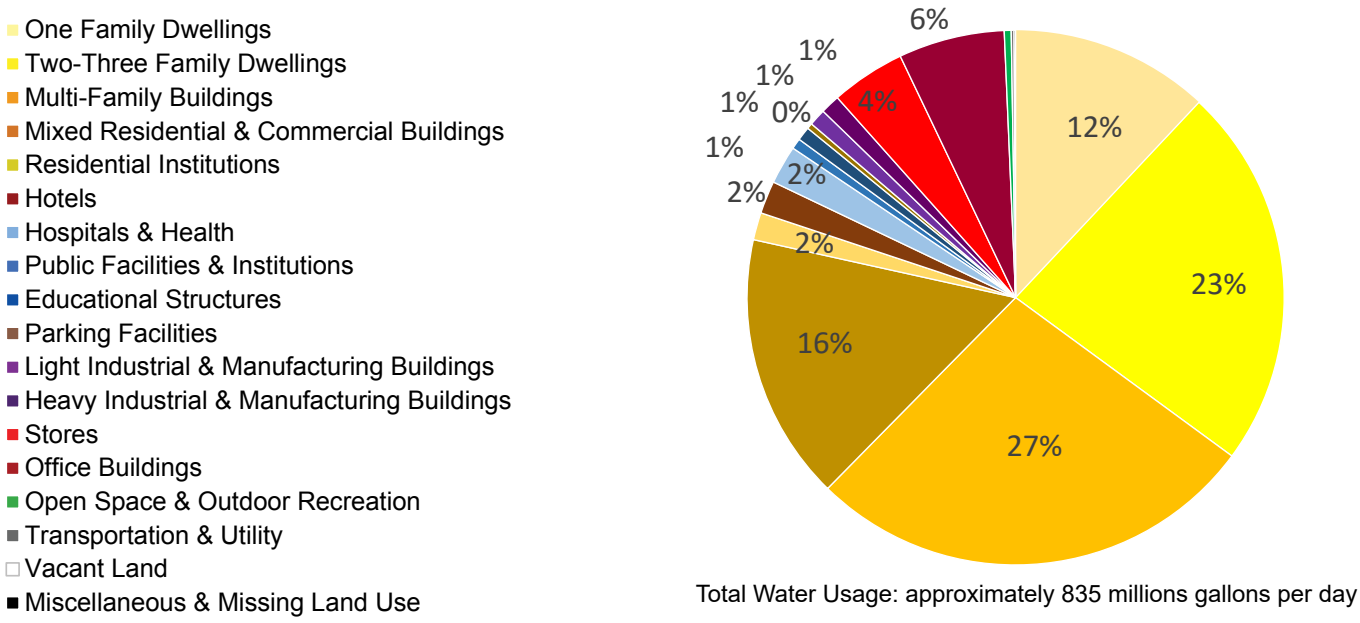
Figure 14: Firehouses retrofitted to date and the location of the water reuse facility

STRATEGY 2

RESIDENTIAL WATER EFFICIENCY PROGRAM

Multi-family buildings in Manhattan, NY

DEP continues to track residential properties which account for 78% of the City's total billed water demand (Figure 15). Residential demand is primarily driven by various types of domestic end uses. DEP has provded incentives, formed partnerships, and promoted simple housekeeping practices to keep residential buildings as water efficient as possible.



Total Water Usage: approximately 835 millions gallons per day

Figure 15: Total water usage in New York City by land use (does not include non-revenue water)

Initiative 1: Save Water through Toilet Replacement Program Phase I

Currently in its third year, the Toilet Replacement Program offers $125 vouchers to qualified multi-family property owners to purchase 1.28 gallon per flush (gpf) high-efficiency toilets. Qualified multi-family property owners under the Multifamily Conservation Program (MCP) rate who submit applications and are approved for a voucher can take them to an authorized vendor selected to participate in the program via DEP contracting process. DEP previously launched a version of the program in 1994 through 1997; the current program launched in June 2014 and is scheduled through 2019.

As MCP customers continue to enroll in the program, and as some MCP customers replace their inefficient toilets without participating in the program, the population of eligible customers continues to decline. Although DEP regularly makes these refinements to the eligible customer population, the accounting of savings to date was not accurately reflected in the past. Moving forward, DEP will accurately reflect savings from the Toilet Replacement Program. As of May 23, 2017, there are 63,695 units in 5,504 buildings citywide that are eligible to participate in the Toilet Replacement Program. To date, 903 vouchers have been redeemed for the replacement of 11,341 toilets, accounting for approximately 0.45 MGD of savings.

The various outreach efforts undertaken since the launch of the program include: presentations at owners associations, meetings with co-op boards and building management companies, informational mailings and postcards in multiple languages, in-person sign-up events at each of the TRP authorized plumbing fixture vendor locations, and tabling and presentations at outreach events (e.g., NYC Building Show and DEP Rain Barrel Giveaway events).

In 2016, DEP began partnering with New York City Retrofit Accelerator, a city organization that provides personalized advisory services to building owners and managers, to streamline the process of making efficiency improvements in buildings. In partnership with DEP, Retrofit Accelerator Efficiency Advisors reach out to New York City Department of Housing Preservation and Development – Asset Management building owners and managers in DEP's MCP through phone calls and emails, informing them of the Toilet Replacement Program and encouraging them to participate in the program to comply with MCP fixture efficiency requirements. To date, Retrofit Accelerator has made an average of 370 calls and 100 emails daily to 944 building owners and managers. DEP plans to continue this partnership through 2019.

Initiative 2: Save Water through the Toilet Replacement Program Phase II

Phase II of the Toilet Replacement Program continues to be evaluated by the department.

Initiative 4: Save Water through Residential Water Surveys and Home Water Saving Kits

In addition to establishing the Toilet Replacement Program, DEP directed its contractor, Honeywell, to provide building owners with complimentary household water surveys, in an effort to promote water conservation in their buildings. The surveys assist building owners with identifying opportunities for water savings and detecting leaks (Figure16). In 2016, Honeywell conducted surveys in 3,040 individual apartments in 2,347 single-family apartment buildings. Honeywell also surveyed 900 multi-family buildings, and 15,437 individual units within these properties. To date, this program had led to an estimated savings of 0.4 MGD through reported leaks and other corrective measures.

Figure 16: A home water savings kit

Queens Presbyterian Hospital

STRATEGY 3

NON-RESIDENTIAL WATER EFFICIENCY PROGRAM

DEP's efforts in the non-residential sector have focused on establishing partnerships for developing informed, mutually-beneficial policies that incentivize water efficiency, reuse, and alternative water use. Private industry groups that manage large individual properties in New York City comprise the backbone of DEP's non-residential water efficiency efforts.

Initiative 1: Save Water through Voluntary Partnerships

On January 1, 2016 DEP launched a Water Challenge to Hospitals. The three participants are Memorial Sloan Kettering, Queens Presbyterian and Harlem Hospital. The participants represent a mix of public and private hospitals that provide inpatient care, teaching, and research services. The challenge duration is two years to allow participants to study their seasonal water usage. DEP hosted quarterly workshops to give participants the tools to perform water audits, identify strategies to achieve savings, and to create water demand management plans for their properties. Water reduction strategies in hospitals include replacing inefficient fixtures and dishwashers, and switching from water cooled systems to machine cooled systems. If all hospitals achieve a 5% reduction at the conclusion of the challenge, the savings achieved would be approximately 60,000 gallons per day.

All participating hospitals established baseline analytics for their existing water consumption trends, two completed water audits of their facilities, and one created a water demand management plan. Currently, participating hospitals are in the second year of the challenge and are working to include water saving strategies in their capital plans for future funding and implementation. The hospitals are also working toward including conservation strategies in daily operations, and are training staff to reduce water use during routine cleaning.

Previously, DEP launched two water challenges to different commercial sectors. The 2014 Mayor's Water Challenge to Hotels was successful, with 4 out of 11 hotels reducing their demand by over 10% from the previous year, an overall savings of 11.3 million gallons for the year, or an average of 31,000 gallons per day (Figure 17). In November 2014, DEP, the United States Environmental Protection Agency (USEPA), the Mayor's Office, the New York State Restaurant Association, and 30 NYC restaurants, launched a Water Challenge to Restaurants. The Challenge concluded in

December 2015 with 10 restaurants successfully completing the challenge, saving 2.6 million gallons in the challenge year, or 7,100 gallons per day (Figure 18).

Figure 17: The Carlton Hotel, a Hotel Challenge participant and winner

Figure 18: Tacombi at Fonda Nolita, a Restaurant Water Challenge participant

Initiative 2: Save Water through Cost Sharing

In November 2016, DEP launched the On-Site Water Reuse Grant Pilot Program to provide commercial, mixed-use, and multi-family residential property owners with incentives to install water reuse systems. Benefits from incentivizing water reuse and alternative use include deferred capital costs of large-scale water, wastewater, and stormwater infrastructure; reduced loadings to sewers and water bodies; improved environmental stewardship; and increased capability to manage demand on the water supply system. DEP developed a website for the program where applicants can learn more about available grants, the application process, upcoming workshops, and submit applications. The program website also provides an email address where applicants can send direct inquires to DEP staff.

Grants for water reuse systems are available at the individual building and district level. District-scale projects involve two or more parcels, such as a housing development, where the project reduces demand in the shared distribution system. Individual building-scale projects are eligible to receive up to $250,000 in reimbursement for a system designed to save at least 32,000 gpd, and district-scale projects are eligible to receive up to $500,000 in reimbursement for a system designed to save at least 94,000 gpd.

Figure 19: Water reuse system at the Solaire Building in Manhattan
Photo Credit: Natural Systems Utilities

STRATEGY 4

WATER DISTRIBUTION SYSTEM OPTIMIZATION

DEP crew addressing a service line leak

Through the Universal Metering Program, DEP and its customers have been able to monitor water usage, detect inefficiencies, and track water demand citywide. The infrastructure that provides water to our customers every day is massive and primarily underground, hidden from view. Mains and service connections that range in size from one to 96 inches carry water from three main in-city tunnels to the City's residences, business, and institutions. This massive infrastructure must be continually monitored, maintained, repaired, and eventually replaced. DEP continues to search for ways to improve our water system and to ensure that New Yorkers are receiving top quality water in the most sustainable way.

Initiative 1: Optimize the Leak Detection Program

In 2016, DEP surveyed 3,181.66 miles of water mains for leaks (Figure 21). As a result of leaks proactively found and repaired, DEP estimates that 1.58 million gallons of water per day were saved. In addition, DEP continues to implement a more strategic approach to leak detection. In this

Figure 20: Digital correlator for testing meter flow

Figure 21: Sonar hearing detection for leaks

approach, local, borough-based teams properly trained in leak detection target specific areas known to be served with older mains that are more likely to need both preventive and corrective maintenance. These teams are able to respond rapidly to any identified problems, as opposed to the slower response times experienced in many locations when DEP relied upon one consolidated resource center. Leaking and/or vandalized fire hydrants can also result in significant water waste, as an illegally opened fire hydrant can release more than 1,000 gallons per minute and drop pressure. In 2016, DEP repaired 11,690 hydrants, replaced 1,595, and provided other maintenance services to 11,429 additional hydrants.

Initiative 2: Optimize Pressure Management

DEP has been working to improve maintenance of the pressure zones within the water distribution system. In calendar year 2016, the number of breaks per 100 miles was 6.7 slightly below the City's 10 year average of 7.0, but still well below the accepted industry average of 25 breaks per 100 miles annually.

In 2016, DEP completed 5,399 preventive maintenance inspections/calibrations on pressure regulating valves. DEP then overhauled 49 of the 424 pressure relating valves citywide that are in use. The activation of City Water Tunnel No. 3 stage 2 also provided 16 new pressure regulating valves for increased pressure control.

Initiative 3: Replace Large Meters and Optimize Metering and AMR

Of the City's 850,000 meters, approximately 70,000 are considered large water meters (1.5 inches and larger). Maintaining reliable water meters is critical, given that City consumption is 1.1 billion gallons per day. 70,000 large meters represent $1.1 billion, or roughly one third of DEP's revenue. These particular meters are critical points in DEP's billing system, and have been targeted for both replacement and optimization. DEP replaced 804 large meters in 2016 (i.e., those over 1.5 inches in diameter). Figure 22 shows where these meters are tested.

In addition, as of December 2016, DEP has substantially completed the installation of AMR devices, which now account for approxiamately 835,000 service connections. At the start of the AMR program, DEP had an estimated billing percentage of 17.4%. By December 2016, this fell to 2.76%, an 84% reduction.

Figure 22: Meter testing facility

STRATEGY 5

WATER SUPPLY SHORTAGE MANAGEMENT

Ashokan Reservoir

New York City has experienced approximately nine drought periods of record over the last 75 years. Over time, water efficiency and conservation measures have become increasingly important during drought periods. Water shortage relief efforts have played a significant role in reducing demand when water supply has been limited. In order to ensure a coordinated and rapid response to water supply shortage conditions, DEP has developed and implemented standard operating procedures and water use restrictions for periods of shortage. As our water supply infrastructure ages and as climate and weather patterns become more difficult to predict and increasingly severe in magnitude, DEP re-evaluated existing water use restrictions in 2013 and has been working to adapt them to address the changing landscape of current and future conditions.

Initiative 1: Establish City Agency Responsibilities

DEP coordinated with the Office of Emergency Management (OEM) and other city agencies to brief them on the outcomes of the studies that informed the Water Demand Management Plan and upcoming changes to the Water Shortage Rules. In collaboration with OEM, DEP contacted each of the required agencies to confirm that standard operating procedures for demand management under water supply shortage conditions have been reviewed, updated and are in place.

DEP also worked with OEM to develop the Hazard Mitigation Guide (2014) which includes a detailed water shortage risk profile. This guide was designed to be accessible to NYC public officials and the public.

Initiative 2: Develop a Communications Strategy

If water shortage is triggered during the shutdown of the Delaware Aqueduct, DEP will develop a water supply shortage public information and education campaign which will include hard copy materials to be distributed and mailed, as well as electronic communications such as DEP websites, email distribution lists, and 311 services. DEP will develop this campaign towards the end of the Water Demand Management Plan implementation, in a three or four year time frame.

Initiative 3: Adopt Water Shortage Rates

DEP has completed a rate study which covers the various options for establishing a framework for setting and implementing a water shortage rate in the event of a water supply shortage, that is consistent with the provisions in the current Drought Emergency Rules. The proposed water shortage rate will need to be compatible with DEP's billing system.

Initiative 4: Update Rules and Plan to Allow for Planned Infrastructure Repairs

DEP is in the process of amending the "Emergency Drought Rules" (15 RCNY Chapter 21). The rulemaking process in New York City, called City Administrative Procedure Act (CAPA), began in July 2013 for this effort and in December 2016, the Mayor's Office of Operations and the City Law Department certified DEP's revisions to the "Emergency Drought Rules." The proposed revised title is "Water Shortage Rules," replacing the narrower focus of the previous title. The proposed revisions address water shortage emergencies due to circumstances other than natural conditions, such as planned and unplanned infrastructure outages and repair that New York City may face over the next several years. The proposed revisions also add, remove, and change certain water use prohibitions during the different stages of water shortage emergencies, to better reflect DEP's current understanding of City water use.

Initiative 5: Provide Customers with Easy and Timely Access to Water Usage Data

DEP is working to give customers more information on their water consumption. Giving consumption information to customers empowers them to spot inefficiencies, including leaks, via the My DEP Account web portal.

More than 375,000 customers, approiamtely 51,000 in 2016, have signed up for My DEP Account where customers can view their water usage, bills, and payment history online. One-to-two family residential customers can view four meter readings a day, while large multifamily building or commercial customers can view their readings on an hourly basis. This information allows customers to monitor their consumption and increase awareness of their consumption patterns.

DEP also offers an option in the My DEP Account web portal that allows customers to receive a leak alert if their consumption triples for five consecutive days. This alert helps customers identify leaks and fix them, saving them water and money. Over 271,000 customers have signed up for leak alerts.

Ossining, NY

STRATEGY 6

Wholesale Customers Water Demand Management

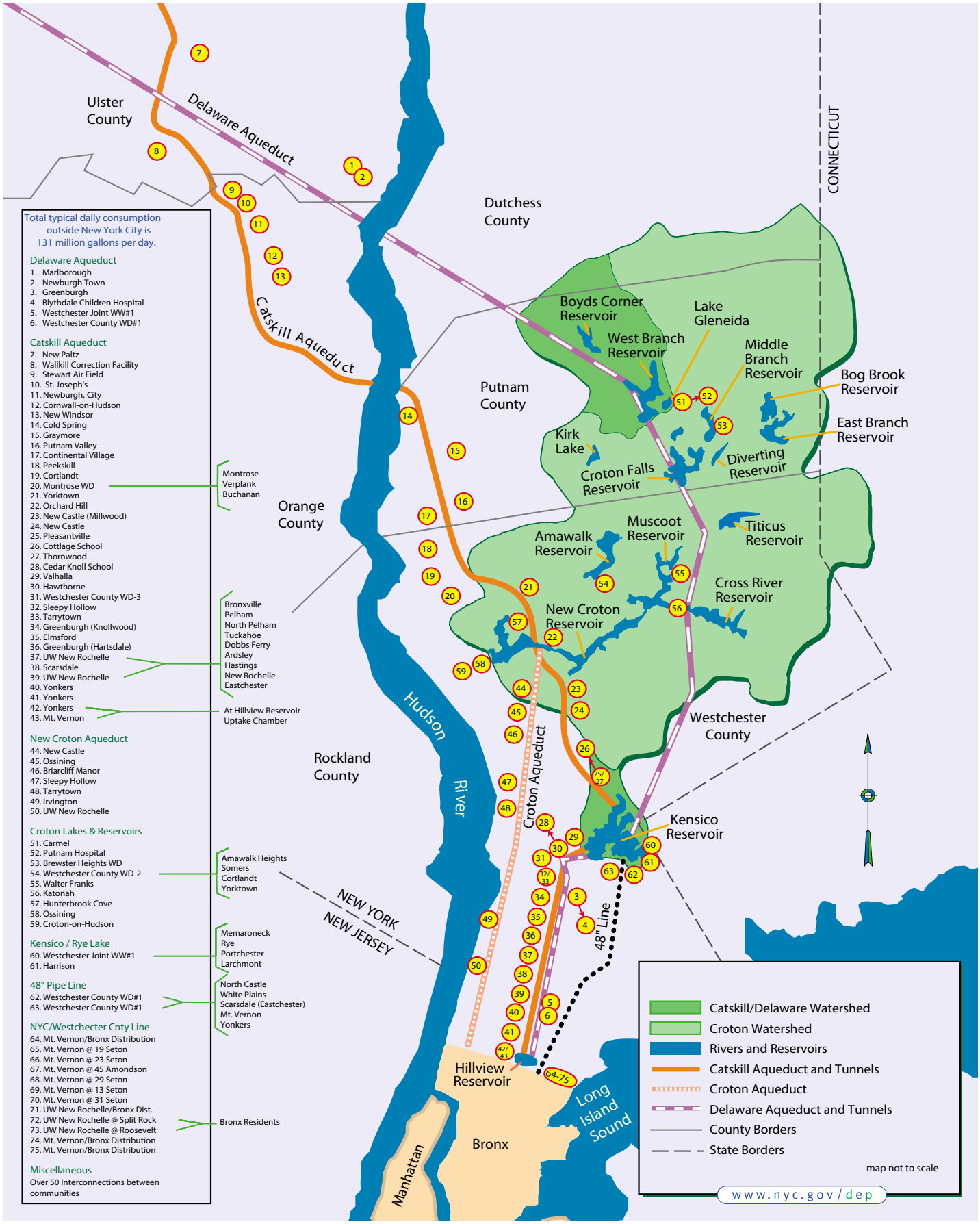
Initiative 1: Water Demand Management Plans for Largest Customers

In 2014, DEP kicked off the demand management program for wholesale water utility customers located in upstate communities. These customers serve nearly one million residents and make up 10% of the NYC system's current consumption. As of 2017, DEP offers assistance and is working with nine utility partners to complete demand manage¬ment plans for their systems. These are: the City of Yonkers, Westchester Joint Water Works, the Town of Greenburgh, the City of Mt. Vernon, the Village of Scarsdale, the Town of New Windsor, the Village of Tarrytown, the Village of Ossining and SUEZ Water Westchester. DEP has also engaged with the Town of Newburgh and Westchester County/White Plains. Demand management planning agreements are pending with these customers. The program goal is a 5% total reduction in consumption, or 5 MGD. Initial review of plans and water audits identified two findings. First, similar to in-City demand, wholesale usage has a generally decreasing trend with yearly variation. Second, water loss is a common theme across the utilities. Thus, DEP is researching the potential benefits of regional annual water loss auditing.

Initiative 2: Implement Planned Demand Management Measures

Once participating utilities complete their demand management plans, each utility will work to implement the conservation measures identified in their plan to achieve a 5% reduction in consumption. DEP is working to draft individual intergovernmental agreements (IGA) – the implementation mechanism for each participating wholesale customer. Each IGA represents a contractual funding obligation from DEP and the commitment of the utility partner to implement their demand management plan. Each utility partner's IGA defines conservation measures to be implemented, the implementation plan (schedule, budget, and scope of work), and individual deliverable reporting milestones.

The demand management plan for the Village of Ossining was finalized in May 2016 and the IGA was executed in 2017. DEP anticipates that implementation of Ossining's demand management plan will begin in summer 2017.


Total typical daily consumption outside New York City is 131 million gallons per day.
Delaware Aqueduct
1. Marlborough
2. Newburgh Town
3. Greenburgh
4. Blythdale Children Hospital
5. Westchester Joint WW#1
6. Westchester County WD#1
Catskill Aqueduct
7. New Paltz
8. Wallkill Correction Facility
9. Stewart Air Field
10. St. Joseph's
11. Newburgh, City
12. Cornwall-on-Hudson
13. New Windsor
14. Cold Spring
15. Graymore
16. Putnam Valley
17. Continental Village
18. Peekskill
19. Cortlandt
20. Montrose WD
21. Yorktown
22. Orchard Hill
23. New Castle (Millwood)
24. New Castle
25. Pleasantville
26. Cottlage School
27. Thornwood
28. Cedar Knoll School
29. Valhalla
30. Hawthorne
31. Westchester County WD-3
32. Sleepy Hollow
33. Tarrytown
34. Greenburgh (Knollwood)
35. Elmsford
36. Greenburgh (Hartsdale)
37. UW New Rochelle
38. Scarsdale
39. UW New Rochelle
40. Yonkers
41. Yonkers
42. Yonkers
43. Mt. Vernon
New Croton Aqueduct
44. New Castle
45. Ossining
46. Briarcliff Manor
47. Sleepy Hollow
48. Tarrytown
49. Irvington
50. UW New Rochelle
Croton Lakes & Reservoirs
51. Carmel
52. Putnam Hospital
53. Brewster Heights WD
54. Westchester County WD-2
55. Walter Franks
56. Katonah
57. Hunterbrook Cove
58. Ossining
59. Croton-on-Hudson
Kensico / Rye Lake
60. Westchester Joint WW#1
61. Harrison
48" Pipe Line
62. Westchester County WD#1
63. Westchester County WD#1
NYC/Westchecter Cnty Line
64. Mt. Vernon/Bronx Distribution
65. Mt. Vernon @ 19 Seton
66. Mt. Vernon @ 23 Seton
67. Mt. Vernon @ 45 Amondson
68. Mt. Vernon @ 29 Seton
69. Mt. Vernon @ 13 Seton
70. Mt. Vernon @ 31 Seton
71. UW New Rochelle/Bronx Dist.
72. UW New Rochelle @ Split Rock
73. UW New Rochelle @ Roosevelt
74. Mt. Vernon/Bronx Distribution
75. Mt. Vernon/Bronx Distribution
Miscellaneous
Over 50 Interconnections between communities
Montrose
Verplank
Buchanan
Bronxville
Pelham
North Pelham
Tuckahoe
Dobbs Ferry
Ardsley
Hastings
New Rochelle
Eastchester
At Hillview Reservoir
Uptake Chamber
Amawalk Heights
Somers
Cortlandt
Yorktown
Memaroneck
Rye
Portchester
Larchmont
North Castle
White Plains
Scarsdale (Eastchester)
Mt. Vernon
Yonkers
Bronx Residents
Ulster County
Dutchess County
Putnam County
Orange County
Rockland County
Westchester County
CONNECTICUT
NEW YORK
NEW JERSEY
Hudson River
Croton Aqueduct
48" Line
Boyds Corner Reservoir
West Branch Reservoir
Lake Gleneida
Middle Branch Reservoir
Bog Brook Reservoir
East Branch Reservoir
Kirk Lake
Croton Falls Reservoir
Diverting Reservoir
Amawalk Reservoir
Muscoot Reservoir
Titicus Reservoir
New Croton Reservoir
Cross River Reservoir
Kensico Reservoir
Hillview Reservoir
Bronx
Manhattan
Long Island Sound
Catskill/Delaware Watershed
Croton Watershed
Rivers and Reservoirs
Catskill Aqueduct and Tunnels
Croton Aqueduct
Delaware Aqueduct and Tunnels
County Borders
State Borders
map not to scale
www.nyc.gov/dep

WATER DEMAND TRACKING

New York City water consumption continues to decline despite increases in population, as shown in Figure 1 on page 4. Average water consumption in 2016 was 1,002 MGD, lower than the drought of record. This is partially attributable to cooler and wetter summers in recent years. Additionally, it is reasonable to assume that water use will remain stable or continue to decline during the near-term due to increasing rates, expanded AMR, and volumetric meter-based billing, which is a water conservation pricing mechanism. This overall trend could also be affected by additional factors, including annual temperature fluctuations and potential drought.

DEP conducts water demand analyses and projections for many purposes, including: water supply and wastewater infrastructure planning; revenue analysis; affordability studies; new growth and rezoning assessments; and analyzing and understanding the effects of water demand on agency operations. In 2013, DEP began using AWWA water audit software to assess system water balance. Figure 24 includes the results of the balance for FY 2016.

DEP also continues to track annual per capita consumption of water. Because New York City is a business district and tourist destination, dividing water consumption by population does not accurately capture normal per capita consumption. Thus, DEP compares consumption data to local population data and calculates gallons per capita per day (gpcd), based on consumption volumes and 2009-2013 US Census American Community Survey data. In FY16, New York City consumption was approximately 69 gallons per customer per day (gpcd). Meter-billed consumption is lower, at approximately 64 gpcd (Figure 23).

Land use	per capita all types	per capita billed
1. Tax Class 1 One Family Dwellings	64	62
2. Tax Class 1 - Other (Two-Three Family)	59	60
3. Multi-Family Buildings	69	60
4. Mixed Residential & Commercial Buildings	84	81
All Residential	**69**	**64**

Figure 23: FY16 Residential Per Capita Water Consumption

AWWA Free Water Audit Software: Water Balance (WAS v5.0)

Water Audit Report for: NYC Department of Environmental Protection
Reporting Year: 2016 (7/2015 - 6/2016)
Data Validity Score: 78

		Water Exported 0.000	Billed Water Exported			Revenue Water 0.000
Own Sources (Adjusted for known errors) 346,748.290	System Input 346,748.290	Water Supplied 346,748.290	Authorized Consumption 303,189.476	Billed Authorized Consumption 297,451.581	Billed Metered Consumption (water exported is removed) 202,284.112	Revenue Water 297,451.581
					Billed Unmetered Consumption 95,167.469	
				Unbilled Authorized Consumption 5,737.895	Unbilled Metered Consumption 1,403.541	Non-Revenue Water (NRW) 49,296.709
					Unbilled Unmetered Consumption 4,334.354	
			Water Losses 43,558.814	Apparent Losses 14,187.886	Unauthorized Consumption 3,467.483	
					Customer Metering Inaccuracies 10,720.403	
					Systematic Data Handling Errors 0.000	
Water Imported 0.000				Real Losses 29,370.928	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	

Figure 24: FY16 AWWA Water Balance