Annual Review and Update of Strategic Trends and Utility Planning Issues for Fiscal Year 2021

OCTOBER 2021

Orange Water and Sewer Authority

Carrboro, North Carolina

Orange Water and Sewer Authority

OWASA is Carrboro-Chapel Hill's not-for-profit public service agency delivering high quality water, wastewater, and reclaimed water services.

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Purpose and Summary

This report summarizes observed trends for several indicators – such as customer growth and demands, water supply and drinking water treatment, wastewater treatment, use of reclaimed water, and environmental regulations – which are important factors that influence the need, timing, and scope of our facilities planning and investment decisions. Through the process of regularly reviewing and updating this report, we strive to anticipate and proactively prepare for change so that we are better positioned to provide high quality and reliable water, wastewater, and reclaimed water services for the long-term. Some of the key messages are:

- Our customers have reduced peak day drinking water demands by 41 percent since Fiscal Year (FY) 1999 despite a 32 percent increase in customer accounts over that same period. (Note: our overall demands fell during the pandemic; the University of North Carolina at Chapel Hill (UNC), schools, and commercial use fell while residential use increased). Similarly, demands on our raw water supply have decreased substantially. These reduced, long-term demands result from:
    - Increased water use efficiency and conservation by our customers;
    - Conservation pricing and conservation ordinances including year-round water restrictions; and
    - Implementation of the reclaimed water system in partnership with the UNC in 2009, which now meets about 11 percent of the community's water needs based on water sales.
- These reductions in drinking water demand – and the associated reductions in wastewater flows – help defer the need for costly expansion of the capacities of our raw water supplies, water treatment plant, and wastewater treatment plant. More efficient use of water also helps reduce costs for energy and chemicals for water supply, drinking water treatment and water distribution, and wastewater collection and treatment.
- Based on current demands, we believe we have sufficient raw water supply for the next few decades under most conditions. Our allocation of Jordan Lake water supply, which we can access through our mutual aid agreements with the City of Durham and Town of Cary, serves as an insurance policy to meet demands during extended droughts or operational emergencies. Through the update of our Long-Range Water Supply Plan, we will evaluate options to expand our opportunities to access our allocation of water from Jordan Lake.
- Based on current demands and projections, we do not anticipate needing to expand the hydraulic capacity of the water or wastewater plant for several decades.
- OWASA is committed to providing high quality and reliable services to our customers. We have an asset management program to evaluate our infrastructure and risks and guide our investments in our ongoing maintenance and system renewal programs. The trends listed in this report are one mechanism to evaluate how well we meet our core mission.

Acronyms

AC	asbestos cement
AMI	advanced metering infrastructure
AMWA	Association of Metropolitan Water Agencies
AWIA	America's Water Infrastructure Act
AWWA	American Water Works Association
BG	billion gallons
CIP	Capital Improvements Program
CoF	consequence of failure
CY	calendar year
DEQ	NC Department of Environmental Quality
DWR	NC Division of Water Resources
EPA	US Environmental Protection Agency
ERP	Emergency Response Plan
FY	fiscal year (July – June)
I&I	Inflow and infiltration
JLP	Jordan Lake Partnership
Kgal	One thousand gallons
kWh	kilowatt-hour
KWh/MG	kilowatt-hour per million gallons
lb/yr	pounds per year
LCRR	lead and copper rule revisions
LoF	likelihood of failure
LRWSP	Long-Range Water Supply Plan
LT2	Long-Term 2 Enhanced Surface Water Treatment Rule
MCL	maximum contaminant level
ME	meter equivalent
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
NPDES	National Pollution Discharge Elimination System

OWASA	Orange Water and Sewer Authority
PFAS	per and poly-fluoroalkyl substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonic Acid
ppt	parts per trillion
RCW	reclaimed water
RRA	Risk and Resilience Assessment
SCADA	Supervisory Control and Data Acquisition
SWRRP	Source Water Resiliency and Response Plan
TAWSMP	Triangle Area Water Supply Monitoring Project
TN	total nitrogen
TP	total phosphorus
TWP	Triangle Water Supply Partnership
µg/l	micrograms per liter
UCMR3	Unregulated Contaminant Monitoring Rule 3
UCMR4	Unregulated Contaminant Monitoring Rule 4
UCMR5	Unregulated Contaminant Monitoring Rule 5
UNC	University of North Carolina at Chapel Hill
USGS	US Geological Survey
WHO	World Health Organization
WRF	Water Research Foundation
WSMPBA	Water and Sewer Management, Planning and Boundary Agreement
WTP	water treatment plant
WWTP	wastewater treatment plant

Background

Orange Water and Sewer Authority (OWASA) publishes this annual report to evaluate how well we are meeting our mission of providing our customers with high quality and reliable water, wastewater, and reclaimed water services through responsible and creative stewardship of the resources we manage.

This report summarizes observed trends for several indicators – such as customer growth and demands, water supply and drinking water treatment, wastewater treatment, use of reclaimed water, and environmental regulations – which are important factors that influence the need for, timing, and scope of our facilities planning and investment decisions. Thus, the information in this document is one item that shapes our Capital Improvements Program (CIP). Through the process of regularly reviewing, updating, and publishing this report, we strive to anticipate and proactively prepare for change so that we are better positioned to engage the community as we consider and decide on how best to sustainably meet service requirements for the foreseeable future.

The OWASA Board of Directors adopted a Strategic Plan in March 2014 and an update to the Strategic Plan in June 2016. The Strategic Plan identifies the key initiatives and corresponding actions OWASA will take to address the issues we believe are most important for the customers and community we serve. The June 2016 Strategic Plan stated that this Annual Review and Update of Strategic Trends and Utility Planning Issues (Strategic Trends report) would be modified to serve as a companion document to the Strategic Plan. The Board of Directors is currently developing a new Strategic Plan. The information provided in this report could be used to help shape that plan along with the results of outreach efforts. Depending on the strategic initiatives identified in the new Strategic Plan, the format of this report may be modified for future updates.

This Strategic Trends report begins with an overview of OWASA's planning environment which includes a description of those items which may impact the timing and scope of our facilities planning and investment decisions. It then includes a description of OWASA's main management areas beginning with source water protection; then raw water supply and treatment; distribution of drinking water to our customers; wastewater collection, treatment, and recycling or reuse. Each topic includes information on regulations, technology and research, energy management, links to the Strategic Plan, and follow-up actions.

OWASA's Planning Environment

This section describes the items in OWASA's planning environment that would impact the timing and scope of our facilities planning and investment decisions. Understanding these items ensures that we provide our customers with high quality and reliable water, wastewater, and reclaimed water services through responsible and creative stewardship of the resources we manage.

Service Area

The local governments in Orange County have developed several agreements to determine who has jurisdiction over certain areas and what areas are to be served by municipal water and sewer. These agreements help concentrate growth in compact municipal areas, preserve the rural character of the County, and limit urban sprawl. The area that OWASA can provide service to is shown in Figure 1 and is from the Water and Sewer Management, Planning and Boundary Agreement (WSMPBA) which was adopted in 2001 and amended in 2010, 2017, and 2020. The 2017 amendments included minor changes to the boundary along Smith Level Road, and the 2020 amendment included minor changes at the southern end of the service area on Bayberry Drive to accommodate 2 residential lots. If significant changes are made to OWASA's service area, OWASA will need to ensure its resources and infrastructure will reliably meet the demands of those new areas along with the projected development within our current service area.

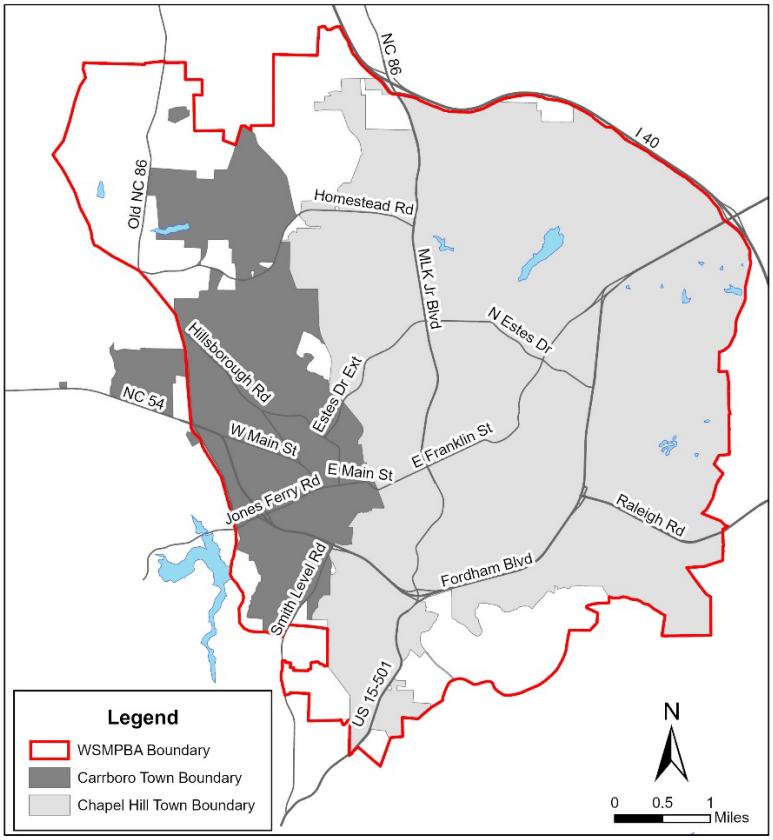


Figure 1. WSMPBA Boundary

Growth and Development

It is important to project when, where, and how much growth will occur, and what the subsequent demands will be on our water, wastewater, and reclaimed water services to ensure we have adequate capacity to meet the community's future needs. Figure 2 illustrates past population numbers for the Towns of Carrboro and Chapel Hill as well as the 2045 projected population based on regional transportation planning and the 2070 projected population as presented in the report titled *Long-Range Water Demand Projections Through 2070 for the Long-Range Water Supply Plan Update* presented to the Board of Directors in March 2019. These projections are similar to those provided during the State of the Community Report in September 2021 produced by the Chapel Hill-Carrboro Chamber of Commerce; the projected 2060 population in Chapel Hill and Carrboro based on linear models is anticipated to be between 109,015 and 135,195. The projected 2060 population shown by the orange line in Figure 2 is 128,006 and 136,935 shown by the blue dotted line. These projections are all very similar.

In addition, regional transportation planning currently being done through 2050 show an increase of 1,496 people per year in the County; the regional transportation planning completed through 2045 upon which our 2070 demand projections are based show annual increases of 1,498 people per year. These projected county-wide totals are also very similar.

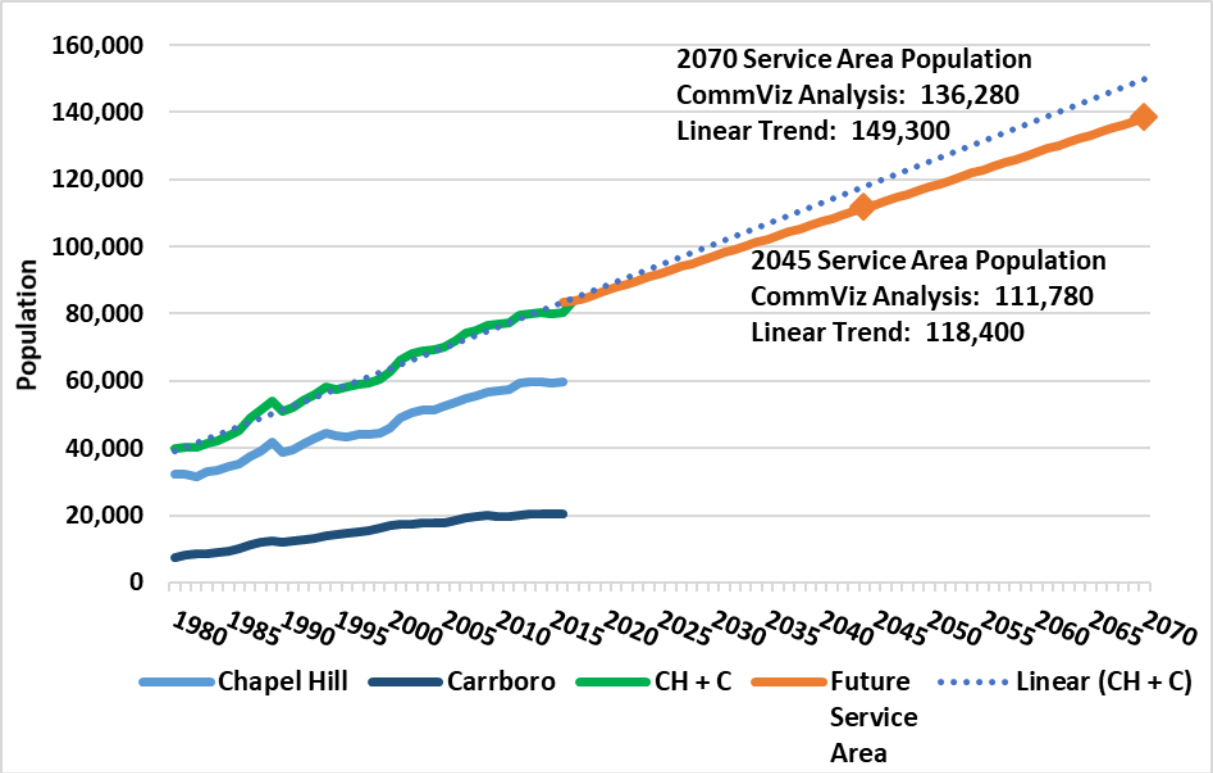


Figure 2. Population Projections - UNC is included in Town of Chapel Hill population projections

We anticipate that growth will continue to be higher density, with redevelopment and infill projects such as the Blue Hill District, East Rosemary Street Parking Deck area, 203 South Project, and Club Nova,

and with new development projects such as Carraway Village and Shops at Lloyd Farms. Higher density development tends to result in lower per capita demands as there is less outdoor water use. OWASA uses local government future growth information to ensure that the capacity of our water distribution system and wastewater collection system is sized appropriately.

Climate Change

OWASA's operations are intricately linked with the environment and weather, and climate change has the potential to significantly and directly impact various aspects of our business. Additionally, extreme weather events like drought and hurricanes have the potential to indirectly affect the supply of resources that we need to conduct business (i.e. power and chemicals), as well as the demand for our services. OWASA must be prepared to adapt to a changing climate, and we are incorporating climate change adaption into various aspects of our operations.

While experts believe the southeastern United States will receive about the same or more rainfall on average in the future, that rainfall will likely be provided in more severe storms and flooding events with more severe and prolonged droughts in between. This new pattern of rainfall will impact the yield of OWASA's and the region's reservoirs and the patterns of water demand including the water used for irrigation and cooling. As a result, OWASA and our utility neighbors must address the resiliency of water supply and storage, especially for periods of severe and extended droughts as well as the capacity of our reclaimed water system, which may face higher peak demands.

OWASA worked with our utility neighbors through the Jordan Lake Partnership (JLP) to develop the Triangle Regional Water Supply Plan to ensure all Partners have sufficient and reliable water supply through 2060. The JLP also contracted a regional interconnection study to evaluate the interconnection capacity of our drinking water systems and to identify needed infrastructure improvements to meet future needs. The JLP has been reorganized as the Triangle Water Supply Partnership (TWP). The TWP is building on the work of the JLP, updating the interconnection model, and will use it to run planning scenarios to identify strategies to improve the region's resiliency to planned and unplanned water supply challenges. OWASA is updating its Long-Range Water Supply Plan (LRWSP) to ensure we have water to meet our needs for the next two generations through 2070.

Our climate change planning to date has focused on drought management planning and natural disaster emergency preparedness. However, large rain events could result in greater flooding of our infrastructure. While our infrastructure has been designed to meet certain flood events, the frequency of those events could increase in the future. Recognizing this potential change in rainfall trends, OWASA took a new approach to evaluate rainfall data in order to select an appropriate design storm as part of our wastewater collection system model update in 2019. Prior to the 2019 update, the past 65 years of rainfall data had been used to identify the design storm used for modeling; however, looking at that data on a 30-year rolling average basis revealed a compelling trend of increasing frequency of large storm events over the past several decades. As such, OWASA has chosen to run the current gravity sewer hydraulic model with a 10-year design storm based on the last 30 years of rainfall data. The new design storm has a higher 24-hour rainfall volume as compared to the design storm historically used to model the collection system.

In addition to regularly occurring rainfall events, hurricanes and other storms could also damage critical infrastructure. OWASA plans for forecasted events, and coordinates emergency planning with our neighboring communities and other utility partners in North Carolina. Additionally, OWASA has evaluated our risk profile for natural hazards, such as hurricanes, through the America's Water Infrastructure Act (AWIA) requirements. As part of these AWIA requirements, OWASA evaluated the impact of hurricanes on the resiliency of the Cane Creek Reservoir Dam and the University Lake Dam. The Risk and Resiliency Plan that was certified and sent to EPA on December 22, 2020 recommends continuing our current activities, such as maintaining the dam Emergency Action Plans and performing routine inspections.

Climate change also has potential implications on the quality of the water in our reservoirs. With temperature change and impacts on rainfall, we could experience more frequent algal blooms in our reservoirs and potential increases in taste and odor events and cyanotoxin concentrations. (Cyanotoxins are toxins produced by blue-green algae and were responsible for the City of Toledo's "Do Not Use" warning in 2014.)

OWASA continues to monitor climate change science, and we participate in applied research projects with universities, other utilities, and other agencies where applicable, to proactively plan to meet the community's water and wastewater needs in the face of increasing climate variability. Nonetheless, we would benefit as an organization and community to take a strategic approach to the impact of climate change on our overall mission that considers compounding situations and those that might fall just outside of obvious consideration.

Regulations

OWASA monitors the regulatory arena closely so we proactively ensure we can meet all legal requirements applicable to the provision of water, wastewater, and reclaimed water services to our customers. Many of these potential regulations would impact our drinking water supplies and treatment facilities. Potential regulations are included for trends where they are applicable in this Strategic Trends report.

Technology and Research

OWASA stays informed about advancements in technology and research, their capital and operating costs, and ability to better position us to provide services to our customers in a more sustainable manner. OWASA often partners with local university researchers, professional associations, and our consultants to obtain information on how emerging technologies may apply specifically to OWASA. Technologies that OWASA is monitoring are described in applicable sections of this Strategic Trends report. General information on our use of university research, professional associations, and consultants is provided below.

University Partnerships

OWASA often partners with our local universities to evaluate emerging technologies. We have provided water and wastewater samples to local universities to test emerging technologies; during the pandemic, we began providing wastewater samples for COVID-19 surveillance, which provides early warning to

public health officials where more outbreaks may occur. The North Carolina Department of Health and Human Services has developed a dashboard to aid in communications with the public regarding COVID-19.

We have supported university classes by providing data. One effective use of university research is through our membership in the Urban Water Consortium, a group of twelve of the largest water utilities in the state. Together these twelve utilities pool their funds to bridge our research needs with university expertise. Some of the current research funded through this consortium is included in applicable sections of this report.

Professional Associations

OWASA is a member of various water and wastewater organizations, and our employees review their publications and attend their conferences. Staff regularly meet with other utility staff locally, throughout the southeast region, and nationally through these memberships; these contacts with other utility staff enable us to stay abreast of the latest technologies that work in our region to better meet our water, wastewater, and reclaimed water needs. Some of the industry trends noted by attending these conferences and interacting with staff from other utilities are:

- Renewal and replacement of aging infrastructure
- Asset management
- Conservation and reclaimed water to meet the needs of growing populations with existing water resources
- Emergency preparedness
- Public understanding of the value of water
- The need to attract, train, and retain staff and utility management and leadership
- Excellence in customer service and public awareness of water issues
- Cybersecurity
- Climate risk and resiliency
- Energy management
- Compounds of emerging concern

Several of the national organizations develop annual reports that often reiterate these industry trends and that we use to evaluate OWASA's practices; the latest annual reports provide information regarding pandemic response along with other industry challenges:

- AWWA's State of the Water Industry Report – this report is based on an annual survey of utilities to identify and track challenges facing the water industry, provide data and analysis to support water professionals, and inform decision makers and the public of challenges facing the water industry
- AWWA's Benchmarking Report – AWWA summarizes performance results provided by water and wastewater utilities in quartiles. OWASA participates in AWWA's benchmarking surveys and has used the results of the Benchmarking Report as goals in several of the trends presented in this report.

- Association of Metropolitan Water Agencies (AMWA) Annual Report - this report is focused on regulatory issues, but AMWA also supports scientific research, collaboration, and sustainable utility practices. The latest report focuses on pandemic response, extreme weather, cybersecurity, and social equity.
- The National Association of Clean Water Agencies, Water Environment Federation and Water Environment Research Foundation Water Resources Utility of the Future – this report was first developed in 2013 to recognize that water and wastewater utilities were identifying themselves as resource managers rather than waste managers. One trend that the latest Utility of the Future (2015) recognizes is that utilities in the United States are beginning to expand their use of technologies used in other countries. This 2015 report also notes how partnerships between utilities, consulting engineers, government, and finance are used to move utilities forward. This report has been replaced by the Utility of the Future Today Recognition Program. OWASA was recognized by this program for its organizational culture and energy efficiency programs.

The American Water Works Association (AWWA) sponsors the Partnership for Safe Water and the Partnership for Clean Water. The Partnership for Safe Water is a voluntary effort for water utilities to optimize their treatment and distribution system processes to help ensure the production and delivery of safe water to all users that go beyond regulatory measures. The OWASA Jones Ferry Water Treatment Plant was the ninth plant in the nation and first in North Carolina to achieve the highest level of recognition with the Phase IV Excellence in Water Treatment Award. This level of excellence has been maintained for ten consecutive years. (OWASA has maintained Phase III or higher for 16 years). In 2016, OWASA received the Presidents Award under the Partnership for Safe Water for its distribution system and has continued to maintain this status. The Partnership for Clean Water is a parallel program that focuses on wastewater treatment plant optimization, effluent quality and energy savings. This program was established in 2016. The OWASA Mason Farm Wastewater Treatment Plant completed the initial self-assessment phase, which is currently under review by the Partnership Review Committee.

The Water Research Foundation (WRF) also maintains a website that summarizes current research on topics important to water utilities including per and poly-fluoroalkyl substances (PFAS), cyanotoxins, fluoride, and taste and odor.

The U.S. Environmental Protection Agency (EPA) and six major water and wastewater associations developed a Primer on Effective Utility Management which was written to guide utility managers to make effective changes to achieve excellence in meeting their core missions. This primer is being used as one tool to guide OWASA's update to its Strategic Plan described earlier.

The State Water Infrastructure Authority was created by the North Carolina General Assembly in 2013 to assess and make recommendations about the water and wastewater infrastructure across the state. The Authority finalized the Infrastructure Master Plan in 2017. The report notes that in order for a water utility to be viable, it must exhibit best practices around infrastructure management, organizational management, and financial management. OWASA employees regularly attend meetings with staff of the State Water Infrastructure Authority to stay updated on their recommendations.

Engineering Consultants

OWASA hires engineering firms to plan, design, and construct our infrastructure. These engineering firms design and construct similar infrastructure throughout the region and nation. We hire them for their expertise; based on our specific requirements and circumstances and their experiences with different technologies, they recommend technologies that will best meet our needs.

Other Important Utility Planning Issues

This section includes a brief overview of other utility planning issues in which OWASA is currently engaged which support our mission and the values included in the Strategic Plan. This section is not intended to be a comprehensive overview of utility planning issues.

Energy Management

Strategic Initiative Number 4 in OWASA's Strategic Plan is to implement an Energy Management Program. OWASA requires significant energy to operate our water, wastewater and reclaimed water facilities, protect the environment, and provide service to about 86,300 residents in the Carrboro-Chapel Hill community. In Calendar Year 2020, our facilities used about 59 billion BTUs of energy – enough to power about 1,600 homes for a year. That energy came at a cost of $1.1 million.

In a move to improve our environmental impact, reduce a significant operating cost, and increase the resiliency of our organization, the OWASA Board of Directors established the following energy management goals and objectives.

1. Reduce use of purchased electricity by 35 percent by the end of Calendar Year (CY) 2022 compared to CY 2010 baseline;
    a. Progress: In CY 2020, OWASA used 32.5 percent less electricity than in CY 2010.
    b. In 2020, OWASA made significant progress on installing solar photovoltaics at four OWASA facilities. One 150 kW (direct current) project (at the Biosolids Recycling Facility) was put online in November 2020. This system is net-metered behind the electric meter serving the off-site biosolids mixing tanks and will offset approximately 40 percent of electricity purchased from the electric grid. The remaining three projects will go online in 2021.
2. Reduce use of purchased natural gas by 5 percent by CY 2020 compared to CY 2010 baseline;
    a. Progress: Achieved! In CY20, OWASA used 27 percent less natural gas than in Calendar Year 2010.
3. Beneficially use all wastewater treatment plant (WWTP) biogas, provided the preferred strategy is projected to have a positive payback within the expected useful life of the required equipment, and formally engage local governments and partners in discussion about potential development of a biogas-to-energy project at the Mason Farm WWTP
    a. Progress: We have determined that there is no cost-effective strategy that we can pursue on our own at this time. We are currently using half of the biogas in a boiler that heats anaerobic digesters (see progress on natural gas goal).

OWASA has an active Energy Management Program designed to systematically identify and evaluate energy management to achieve our objectives. We consider the social cost of carbon in evaluating economic efficiency. Our progress is a result of our investment in energy efficient equipment (blowers, pumps, drives, and motors), lighting, HVAC units and solar arrays. It is also a result of our community's enhanced commitment to water conservation and efficiency. Less water use equals less energy use.

This Strategic Trends report includes information on electricity and natural gas use for OWASA's operations for trends where it is appropriate. We are not tracking vehicle fuel use by functional area and are not reporting that energy use in this Strategic Trends report.

Safety

Safety is the number one priority of every member of the OWASA team. We are dedicated to reducing injuries, accidents and ensuring compliance. We achieve this by fostering a culture focused on awareness and safe work methods and by providing high-quality training, comprehensive workplace evaluation and emergency response.

Staff continually evaluate methods to improve our processes. We routinely perform after action reviews following small and large events. The after action review process identifies what happened, what we set out to accomplish, what worked well, and where we can improve.

Much of the information contained in this Strategic Trends report helps us ensure we are providing the community with safe drinking water and protecting both public health and the environment through successful wastewater conveyance, treatment, and recycling or reuse.

Source Water Protection

Description

Our community has a long history of taking progressive actions to ensure the health and safety of our drinking water supplies. Since it began operations in 1977, OWASA has understood that to protect the water source, you must protect the watershed, and we have been actively involved in a wide range of watershed protection efforts, such as:

- Limits on the extension of water/sewer service into the Cane Creek Reservoir and University Lake watersheds;
- Support for comprehensive protection through zoning and land use controls;
- Restrictions on in-lake recreational activities;
- Special technical studies and educational activities;
- Land acquisition through the strategic purchase of property or conservation easements in areas determined to be critical for water quality protection; and
- Managing healthy forests.

This section of the report focuses on land acquisition, monitoring and technical studies, and OWASA's forest management program. OWASA spent $7.8 million on land protection between 1991 and 2006 through purchase and conservation easements, and grant funds covered $3.0 million of these costs. (Note: these costs have not been adjusted for inflation and do not reflect ancillary expenses for legal, survey, appraisals, other site work, or administrative costs of OWASA staff time).

Land acquisition was among the options evaluated in the University Lake watershed management study and plan commissioned in the late 1980s. Water quality modeling indicated that permanently protecting 2,900 acres (approximately 15 percent) of the watershed would have only slight water quality benefits and not justify the multi-million-dollar cost, but that selected land acquisition in critical areas of the watershed may be appropriate. This recommendation was later confirmed in a follow-up analysis, which found that land acquisition would probably not be effective, but a possible exception may apply to undeveloped land very near the lake, and that conservation easements along stream buffers would be particularly valuable near the downstream ends of tributaries as they approach University Lake.

Based on these technical recommendations, OWASA elected not to pursue a widespread program of land or easement acquisition in the University Lake watershed, but to consider land preservation opportunities on a case-by-case basis. In 2006, OWASA purchased a 73-acre property along Morgan Creek immediately upstream of University Lake (with the help of a $1.2 million NC Clean Water Management Trust Fund grant). This property was placed under a permanent restrictive conservation easement that protects all riparian areas and greatly limits future development; subdivided into two large tracts; and re-sold on the open market in 2011 – with all restrictions in place.

The primary recommendations in a 1996 study of the Cane Creek Reservoir watershed included large lot (5 acres or greater) residential re-zoning and the permanent protection of 1,265 additional acres of

watershed land either through purchase of land or acquisition of conservation easements to limit development and protect critical riparian buffers. OWASA adopted those recommendations as goals for the protection of Cane Creek Reservoir and subsequently protected an estimated 1,050 acres of additional Cane Creek Reservoir watershed land through purchase or acquisition of conservation easements. Since 1997, Orange County's Land Legacy Program and other groups also acquired protective conservation easements on an additional 360 acres in the Cane Creek Reservoir watershed. Together, OWASA and Orange County's land protection efforts have exceeded OWASA's original goal. OWASA and Orange County staff continue to work closely in coordinating the needs of our respective programs as the County protects additional land in the watershed and elsewhere. OWASA also continues to seek cost-effective protection opportunities and worked with a neighboring landowner to permanently protect 5.4 acres of riparian buffer areas in fiscal year (FY) 2021.

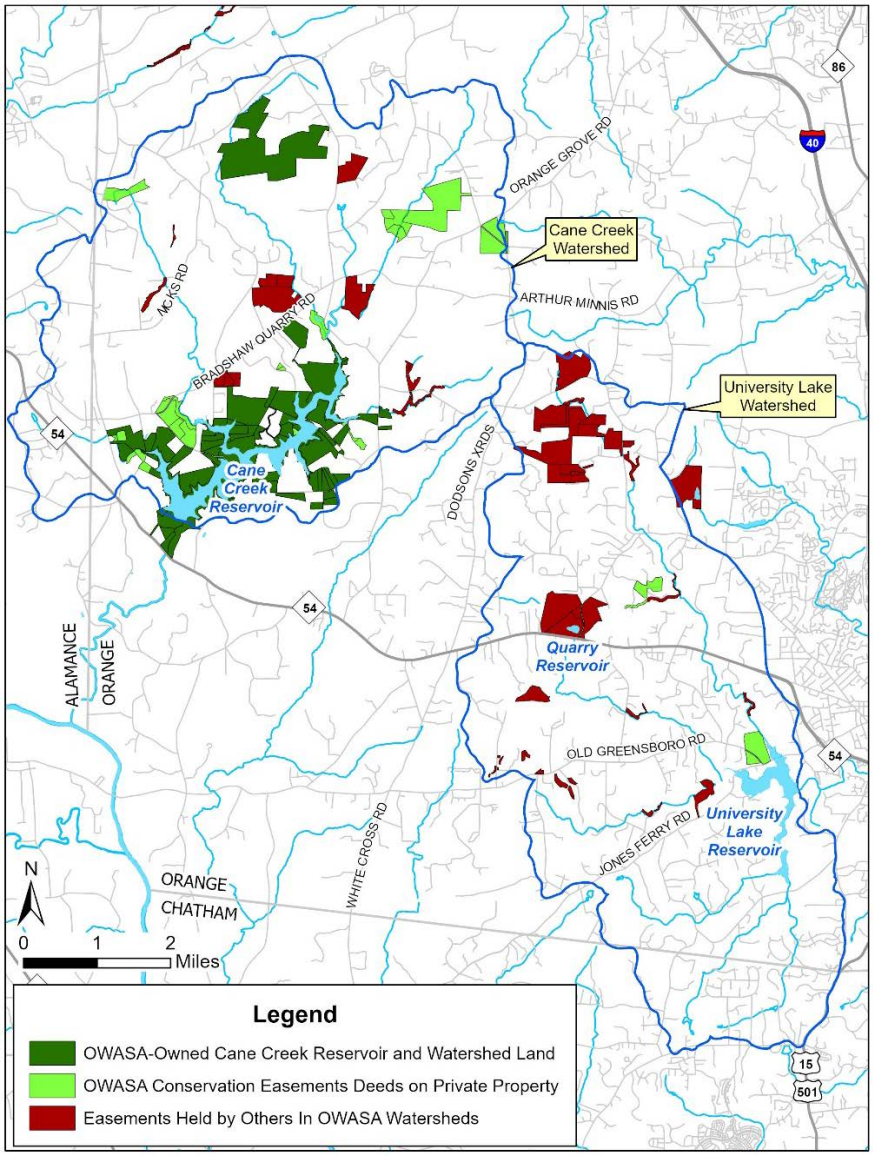


Figure 3. Protected Land in OWASA's Watersheds – Approximately 10 percent of our watershed lands are located outside Orange County, where less stringent controls apply.

Water Quality Monitoring

OWASA is a founding member of and actively participates in the Triangle Area Water Supply Monitoring Project (TAWSMP), which is an interlocal water quality monitoring and research project implemented in collaboration with the US Geological Survey (USGS). This Partnership began in 1988. The TAWSMP samples area water supply reservoirs and some of their key tributaries to monitor water quality and parameters of emerging concern. The robust continuous dataset enables analysis and identification of trends in water quality. TAWSMP operates in multi-year phases. Scopes of work were developed for each phase of the TAWSMP which include parameters which remain the same from phase to phase such as nutrients, chlorophyll *a*, major ions, and total suspended solids as well as parameters of interest for that particular phase.

The USGS published Trends in Water Quality of Selected Streams and Reservoirs Used for Water Supply in the Triangle Area of North Carolina, 1989-2013 in July 2018. The USGS evaluated land cover, nutrients, and other parameters for statistical trends over the 25-year period. The results of that trend analysis were summarized in OWASA's 2018 Strategic Trends Report.

An important consideration for long-term watershed protection is how a changing climate may impact water supply water quality and potential treatment needs. Warmer temperatures and changing hydrology will impact the frequency, type and extent of algal blooms in our drinking water reservoirs, but there are several key unanswered questions. Will we need to install advanced treatment technologies in our WTP to reduce public health risk from algal toxins? Are there any effective in-lake management measures (such as mixing) that will reduce the frequency and severity of algal blooms and other water quality problems? What are the costs, effectiveness, and energy requirements of those measures? How are future declines in water quality likely to keep us from maximizing the reliable yield of our water supply reservoirs? Unfortunately, these are not questions that can be addressed by quickly evaluating water quality monitoring data on an annual basis. Staff have been in communication with university researchers who have expertise in characterizing algal blooms, and in particular, cyanobacteria (also sometimes called blue-green algae). These questions are not unique to OWASA, so we have reached out to other utilities and agencies to explore opportunities to collaborate on targeted research to better understand and address these issues, perhaps through one or more of our existing partnerships, such as the Urban Water Consortium or the Triangle Water Supply Monitoring Program. Due to other priorities and pandemic, little progress has been made on this potential initiative.

Forest Management

OWASA owns approximately 2,400 acres of forested lands, the majority of which is in the Cane Creek Reservoir watershed. Sustainable forest management facilitates protecting our water supply and provides other environmental benefits such as reducing the risk of wildfire and providing wildlife habitat. OWASA has seven guiding principles for its forest management program:

- Protect water quality, OWASA's highest priority;
- Improve ecological health of forested land;
- Reduce the risk of wildfire;

- Improve wildlife habitat and species diversity;
- Sustainably manage OWASA's resources;
- Engage the community and partner agencies; and
- Minimize adverse impacts on neighbors and surrounding community

OWASA has been actively managing its Cane Creek Mitigation tract, an area of approximately 500 acres in the northern portion of Cane Creek Reservoir watershed for about ten years. OWASA completed forest stewardship plans for Meadow Crest North and Meadow Crest South in 2020 located on either side of Teer Road and will begin implementing those plans in FY 2022. OWASA will develop a forest stewardship plan for its Teer West property on Flatrock Road in FY 2022.

Regulations

- There is ongoing research at the federal and state level regarding per- and poly-fluoroalkyl substances (PFAS) in drinking water. PFAS are present throughout the environment because they are highly persistent and have been widely used for decades, including in industrial applications, household and consumer products, food packaging, and firefighting foams. GenX is one of the PFAS compounds that was found in the City of Wilmington's water supply, and PFAS has also been found in the Town of Pittsboro's water supply. EPA released a PFAS Strategic Roadmap in October 2021 that summarizes how the agency plans to address PFAS through 2024. This Roadmap is an integrated approach that is using several federal statutes to address PFAS including the Safe Drinking Water Act; Clean Water Act; Comprehensive Environmental Response, Compensation and Liability Act; and the Toxic Substances Control Act. The comprehensive plan includes strategies to address PFAS before they enter the environment, improve our understanding of PFAS and their impact on human health and the environment through monitoring, develop guidance on disposing of PFAS, and develop technologies to reduce PFAS already in the environment. The North Carolina General Assembly appropriated $5 million in Summer 2018 to test raw water at public water supplies across the state for PFAS and included air quality sampling because air emissions can transport PFAS in the environment. The universities conducting this monitoring delivered a final report to the General Assembly in April 2021; however some work is continuing including analysis of the second round of samples. When raw water samples were collected from OWASA's water supplies, staff also collected paired raw water samples and a treated drinking water sample for analysis by our contract laboratory. OWASA completed special monitoring for PFAS in our raw water, drinking water, Morgan Creek, and in our wastewater treatment plant effluent after researchers from Duke University found some of those substances in our drinking water. Further information was provided to the Board of Directors on February 22 and March 8, 2018. OWASA's Natural Resources and Technical Services Committee discussed PFAS and source water protection in November 2018. To better understand the range and variability of PFAS levels present, OWASA collected samples of raw water at Cane Creek Reservoir intake and of the drinking water leaving our Jones Ferry Road WTP quarterly beginning in 2019 and this monitoring continues. The fifth Unregulated Contaminant Monitoring Rule (UCMR5), the primary way the EPA gathers occurrence data on compounds it is considering regulating, will include 29 PFAS compounds. OWASA's

monitoring efforts thus far provide a good baseline of expected levels for most PFAS compounds included in UCMR5. Several compounds have not been included in previous monitoring efforts but will be included beginning in FY 2022. In addition to the UCMR, EPA is also evaluating PFAS through the Toxic Substances Control Act; OWASA is following each of these federal and state initiatives.

- The Long Term 2 Enhanced Surface Water Treatment Rule (LT2) builds upon the 1996 amendment to the federal Safe Drinking Water Act to strengthen protection against microbial contaminants, especially *Cryptosporidium*. OWASA completed the first round of monitoring for *Cryptosporidium* and *E. coli* in our source waters in 2009. As a result of this monitoring, OWASA was placed in the lowest treatment category, which requires no additional treatment. Staff completed the second round of two years of monthly monitoring of Cane Creek Reservoir and University Lake in August 2017. Based on the round 2 results, OWASA remains in the lowest treatment category and will not be required to provide additional filtration treatment. Staff completed a round of monthly sampling of the Quarry Reservoir in January 2020; these results are also within the lowest treatment category range.
- The EPA required monitoring for some cyanotoxins by all large utilities and some small utilities as part of UCMR4. OWASA conducted this monitoring April-July, 2020. Although this monitoring consisted of sampling the treated drinking water, raw water is the source of these compounds. Since 2016, OWASA has monitored for three cyanotoxins in our raw water, treated drinking water, and within our treatment process. This monitoring serves as an early warning of actual conditions in our lakes. Further information on our cyanotoxin monitoring is provided in the Water Treatment Plant: Peak Day Drinking Water Demands trend.
- OWASA follows developments regarding pharmaceuticals and personal care products in drinking water, wastewater, and reclaimed water. These products enter wastewater systems through excretion, disposal of unused medicine in sinks or toilets, and personal care products washed from skin and hair. They can also be present in runoff from livestock operations and subsurface discharges from onsite wastewater systems (septic tanks). Cane Creek Reservoir and University Lake watersheds are highly protected, and no treated municipal or industrial wastewater is discharged within our local water supply watersheds. However, there are livestock operations, private septic systems, and biosolids applications in both watersheds. A 2007 study by the U.S. Geological Survey of local untreated (or raw) water sources including Cane Creek Reservoir and University Lake tested for pharmaceuticals. In this study, one pharmaceutical (acetaminophen) was detected in one sample from Cane Creek Reservoir; all other results from OWASA reservoirs were below the detectable levels. OWASA does participate in EPA monitoring efforts of unregulated contaminants. This tool is used to improve drinking water quality standards by collecting data on compounds that are suspected to be present in drinking water, but do not yet have health-based standards set under the Safe Drinking Water Act. Pharmaceuticals and personal care products have not been included in this program to date, and there are no federal requirements for them.
- In accordance with direction from EPA, the North Carolina Department of Environmental Quality (DEQ) is developing draft nutrient criteria for surface waters in the state. If nutrient levels in one or more of our water supply reservoirs, Morgan Creek, and/or other surface waters in our area exceed future nutrient-related water quality limits, we and/or other parties could be required to reduce the

discharge of nutrients into those water bodies. The technical, economic, and environmental feasibility of complying with such requirements can only be determined once proposed criteria are issued.

- The North Carolina General Assembly ratified House Bill 894 in August 2014 to improve Source Water Protection in response to the accidental release of 4-methylcyclohexanemethanol in West Virginia and the coal ash spills in North Carolina. Subsequently, the North Carolina Commission for Public Health adopted rules that require all public water supplies which use surface water to develop a Source Water Resiliency and Response Plan (SWRRP). The regulations state that public water supplies that are required to complete a risk and resilience assessment (RRA) and a subsequent emergency response plan (ERP) under America's Water Infrastructure Act (AWIA) comply with the state's SWRRP requirements (see next bullet on AWIA for more information on those requirements).
- AWIA requires water systems to prepare an RRA and ERP. The RRA is to evaluate risks from natural hazards and malevolent acts, the resilience of source water, treatment, and conveyance facilities, monitoring, and financial infrastructure. The ERP evaluates strategies to improve the resiliency of the system including physical and cyber security, requires procedures to implement to respond to natural hazard or malevolent acts, and practices that can reduce the impact of an event. OWASA certified its RRA on December 22, 2020 and the ERP on June 17, 2021, thus meeting the federal submittal requirements of AWIA and state requirements for SWRRP.

Technology and Research

- The 2016 General Assembly directed the UNC Collaboratory to evaluate water quality and nutrient management strategies in the Jordan and Falls Lake watersheds; a final report on Jordan Lake was issued in December 2019. These studies could result in new management strategies in the Jordan Lake watershed which could impact OWASA operations. The North Carolina Division of Water Resources (DWR) is using the information from the Collaboratory studies to develop a nutrient management strategy through an integrated management approach called One Water. Staff stay updated on the work of the Collaboratory and the Jordan Lake One Water initiative and have provided data to some of the researchers. A One Water Vision report was published in September 2021 which outlines three goals of the Jordan Lake One Water Initiative around the three pillars of sustainability:
    1. Environmental – to improve the hydrological and ecological function of the Jordan Lake watershed.
    2. Societal – to enhance the health, vitality, and well-being of all residents and communities within the Jordan Lake watershed.
    3. Economic – to foster a robust, prosperous, and viable economy in the Jordan Lake watershed.

  The report also includes a recommendation to define a Jordan Lake One Water organization to review, compile, and refine a list of strategies and a recommendation to co-develop a framework for collaboration between Jordan Lake One Water and the North Carolina Department of Environmental Quality to address regulatory concerns.

Energy Management

Energy use to manage OWASA's lands is minimal and consists of fuel needed for travel and equipment to manage the land.

Strategic Plan Elements

Strategic Initiative 6 includes a goal that states, "Land assets provide the expected value to fulfill OWASA's mission and the assets are effectively managed". OWASA has started an incremental approach to manage its forests, and the guiding principles are included above; healthy forests help protect long-term water quality in the reservoir.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Since OWASA met its watershed protection goals for land acquisition, we are not actively seeking or funding additional land conservation. However, we will continue to evaluate cost-effective land acquisition opportunities through conservation easements or purchase when available.	Ongoing	X	
2. Consider updating 1996 Cane Creek Reservoir Watershed Study	After completion of LRWSP and as part of next Strategic Plan	X (as part of budget)	
3. Inspect conservation easements on private land to make sure owners are following the terms of the easement	Annually		X
4. Update AWIA RRA and ERP to meet federal requirements; these requirements meet DEQ's SWRRP requirements.	Dec 2025 for RRA and June 2026 for ERP		X
5. Continue quarterly sampling for PFAS at Cane Creek Reservoir intake and in drinking water leaving plant. Evaluate data and identify any next steps.	Ongoing		X

Raw Water Supply and Long-Range Water Supply Plan

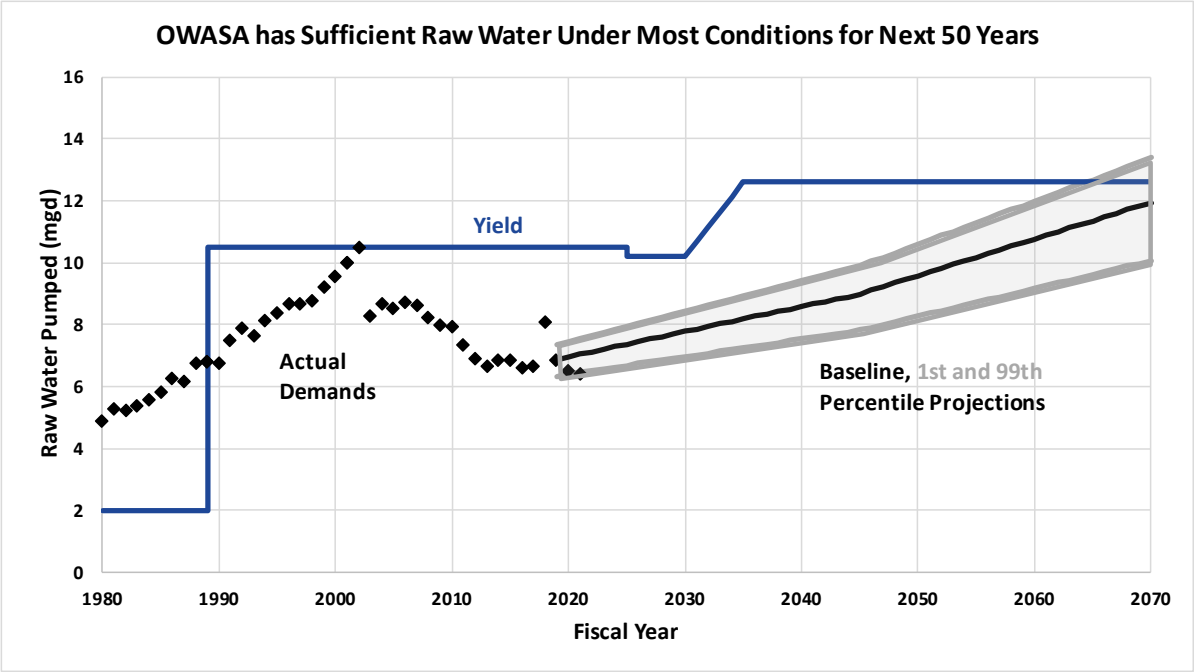


Figure 4. OWASA's Water Supply Yield and Demands

Description: This trend evaluates the supply (reliable yield) of our locally-owned upland water sources – Cane Creek Reservoir, University Lake, and the Quarry Reservoir – and historic raw water demands and estimated future raw water demands. (Since we do not have permanent facilities and/or agreements in place to access Jordan Lake, Figure 4 does not include our Level I Jordan Lake water storage allocation of about 5 million gallons per day (mgd). We can access this allocation through Town of Cary and City of Durham on a limited, emergency basis.)

Key Observations:

- The annual average-day amount of water we pumped from reservoirs has declined substantially since peaking in FY 2002.
- Annual average-day raw water demands are now at the same level they were in the early-1990s, shortly after Cane Creek Reservoir was placed into service. This has occurred despite over a 60 percent increase in the number of customer accounts during that period.
- Key factors in the reduction in water withdrawal rates include:
    - Increased water use efficiency and conservation by our customers;
    - Conservation pricing and conservation ordinances, including year-round restrictions;
    - Implementation of a process water recycling system at the drinking water treatment plant (2002), which reduced annual average-day raw water withdrawals by about seven percent;

- Implementation of the reclaimed water system in partnership with UNC (2009), which now meets about eleven percent of the community's annual average-day water needs (see Drinking Water and Reclaimed Water Sales trend).
- Higher density development which typically results in lower per capita demands.

- Raw water demand was lower than anticipated in FY 2021, but the pandemic resulted in reduced water demands.
- Raw water demand was higher than expected in FY 2018, because we provided water to the City of Durham while they were working on their WTPs. If we had not transferred this water, our average raw water demand would have been approximately 6.9 mgd, the same level it was in FY 2015 and FY 2019.
- OWASA is updating its Long-Range Water Supply Plan (LRWSP), and Figure 4 shows the updated raw water demand projections developed as part of that project. Because we know that there is significant uncertainty when projecting growth and water demands 50 years, we developed a range of projections as shown by the grey lines in Figure 4; these represent the 1st and 99th percentile projections that resulted when we varied assumptions and ran the model 5000 times. Further information on the methodology is in this report.
- As part of the LRWSP update, a sensitivity analysis was performed on the yield; depending on the parameter changed, our estimated yield after the Quarry Reservoir expansion is completed and full in approximately 2035 will range from 11.5 to 15 mgd.
- We anticipate that OWASA's current and planned locally-controlled water supply sources will meet most customer demands through the next thirty to forty years and under most circumstances over the next 50 years.
- We anticipate that Jordan Lake or an alternative source are expected to be needed to reduce risk to acceptable levels, particularly given the uncertainty of climate change on the frequency and severity of droughts. Demand management measures will not meet long-term needs on their own, but will be an important component of OWASA's water conservation program.

Regulations

Regulations concerning our raw water supply are described in the Source Water Protection section.

Technology and Research

Information on technology and research concerning our raw water supply is included in the Source Water Protection section of this report.

Energy Management

As shown in Figure 5, total kilowatt-hours (kWh) of electricity used to pump our raw water to the treatment plant was 27.5 percent less in 2020 than in 2010. Energy use in 2017 and 2018 was higher than prior years since we provided drinking water to the City of Durham while they were upgrading their water treatment plants. In 2019, energy used to pump raw water dropped to normal levels overall, but fell in 2020 during the pandemic. The University Lake Pump Station underwent construction in 2019 and

early 2020, which resulted in a significant drop in use and, subsequently, electricity use. To compensate, our use of the Cane Creek Pump Station increased. The University Lake Pump Station improvement project was completed in 2020 and this pump station is now more energy efficient than the one at Cane Creek.

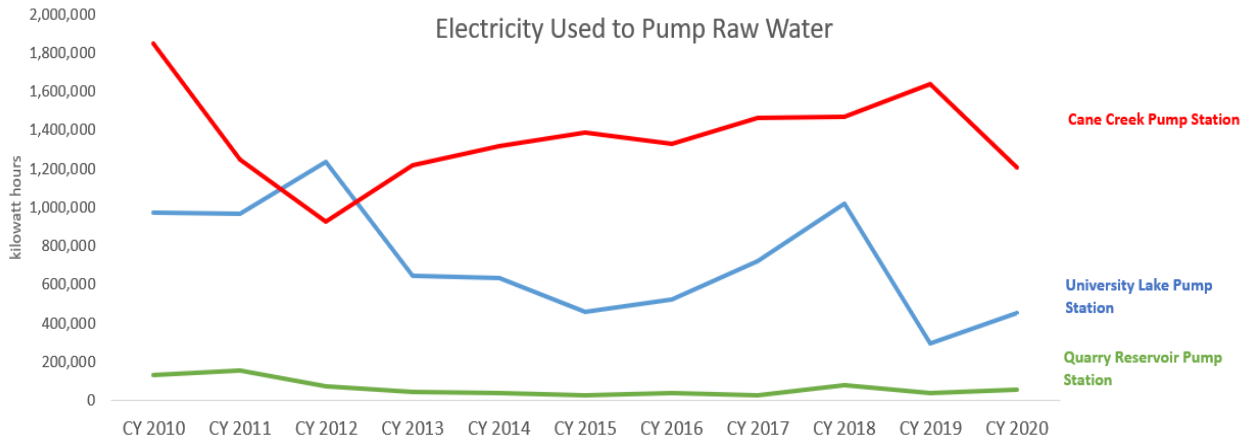


Figure 5. Electricity Used to Pump Raw Water.

The 2020 Energy Management Plan Update identified two upcoming Capital Improvement Projects that have potential to further decrease the amount of energy used for raw water pumping: the Cane Creek Raw Water Transmission Main study (271-05), and the Cane Creek Pump Station Improvement project (270-16).

Strategic Plan Elements

This trend is directly related to updating the LRWSP, Strategic Initiative 1. Updating the LRWSP will also engage the community (Strategic Initiative 2), and the technology of advanced metering infrastructure (AMI, Strategic Initiative 5) may help detect and address leaks sooner which would reduce raw water demand. It also is related to Strategic Initiative 3 in that we want to invest in any new water supply at the right time to sustain the community's drinking water supply.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. In future years, update calculations to estimate yield and estimate raw water demand projections when warranted (e.g., when new drought of record occurs [impacts yield], service area boundaries change, local governments or UNC revise growth projections).	Review when warranted – likely every 5 to 10 years	X	
2. Continue to proactively plan and account for uncertainty, including increasing climate variability, through a diversified water supply and demand management portfolio.	Ongoing –as part of LRWSP update	X (as part of LRWSP update)	
3. Continue to partner with neighboring utilities to evaluate a potential new intake and WTP on the west side of Jordan Lake, evaluate new agreement options which guarantee access to Jordan Lake, and continue with mutual aid agreements as part of update of LRWSP.	Ongoing (as part of LRWSP update and participation in Western Intake Partnership planning activities)	X	
4. Develop Water Conservation Plan.	Now through spring/summer 2022	X	
5. Identify potential energy savings opportunities for raw water pumping in Energy Management Program.	Ongoing	X (as part of Energy Mgmt Plan)	

Quarry Reservoir Storage Volume

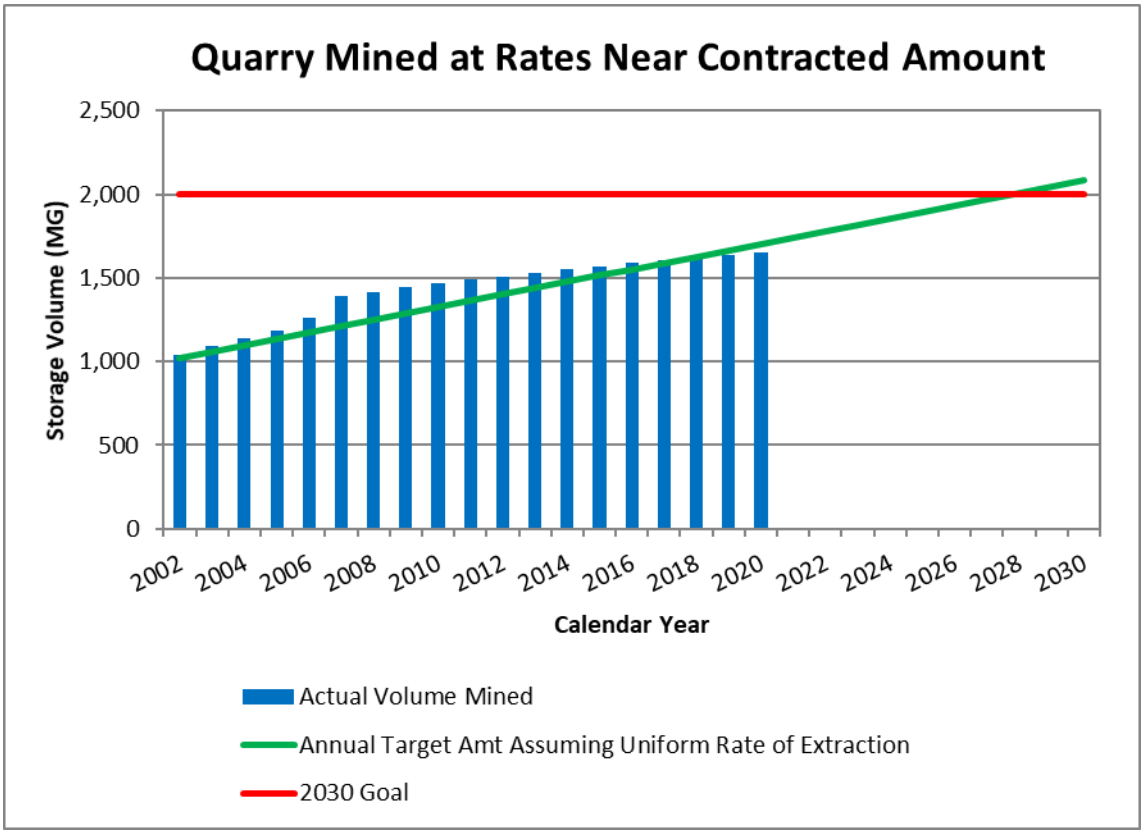


Figure 6. Quarry Mining Rates

Description: In accordance with an agreement with OWASA, Martin Marietta (formerly American Stone Company) is mining rock from OWASA-owned land adjacent to our Quarry Reservoir. Per that agreement and the requirements of Orange County's Special Use Permit that authorized expansion of the quarry, mining operations must cease by 2030, after which OWASA will begin to fill the expanded quarry with water from Cane Creek Reservoir. In 2025, OWASA will drain the existing Quarry Reservoir so Martin Marietta can join it to their existing mining operation during the final years of their permit. Martin Marietta is required to remove enough stone to ensure the expanded quarry (including OWASA's existing Quarry Reservoir at 0.2 billion gallons (BG)) will store at least 2.2 BG of water. This trend evaluates whether the quarry is being mined at rates which will meet that minimum water storage capacity requirement.

Key Observations:

- The actual volume mined is slightly less than the annual target assuming a uniform rate of extraction. However, the contract does not require Martin Marietta to meet the uniform target in any given year. Extraction rates meet the contractual requirements.

Regulations

There are no regulations to report for the quarry. However, OWASA will perform microbial monitoring on the expanded Quarry Reservoir as soon as it is put into service, and DEQ may need to approve it as a water supply source. Adding a new, permanent water supply source may impact the frequency of monitoring for compounds which OWASA was previously granted reduced monitoring status based on results trends (e.g., lead and copper monitoring). Staff has completed LT2 monitoring of the Quarry Reservoir, and more information is included in the Source Water Protection section.

Technology and Research

There are no updates in technology to report for the quarry.

Energy Management

The existing Quarry Reservoir is used only during extreme droughts or other emergencies. We periodically test the pumps to ensure they are ready in time of need. As a result, our energy use at the Quarry Reservoir is negligible (see Raw Water Supply and Long-Range Water Supply Plan trend).

Strategic Plan Elements

The Quarry Reservoir is an essential part of OWASA's water supply portfolio and is tied to Strategic Initiative 1, "Provide reliable and high quality supply of water for the next 50 years".

Actions Needed

		Board Action?	
Action Items	**Timing**	**Yes**	**No**
1. Continue to monitor the annual rate of rock excavation at the quarry to ensure contractual requirements are met.	Annual		X
2. Maintain and follow the Quarry Reservoir implementation checklist in order to ensure timely implementation of the Quarry Reservoir water storage project once mining ceases in 2030.	Ongoing		X
3. Begin draining existing Quarry Reservoir to enable Martin Marietta to connect the current mine site with the existing Quarry Reservoir.	CY 2025		X

Water Treatment Plant: Peak Day Drinking Water Demands

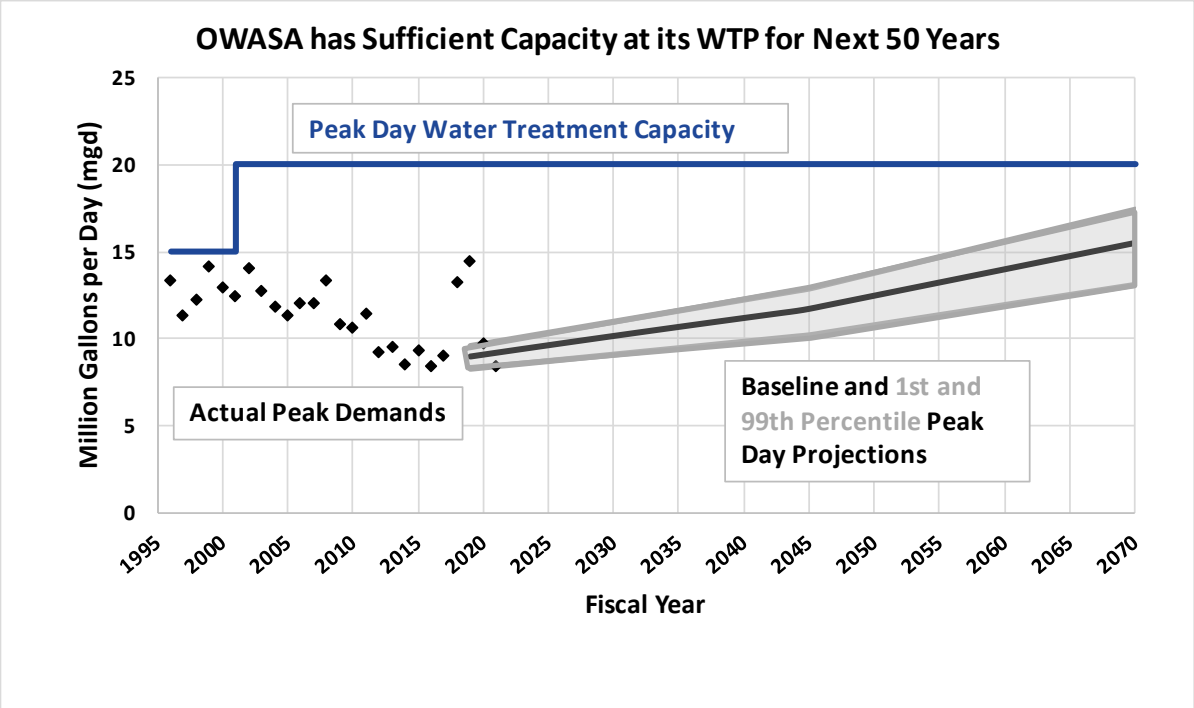


Figure 7. WTP Capacity and Peak Day Drinking Water Demands

Description: This trend evaluates peak day drinking water demands and compares those demands to the 20 mgd rated capacity of the Jones Ferry Road Water Treatment Plant (WTP).

Key Observations:

- Since FY 1999, the year with the highest peak day demand under normal operations, peak day drinking water demands have declined by 41 percent despite a 32 percent increase in customer accounts over that same period. (See comments regarding peak demands in FY 2018 to FY 2021 in bullets below).
- This decline has resulted from the following primary factors: (1) our customers are using water more efficiently, (2) we have adopted conservation pricing and conservation ordinances including year-round water use restrictions, and (3) since March 2009, reclaimed water has been used instead of drinking water to meet certain non-drinking water needs at several UNC facilities that have high summer season demands (cooling towers and irrigation).
- The peak day drinking water demands indicate that we have adequate capacity in our WTP for the next 50 years even when accounting for uncertainty in our demand projections.
- There was a decrease in peak day drinking water demands between FY 2020 and FY 2021; this could be partially due to changes in water demands due to the pandemic. The pandemic resulted in UNC, area schools, and commercial use decreasing and residential use increasing. In addition, there was wetter, cooler weather on average in FY 2021.

- There was a significant increase in peak day drinking water demands in FY 2018 and FY 2019 compared to the recent past. OWASA provided drinking water to Durham while they had one WTP offline in FY 2018 and were making improvements at their second WTP; we provided some water to Durham in FY 2019 as well. The reason for the increased peak day in FY 2019 was the water main break on November 5, 2018. If OWASA had not had the main break, our peak day demand would have been 8.6 mgd, comparable to earlier years.

(NOTE: The projections presented above assume that the reclaimed water system is in service throughout the peak day demand season. Peak day drinking water demands would be considerably greater if the reclaimed water system is out-of-service.)

Regulations

- The 1996 amendments to the federal Safe Drinking Water Act require that monitoring be completed for a list of unregulated contaminants every five years. EPA uses the data collected to determine if any of these contaminants should be regulated. As part of the third round of monitoring, called UCMR3, OWASA participated in the Assessment Monitoring of 21 contaminants from November 2013 through August 2014. OWASA monitoring consistently detected the following three unregulated contaminants: chromium-6, strontium, and chlorate (see next bullets). As part of the 4th round of this monitoring (UCMR4) OWASA participated in required monitoring for 30 parameters including cyanotoxins, pesticides, and disinfection by-products from August 2019 through July 2020. UCMR4 monitoring nationwide is occurring between 2017 and 2021. OWASA monitoring detected manganese in half of the samples and consistently detected unregulated disinfection byproducts (see next bullets).
- EPA has set the maximum contaminant level (MCL) of total chromium (i.e., all forms of chromium) at 100 µg/L but has not yet published a drinking water standard for chromium-6. Before issuing any regulation of chromium-6, EPA must issue a final human health assessment for chromium-6 which has not yet occurred. The state of California adopted a chromium-6 MCL of 10 µg/L, which became effective on July 1, 2014; but on May 31, 2017 the Superior Court of Sacramento County issued a judgment invalidating the MCL; the State Water Board published a white paper on the economic feasibility of a chromium 6 MCL in February 2020 and anticipate a proposed rulemaking in late spring or early summer 2021. However, it is worth noting that the California MCL for total chromium is half the federal level (50 µg/L). During UCMR3 monitoring for chromium-6, levels between < 0.03 - 0.06 µg/L were detected in OWASA's treated drinking water. These levels are well below the now invalid California standard. OWASA and other members of the TAWSMP identified chromium-6 as a focus area for the current phase of water supply monitoring (see Source Water Protection section for a brief overview of the TAWSMP). As such, the US Geological Survey collected bi-monthly samples in our raw water supply sources beginning in August 2017. This monitoring was discontinued in August 2019 due to the very low number of detects and decision of the group that the resources could be better allocated. Analysis of data are ongoing.
- EPA has not yet published a drinking water standard for strontium, but has established a health advisory level of 1,500 µg/L. A health advisory level is a non-enforceable, non-regulatory federal

guidance which describes the concentration which can be consumed with little or no risk to health. OWASA's monitoring for strontium detected levels between 53 - 75 µg/L, well under the health advisory level. On March 10, 2020, the EPA provided an update on strontium in the Federal Register: "the Agency continues to consider additional data, consult existing assessments …, and evaluate whether there is a meaningful opportunity for health risk reduction by regulating strontium in drinking water. Additionally, the EPA understands that strontium may co-occur with beneficial calcium in some drinking water systems and treatment technologies that remove strontium may also remove calcium. The agency is evaluating the effectiveness of treatment technologies under different water conditions, including calcium concentrations."

- EPA has not yet published a drinking water standard for chlorate. The health reference level for chlorate is 210 µg/L. OWASA's monitoring for chlorate during UCMR3 detected levels between 160 – 650 µg/L. California has not set an MCL for chlorate but has set a notification level of 800 µg/L. The World Health Organization (WHO) guideline for chlorate is 700 µg/L. Chlorate is known to occur in drinking water because of the disinfection process and sodium hypochlorite (bleach) degradation. Concentration, long storage times, and temperature all contribute to the degradation of sodium hypochlorite. Following UCMR3, OWASA changed the concentration and reduced storage times of our bulk sodium hypochlorite. OWASA completed a two-year study to test the chlorate levels of our treated drinking water leaving the WTP and in the distribution system quarterly after implementing these changes and found an average decrease of 64 percent compared to levels measured as part of UCMR3. OWASA continues to measure chlorate levels both in the treated drinking water and in the distribution system quarterly. It is not uncommon for levels of chlorate in the summer to exceed the 210 µg/L health reference level despite changing our practices. OWASA will continue to follow this issue.
- PFAS are a family of man-made compounds containing fluorine and carbon. In 2016, EPA published an updated lifetime health advisory for two of these compounds, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), of 70 parts per trillion (ppt) for a combined concentration of PFOA and PFOS in drinking water. This level of 70 ppt was set to protect the most sensitive populations over a lifetime of exposure to the two contaminants. OWASA monitored for these substances in our treated drinking water as part of UCMR3; PFOA concentrations ranged from <0.02 ppt to 0.03 ppt, and PFOS was not detected. OWASA subsequently tested all our water supplies and our treated drinking water for a suite of PFAS in 2018 with lower detection limits. In light of these results, OWASA is continuing to sample our treated drinking water and raw water from Cane Creek Reservoir quarterly. Our use of powdered activated carbon in our treatment process remains effective at removing some but not all of these compounds. Levels of PFOS and PFOA remain well below the health advisory level. PFAS results are published on the OWASA website as a PFAS Monitoring Program interactive dashboard. In February 2020, the EPA made a preliminary determination to regulate both PFOS and PFOA in drinking water. The comment period on these preliminary determinations closed on June 10, 2020 and the agency is reviewing and considering the over 11,000 comments received. Since then, as part of the PFAS Strategic Roadmap released in October 2021, the EPA has proposed establishing these draft drinking water regulations by Fall 2023. The EPA is also asking for information and data on other PFAS and comments on potential

monitoring requirements and regulatory approaches for PFAS. The EPA has committed to including PFAS in UCMR5 and the proposed monitoring list includes 29 PFAS compounds.

- OWASA has historically met all disinfection by-product criteria applicable to our treated drinking water. Monitoring data indicates that we should continue to meet any criteria developed for disinfection by-products. Two groups of currently unregulated disinfection by-products were included in UCMR4 and OWASA consistently detected some but not all the compounds in these groups. Disinfection byproducts are produced from the reaction of disinfectants (chlorine or chloramines) with organic compounds that remain in the water after treatment. OWASA regularly achieves 80-95 percent removal of these organics compared to the 50-55 percent required removal. This high level of removal helps us achieve low levels of disinfection byproducts by limiting the concentration of one of the reactants.
- Cyanotoxins are toxins produced by cyanobacteria (also sometimes called blue-green algae) under certain conditions. These toxins can be harmful to the environment, animals, and human health; one was responsible for the City of Toledo's "Do Not Use" warning in summer 2014. In June 2015, EPA issued health advisories for two cyanotoxins: microcystin (1.6 µg/L for children 6 and up and adults and 0.3 µg/L for children less than 6 years old) and cylindrospermopsin (3.0 µg/L for children 6 and up and adults and 0.7 µg/L for children less than 6 years old). Establishing a monitoring program and benchmarks for when source and/or finished water should be analyzed for toxins provides a solid foundation for a cyanotoxin management approach. OWASA has proactively been monitoring algal cyanotoxins since 2007 in our finished drinking water using a contract laboratory when our cyanobacteria counts rise above 100,000 units/mL in the blend of University Lake and Cane Creek Reservoir water being treated. Additionally, beginning in the summer of 2016 staff began monitoring cyanotoxin levels at the intakes and through the treatment process on a weekly basis to gather baseline data on occurrence and removal. To date, OWASA has not exceeded the health advisory levels in our finished drinking water. In addition to microcystin and cylindrospermopsin, OWASA also monitors for anatoxin-a. Staff will continue to evaluate algal toxins (additional information provided in Treatment Technology section). OWASA monitored for some cyanotoxins as part of UCMR4 in our treated drinking water, and no samples had detectable levels.
- Manganese was included in UCMR4 and may be regulated in the future. Monitoring as part of UCMR4 detected manganese in two of four treated drinking water samples; results ranged from <0.400 to 0.998 µg/L. At this time, there is a secondary MCL, which is based on aesthetic concerns such as taste and discoloration not health effects, of 0.05 mg/L (or 50 µg/L). Additionally, there is a non-regulatory 10-day health advisory limit (based on short-term exposure for infants) for manganese of 300 µg/L. OWASA tests the manganese level in our treated drinking water annually using a certified contract laboratory and results are consistently below the detection limit of 10 µg/L. Additionally, WTP Operators measure manganese levels daily throughout the treatment process as part of their process control monitoring to ensure that manganese removal is occurring appropriately (note, these analyses are performed using an EPA approved method but are not performed by a certified laboratory). These levels are reported monthly to the State. Manganese occurs naturally in our reservoirs and the levels can be quite high. Because there are high levels in our source water, it would be possible for our treated water to exceed regulations. However, our

treatment process is effective at removing this metal. Manganese is insoluble in its oxidized form. Both permanganate and chlorine are strong oxidants that help remove manganese from our water during the treatment process.

Technology and Research

- In 2017, there were several incidents where OWASA's drinking water had taste and odor issues. While taste and odor compounds in the drinking water are not harmful, they are not pleasant and can affect customer confidence. OWASA purchased and started using a gas chromatograph/mass spectrometer in March 2019 which enables staff to test for the compounds in-house and receive results the same day or next morning. This has enabled us to swiftly adjust our treatment in response to higher levels of taste and odor compounds in our reservoirs thereby assuring aesthetically pleasing drinking water for our customers and optimizing our use of treatment chemicals. In January 2021, WTP staff tested the performance of several different powdered activated carbons after being notified that our vendor would no longer supply the product we had been using. Staff measured both organic carbon removal and removal of taste and odor compounds to identify the most suitable replacement product as well as a backup product. This equipment will also be useful for screening for other compounds of emerging concern in the future.
- OWASA evaluates the treatment technologies at our WTP to ensure we can meet any potential upcoming standards with current treatment technologies. OWASA can meet most of the potential standards discussed in the Regulations section. Staff continues to follow on-going research on this topic to ensure safe drinking water for our customers.
- Staff periodically evaluate the chemicals we use at the plant to ensure we are using the best available to meet our treatment goals in the most sustainable manner and to ensure that we do not foresee shortages in chemicals we use which could impact treatment or their price. At this time, staff believe we are using the correct blend of chemicals and no shortages are foreseen in their supply. The evaluation of different powdered activated carbons described above is an example.

Energy Management

In 2020, we used 18 percent less electricity at the Jones Ferry Road Water Treatment Plant (WTP) than we did in 2010. As with the energy use for raw water pumping, we used more electricity in 2017 and 2018 than we would have because we treated and pumped an additional 375 million gallons of drinking water for the City of Durham. Natural gas is used at the WTP to heat buildings, and our use of natural gas is largely driven by weather. The use of natural gas (therms) was about 17 percent lower in 2020 than it was in 2010, largely attributable to weather and minor operational changes.

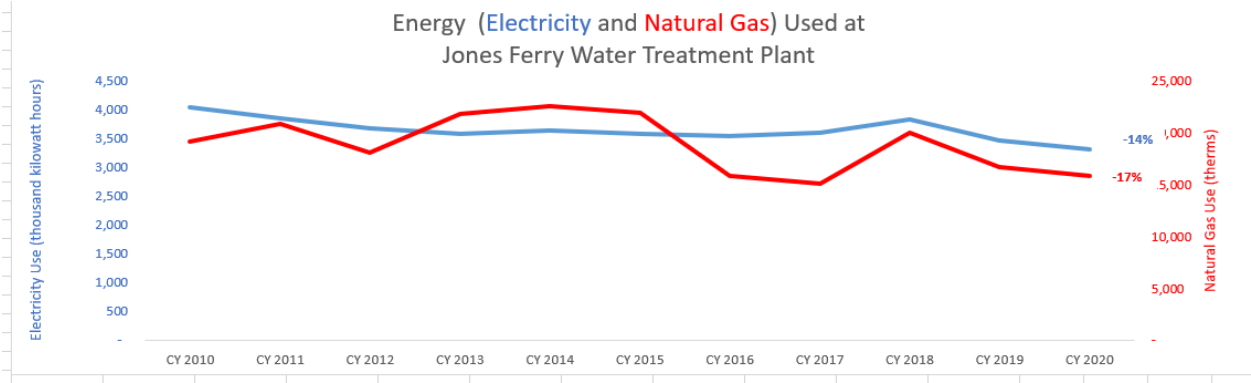


Figure 8. Energy Use at the Jones Ferry Road WTP

Strategic Plan Elements

Strategic Initiative 1 includes preparing a Water Conservation Plan. Conserving water will help reduce peak day and average day demands. The purpose of this document is to:

- Summarize existing policies, pricing structures and programs that incentivize water conservation and efficiency, as well as the use of reclaimed water
- Identify gaps and opportunities to advance water conservation, efficiency and reuse in a cost-effective manner

This plan is intended to serve as a complementary document to OWASA's Long-Range Water Supply Plan (LRWSP), Water Shortage Response Plan, Affordability Program Plan, Energy Conservation Plan and Communications Plan. This plan captures OWASA's current water conservation and efficiency practices and ensures that demand management elements of these plans are well-coordinated.

In addition, Strategic Initiative 3 includes a goal to invest at the right time in our community's water assets. Understanding the capacity of our WTP, the demands placed on it, and the potential implications of future treatment requirements will inform our CIP.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor peak day demands at the Jones Ferry Road WTP.	Annually		X
2. Continue to identify and pursue cost-effective opportunities for additional conservation or reclaimed water use, which help reduce peak demands.	As opportunities arise		X
3. Continue to monitor potential growth in our service area by working closely with Carrboro, Chapel Hill, and UNC to ensure we have sufficient drinking water treatment, pumping and storage capacity.	Ongoing		X
4. Continue to monitor our water and stay current with the potential new drinking water standards to ensure we can meet future requirements. Identify any studies or technologies needed to ensure we provide safe, high quality drinking water to our customers.	Ongoing		X
5. Continue to monitor treatment technologies and chemical use for potential to improve our level of service.	Ongoing		X
6. Identify potential energy savings opportunities for water treatment and pumping in Energy Management Program.	Ongoing	X (as part of Energy Mgmt Plan)	
7. Maintain performance goals within Partnership for Safe Water (see chapter on "OWASA's Planning Environment") for Phase IV Excellence in Water Treatment	Ongoing		X

Cumulative Number of Water Meter Equivalents (MEs)

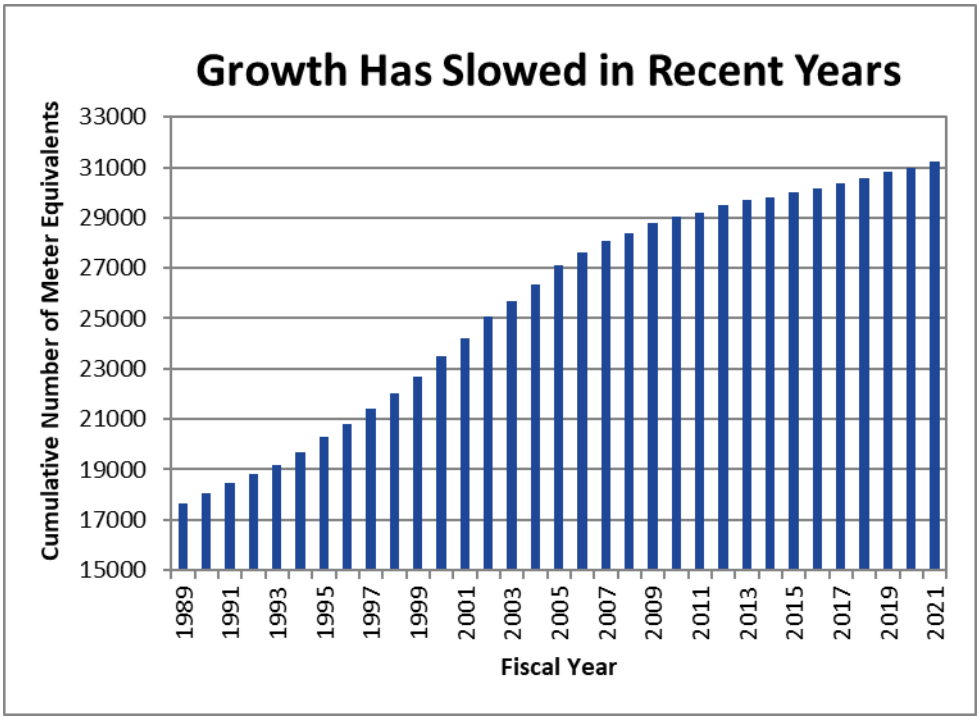


Figure 9. Number of Meter Equivalents Served by OWASA

Description: This trend evaluates the number of meter equivalents (MEs) served by OWASA. The smallest meters (5/8-inch) serve single family homes and small non-residential customers, while larger meters are used to serve locations with larger water demands. The capacities of larger meters are expressed in hydraulic capacity proportional equivalents of a 5/8-inch meter, or "meter equivalent". (For example, a 2-inch meter has a meter hydraulic capacity ratio of 8 MEs, and a 6-inch meter has an equivalency of 50 MEs.) The number of meter equivalents is an indicator of the rate of growth in customer demands in the service area.

Key Observations

- Growth in the service area is slower in recent years than in past.
- The number of meter equivalents has grown 38 percent since FY 1999, the year with our highest peak day drinking water demands (see Peak Day Drinking Water Demands Trend).

Regulations

There are no regulations to report for meter equivalents.

Technology and Research

There are no updates in technology to report for meter equivalents.

Energy Management

There is no energy use to report for meter equivalents.

Strategic Plan Elements

Understanding how growth is occurring in our service area allows us to plan for our water supply needs and treatment and conveyance capacity needs (as well as our wastewater collection and treatment capacity needs). These are related to Strategic Initiatives 1 (provide reliable and high quality supply of water for next 50 years) and 3 (adopt budget decision processes to ensure affordable services).

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor growth in service area by tracking new meter equivalents.	Monthly (for Dashboard report)		X

Drinking Water and Reclaimed Water Sales

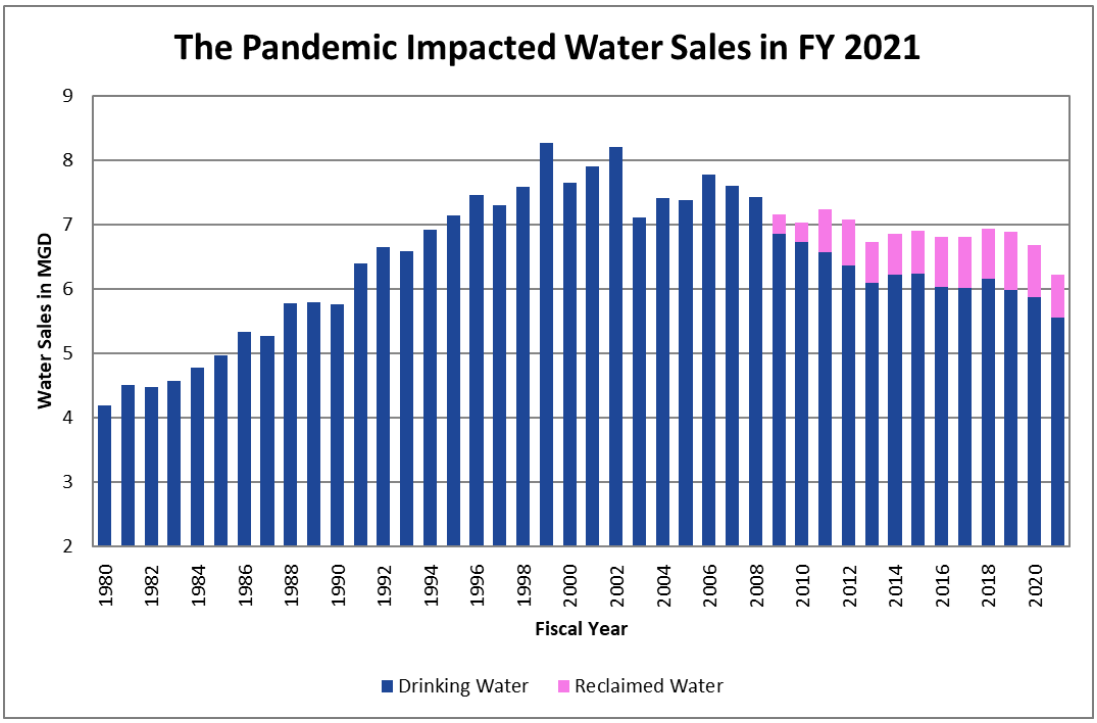


Figure 10. Annual Water Sales

Description: This trend evaluates average-day sales of drinking water and reclaimed water (in mgd) since 1980. (The reclaimed water system began operating in March 2009.)

Key Observations:

- OWASA's annual average drinking water sales volume has declined despite growth in the service area as shown in the Meter Equivalents trend. Drinking water sales volume is currently at about the same level it was 30 years ago.
- Total annual water sales volume (including reclaimed water) is 25 percent less from the peak in FY 1999, despite a 32 percent increase in customer accounts during that same time period. Drinking water sales volume declined 33 percent over that same period.
- Water sales in FY 2021 were lower than anticipated due to the impacts of the pandemic on water demands. The pandemic resulted in UNC, area schools, and commercial use decreasing and residential use increasing.
- Reclaimed water met about 11 percent of the community's water needs in FY 2021 based on sales volume.

Regulations

There are no regulations to report for drinking water volume sales. For regulations on reclaimed water, see Reclaimed Water section.

Technology and Research

In accordance with Strategic Initiative 5, OWASA installed advanced metering infrastructure (AMI) with early leak detection; installation was completed in June 2019. During FY 2021, the Agua Vista Web Portal provided alerts to 8,582 customers. Of those notifications, customers confirmed leaks in 8,457 instances. In these cases, leaks were repaired within 318 hours of starting (note: typically leak lasts for approximately 72 hours before alert provided unless there is larger continuous water usage). The average leak was 318 gpd and that amount is influenced by larger leaks detected at the UNC chiller plants, hospital, and other multi-family residential buildings and irrigation systems. If allowed to continue for 35 days until a customer received a bill, each one of these leaks would have wasted an average of approximately 11,000 gallons more of water than occurred with AMI. If these trends continue, the early leak notification services provided by AMI will help avoid a measurable, but modest amount of wasted water use.

Energy Management

Energy used to pump drinking water is shown in the Peak Day Drinking Water Demands section.

Strategic Plan Elements

The Water Conservation Plan or demand management strategies evaluated in the update to the LRWSP (Strategic Initiative 1) may result in reduced drinking water demand. This in turn would impact revenue, which would be addressed through the financial management policies included in Strategic Initiative 3. Financial reserves help OWASA meet its financial obligations during times of reduced water demand such as may occur during drought conditions.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to identify cost-effective opportunities to expand the reclaimed water system which will help reduce our community's risk to drought, extend the capacity of the WTP, and optimize the use of our locally-controlled water supplies.	As opportunities arise		X
2. Continue to identify cost-effective and customer-accepted opportunities for additional conservation.	Ongoing	X (as part of Conservation Plan)	

Average Monthly Water Use and Billed Amount

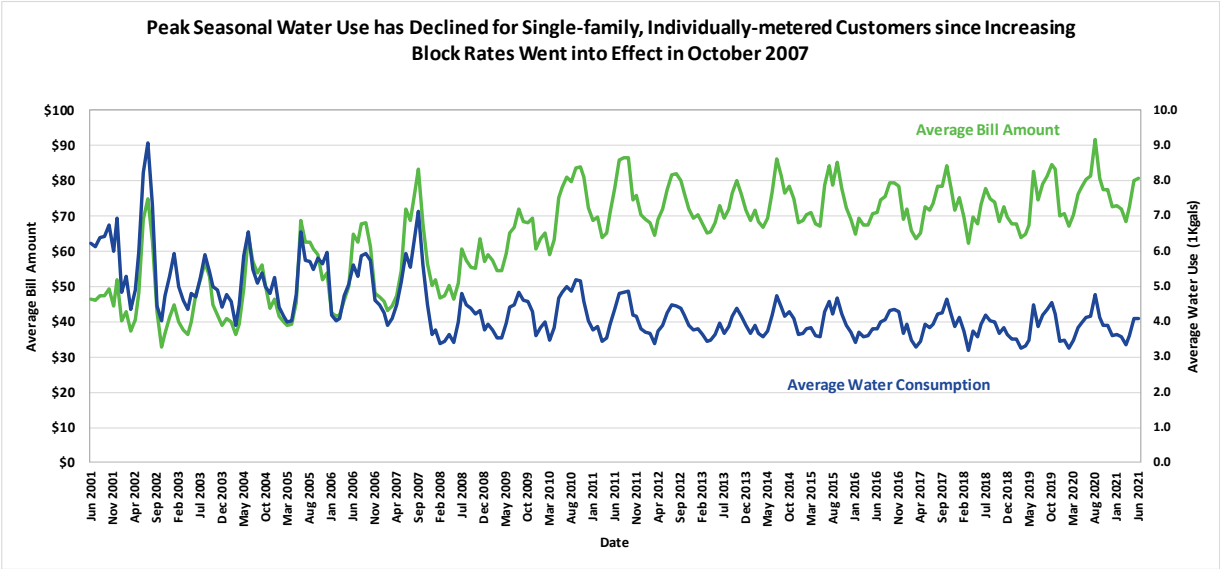


Figure 11. Single Family Residential Water Use

Description: This trend evaluates average monthly water use and the average monthly water and sewer charges for single-family, individually-metered residential customers.

Key Observations:

- Peak seasonal water use by this group of customers has declined, particularly after OWASA's increasing block rates went into effect in October 2007. This indicates that outdoor water use for single-family, individually-metered residential customers has diminished and implies a relationship with the change in our water rate structure.

Regulations

There are no regulations to report for water use.

Technology and Research

In accordance with Strategic Initiative 5, OWASA completed installation of advanced metering infrastructure (AMI) throughout our service area in 2019. AMI allows OWASA and our customers to detect leaks earlier and is likely to have a measurable, but modest impact on overall system demand.

Energy Management

Energy used to pump drinking water is shown in the Peak Day Drinking Water Demands section.

Strategic Plan Elements

The Water Conservation Plan and demand management strategies evaluated as part of the LRWSP (Strategic Initiative 1) may result in reduced drinking water demand. This in turn would impact revenue, which would be addressed through the financial management policies included in Strategic Initiative 3. Financial reserves help OWASA meet its obligations during times of reduced water demand such as may occur during drought conditions.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to track this trend to determine whether water use is increasing.	Annual		X

Physical Interconnection Capacity and Average Annual WTP Demands

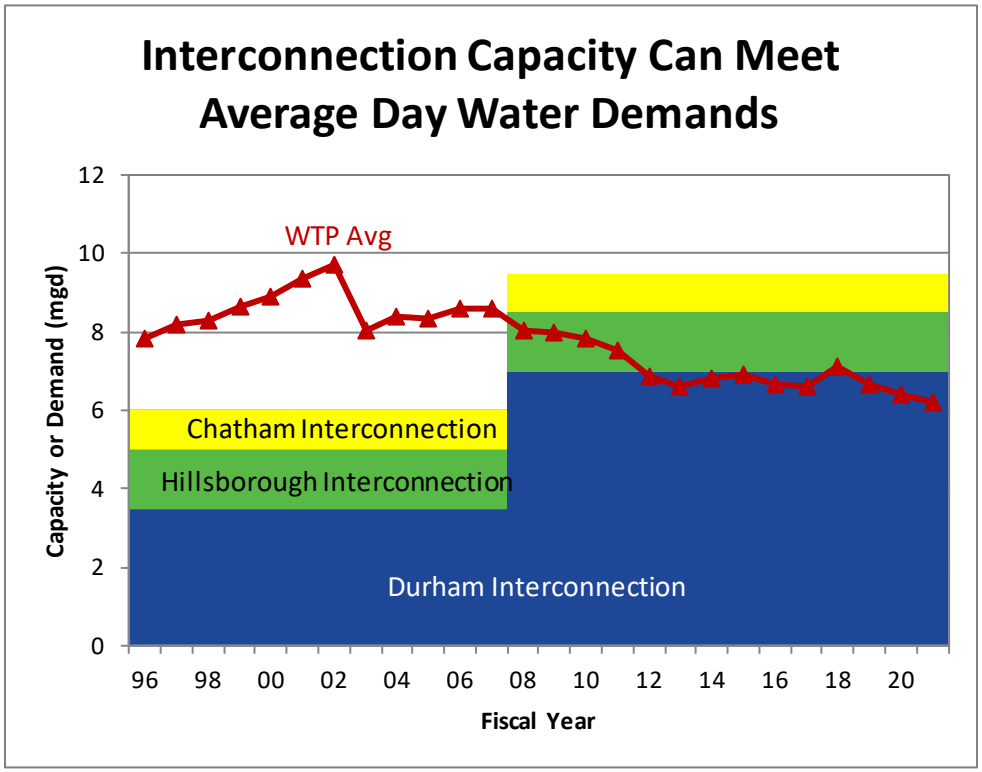


Figure 12. OWASA's Interconnection Capacity

Description: This trend evaluates the ability of OWASA's drinking water system interconnections with neighboring communities to meet average-day drinking water demands during planned or unplanned events that could affect our ability to treat and deliver water to our customers.

Key Observations:

- OWASA's existing physical interconnections are of sufficient capacity to meet average-day drinking water demands.
- Our drinking water system interconnections with the City of Durham have a combined capacity of about 7 mgd.
- We can receive about 1.5 mgd through our interconnection with the Town of Hillsborough, which was confirmed during recent testing.
- OWASA also has an interconnection with Chatham County. OWASA can receive approximately 1 mgd through this connection based on modeling analyses; during the November 2018 water emergency we received approximately 1.3 mgd from Chatham County.

- The combined capacity of our interconnections is about 9.5 mgd, which is about 154 percent of our FY 2021 average-day drinking water demands and about 139 percent of our FY 2021 water demands including reclaimed water.

Regulations

There are no regulations to report for interconnections.

Technology and Research

OWASA is a member of the Triangle Water Supply Partnership (TWP), which is updating a regional interconnection model to use for regional emergency planning such as what might happen if the region lost one of its main raw water supplies or water treatment facilities. As part of this model update, OWASA's interconnections with the City of Durham at I-40 and with Chatham County were field tested.

Energy Management

Energy used to pump water at our interconnections is negligible under most conditions; however, it would increase considerably when we are obtaining drinking water from a neighboring utility depending on the amount of water needed and the length of time it is needed.

Strategic Plan Elements

While Strategic Initiative 1 does not directly include operational emergencies, our interconnections help us meet our water supply needs for short periods if something happened to our raw water supply, treatment plant or distribution system.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. OWASA should continue to monitor this trend to ensure that average-day drinking water demands could be met through water system interconnections with our neighboring utilities.	Annual		X
2. Re-evaluate the capacity of system interconnections to ensure changes in system facilities and demands have not adversely affected our ability to import an adequate supply of drinking water to meet average-day demands during an emergency.	Periodically as needed		X
3. Perform field tests on all interconnections to ensure proper operation, train staff, and confirm capacity.	Periodically, in coordination with utility neighbors		X
4. Continue to work with TWP to update and use regional interconnections model for planning purposes to improve regional reliability and resiliency.	Ongoing		X

Drinking Water Distribution System Integrity

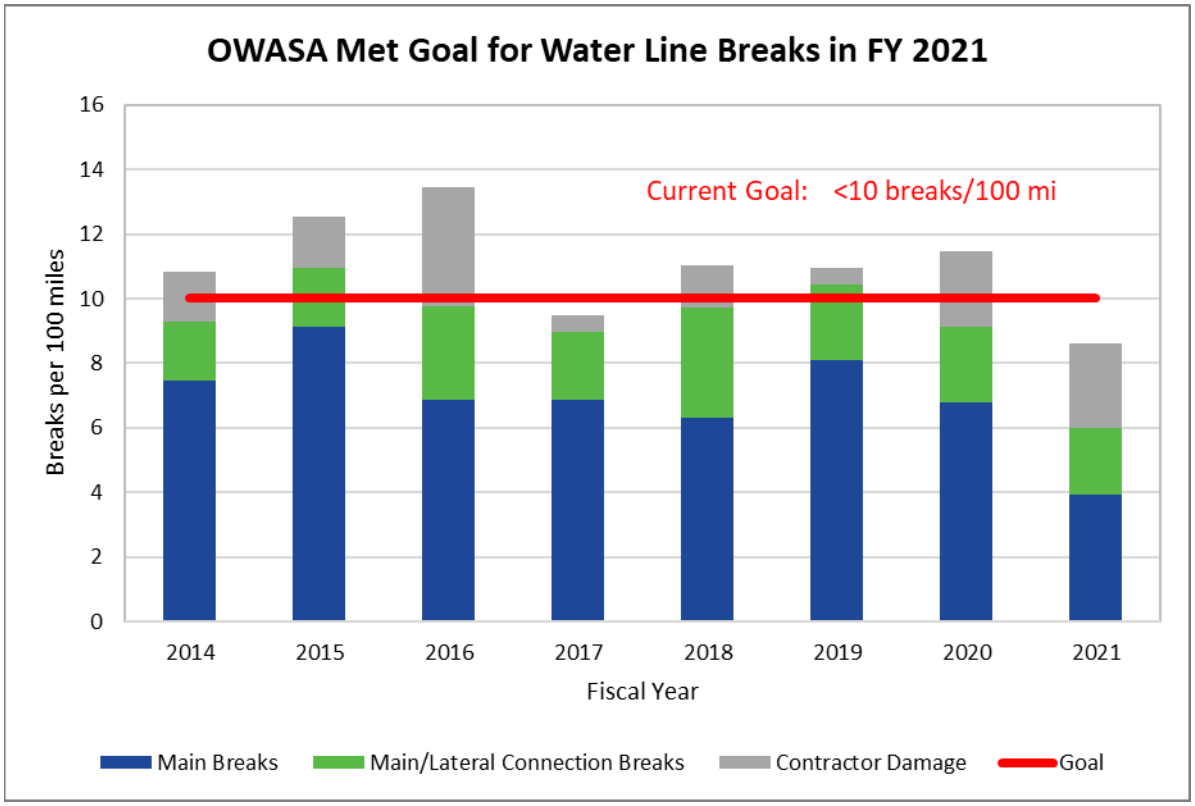


Figure 13. Historic Water Line Breaks

Description: This trend evaluates the number of water main breaks per 100 miles of water mains and connections with service lateral lines. These are important indicators of the integrity of our drinking water distribution system. It also includes information on lines damaged by contractors; while that metric does not impact the integrity of our water distribution system, there is an impact on our customers and thus we include contractor damage in this trend.

Key Observations:

- We had fewer water main breaks than our goal of 10 main breaks or less per 100 miles of pipeline, which is based on a goal selected by the Board of Directors at its December 10, 2020 meeting. That goal is based on OWASA's historic breaks, break rates from other local utilities, and a large study which evaluated rates in the United States and Canada. (Note: In prior reports we used goals which changed annually based on the American Water Works Association's annual benchmarking report).
- OWASA experienced a water main break outside its Jones Ferry Road WTP on November 5, 2018 resulting in a system-wide boil water advisory. To improve the reliability and resiliency of our water system, OWASA has completed a major update of our risk-based water main prioritization model; is collaborating with UNC and UNC Hospitals on resiliency solutions; inspecting all valves; and investing in rehabilitation and replacement projects through the capital improvements program.

Regulations

Public water systems, including community water systems such as OWASA, are required under Federal and state law to test for lead in drinking water collected from customers' homes as part of the Lead and Copper Rule. Samples must be collected from homes that meet criteria set by the EPA; these criteria identify "high priority" homes that are most likely to have elevated lead levels. OWASA tests for lead in drinking water in 30 homes built from 1983 to 1985 that have copper pipes with lead solder every three years. The most recent round of monitoring ended September 30, 2020. In advance of expected changes as part of the Lead and Copper Rule Revisions (LCRR) we requested that our contract lab analyze all samples with lower reporting limits and all 30 samples had no detectable lead (<0.001 mg/L). In the previous round of monitoring, completed September 30, 2017, only one sample had a measurable level of lead. The LCRR was published in the Federal Register January 15, 2021 however the EPA has since delayed the effective date and compliance date to allow time for the new administration to review the Rule and seek further public input. Currently, the effective date is December 16, 2021 and the compliance date is October 16, 2024. Staff is monitoring the latest status of the LCRR and taking proactive steps to ensure our continued compliance including developing a draft service line inventory and opportunistically spot checking that inventory. Staff also plans to work with a consultant to guide the overall compliance with the LCRR. OWASA also provides testing of our drinking water for lead at no charge when requested by a customer.

Technology and Research

Technologies exist to assess the condition of pipe, monitor system pressure and detect leaks. The recently completed Water Main Prioritization Study, in conjunction with the updated risk framework for distribution system pipes, evaluated the applicability of currently available technology and recommended a programmatic strategy for the optimal use of condition assessment technologies and procedures, system monitoring (pressure monitoring), and leak detection to help refine our understanding of system integrity and ultimately inform investment decisions about pipe replacement and other actions.

Due to the cost and complexity of performing assessments on in-service pressurized pipes, water main condition assessment is typically focused on pipes identified as high risk by a prioritization model. However, OWASA's options are limited due to the prevalence of asbestos cement (AC) pipe, which does not lend itself to non-destructive condition assessment technologies. The condition of AC pipe can only be assessed by removing sections of pipe and having those analyzed. Done as a standalone activity, this assessment process can be very costly, can disrupt service to customers, and runs the risk of degrading the integrity of the pipe. Therefore, we have been implementing an opportunistic condition assessment program that capitalizes on events where our pipes have been exposed during construction activities or while repairing breaks and leaks. Pipe samples, soil samples, and corrosion potential measurements are taken during these events and inform a database of information staff uses to assess the general condition of adjacent pipes. To date, 10 different AC pipe samples and 17 soil samples (both from breaks and from taps) have been analyzed. As more pipe and soil samples are collected, we plan to develop a

baseline for pipe that will illustrate the characteristics of pipe that still have service life available and those who are nearing replacement.

For metallic pipes, insertion of a camera is the simplest method to assess the pipe condition; however, the resulting assessment is qualitative (i.e. good, fair, poor). Typically, a visual inspection does not provide sufficient information on pipe condition because it does not provide information on the strength of the pipe or on external conditions which may lead to pipe failure (e.g. external corrosion, bedding condition, or utility crossings). This method of assessment tends to cost more per linear foot and has a lower accuracy than other assessment methods.

Pressure monitoring for overall system monitoring is often an overlooked technology that can assist with the management of the distribution system. High pressures and pressure surges may be indicators of issues that can increase the likelihood of failure of water mains. Early detection of pressure events can reduce the consequence of the event by reducing response time and identifying potentially affected customers. OWASA currently has no formal pressure monitoring or leak detection program, but we do monitor the distribution system pressure at nine locations in addition to the WTP. The current locations include three storage tanks, three booster pump stations and three other locations throughout the distribution system. OWASA is currently evaluating the possibility of expanding our current pressure monitoring network through the installation of temporary devices or permanent devices.

Detecting leaks can help identify conditions that may cause breaks; however, not every leak will cause a break (i.e. complete structural failure) and not every break is caused by a leak. Furthermore, water loss is not a significant issue in our system, so identifying and repairing leaks will not appreciably reduce unaccounted for water. Leak detection tends to have a moderate cost and accuracy, relative to other technologies. Recent studies have recommended that leak detection be a part of OWASA's distribution system monitoring plan. Staff will continue to evaluate this technology as methods evolve and budgets allow.

Energy Management

As reported in the Peak Day Drinking Water Demands section, over half of the energy used at the WTP is actually for pumping drinking water into the distribution system and for maintaining system storage levels to maintain pressure and meet peak demands. In addition, we use energy to pump finished drinking water into a higher pressure zone. Combined, these two uses of energy account for approximately 11.7 percent (1.9 million kWh) of the energy we used in 2020. Other energy is fuel for vehicles and equipment used to maintain our drinking water distribution system.

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. For water distribution system integrity, our ability to program the right investments at the right time is primarily a function of the output of our distribution

system prioritization model, a data-driven risk prioritization framework that provides a structured approach to prioritizing assets based on likelihood of failure (LoF) and consequence of failure (CoF). Each year, prior to the Capital Improvements Program (CIP) budget development, this model is updated to incorporate data from the prior year's water main breaks and updates within the distribution system in order to reassess our understanding of risk prioritization and replacement needs. The model output is not used to predict precisely where breaks will occur but rather to reveal patterns in the LoF and overall risk; implementation considerations and engineering judgment are also necessary to define and prioritize water main replacement projects for inclusion in the CIP.

The model will always be evolving with staff providing insight and updates to reflect changes in the distribution system as well as periodic adjustments to the weighting values for the LoF and CoF components. Staff will continue to review and assess the model's effectiveness at providing decision support for our highest priority distribution system replacement needs.

The model does not incorporate either contractor-caused breaks or breaks related to service laterals; subtracting these events out of the data summarized in Figure 13 (shown at the start of this section) results in a total of around 25 breaks per year that could be used to assess the model's effectiveness. Because of this, it is expected that it will take several years to accumulate enough data to provide meaningful assessment. The model indicates that the majority of the pipe segments within the distribution system are of the lowest and low LoF.

Figure 14 shows a scatter plot of the LoF and CoF output of the model as it was run in March 2021. Each blue dot represents one of the 46,419 pipe segments in the distribution system. Note that pipe segments which have identical scores (for example, if multiple pipes were scored with CoF = 8, LoF = 3.5) are displayed as a single dot, which makes it difficult to visualize the true distribution of scores from this run: Lowest (36%), Low (40%), Moderate (20%), High (3%), and Highest (1%). It is also important to note that the blue dots are not static: the model's output will change slightly over time due to incorporation of new break data and other dynamic factors.

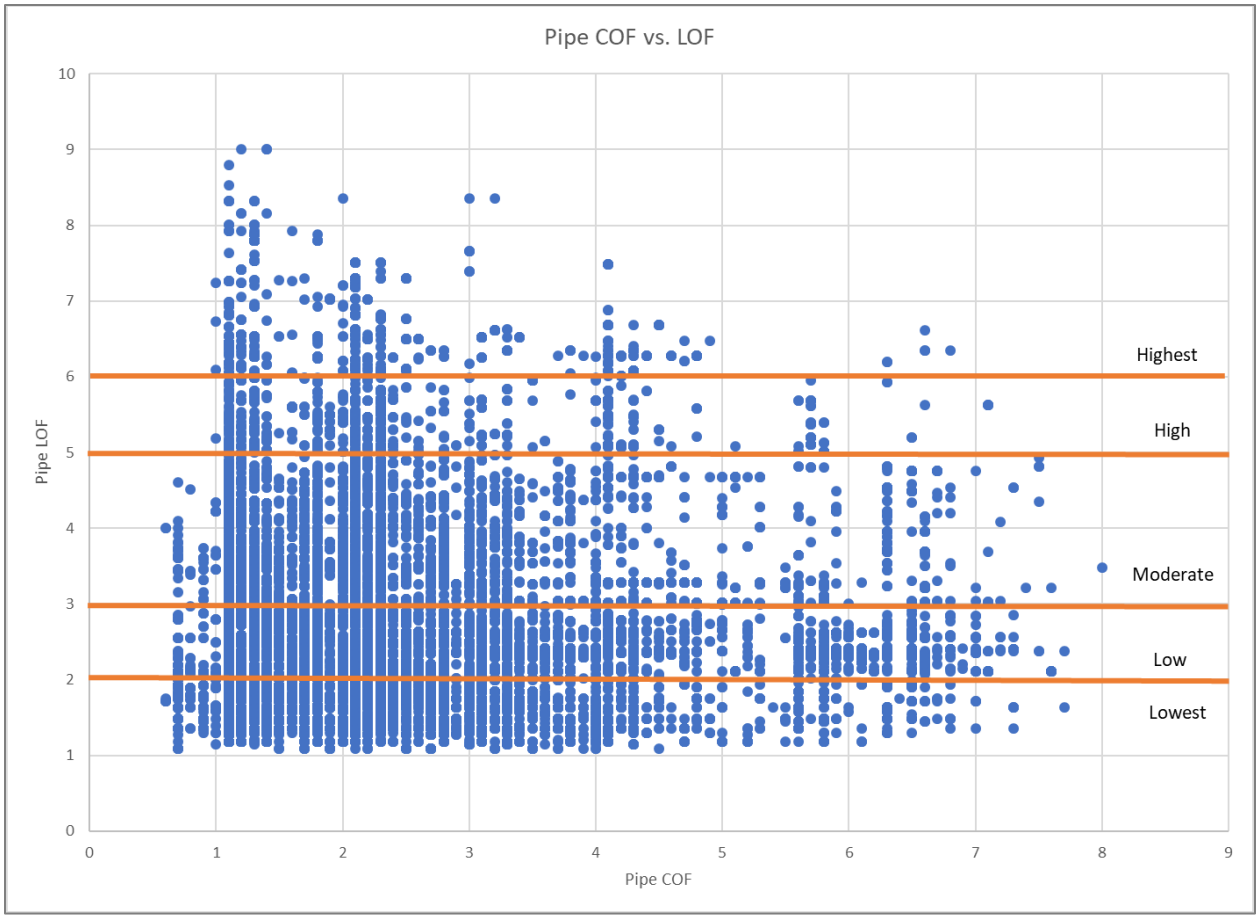


Figure 14: March 2021 Model Run - Blue Dots Indicate Pipe COF and LOF Scores

The March 2021 model run is expected to be the baseline output that will be used to assess the model's effectiveness going forward, but as mentioned above, will require several years of data after the run date to provide meaningful assessment. Figure 15 shows the March 2021 model run with the 6 breaks that have occurred since that time. This graph will be updated on an annual basis to use to evaluate the effectiveness of the model in providing decision support regarding our highest water line replacement needs.

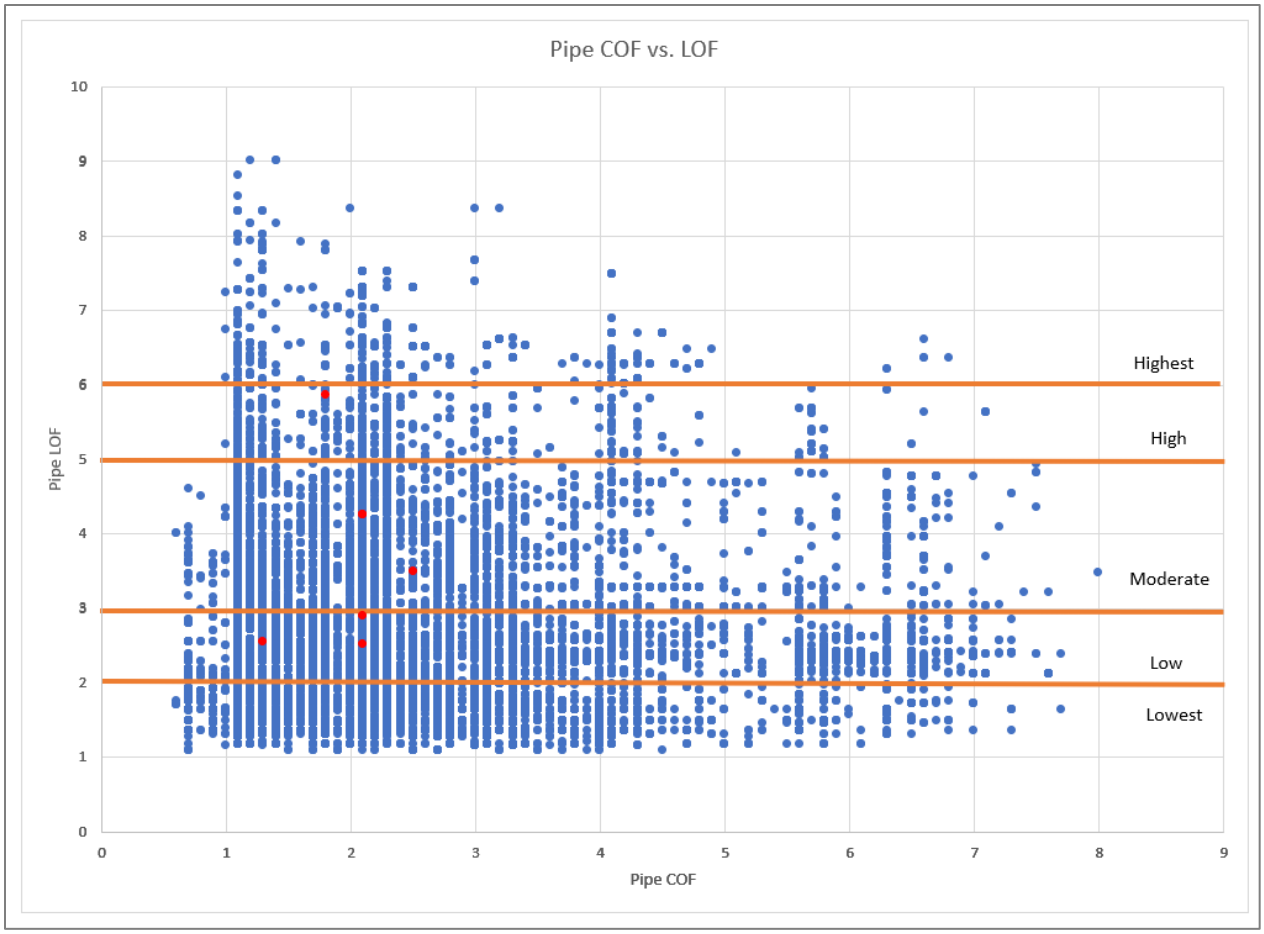
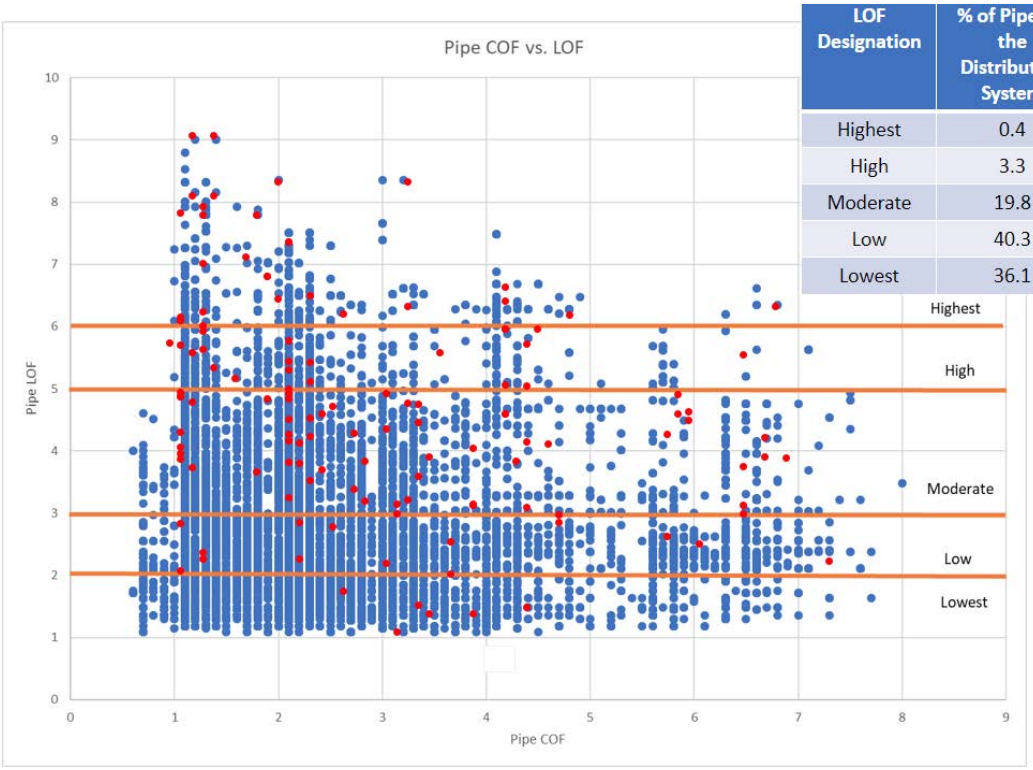


Figure 15: Red Dots Indicate the 6 Applicable Pipes with Main Breaks since March 2021 that were not yet replaced (using the March 2021 model run data)

While it is possible to compare the March 2021 output against historic break data, that results in an important simplification: pipe segments which were replaced with new pipe during that time would not be part of the March 2021 model input (or output). In reviewing the 139 breaks that occurred since 2013 that were applicable to the model (i.e., no contractor breaks and no service breaks), 53 percent of those scored in the highest and high LoF categories; 93 percent scored in the highest, high and moderate LoF categories (see Figure 16).



LOF Designation	% of Pipes in the Distribution System	% of Breaks (over the past 8 Years)
Highest	0.4	12
High	3.3	41
Moderate	19.8	40
Low	40.3	6.8
Lowest	36.1	0.75

Figure 16: Red Dots Indicate the 139 Pipes with Main Breaks since 2013 that were not yet replaced

The model output in conjunction with engineering staff judgment and evaluation provides reasonable justification to assess the pipe segments and groups of pipe segments that are our highest priorities to replace. Overall, through the use of the distribution system prioritization model, maintaining and replacing our infrastructure when needed enables us to maintain high levels of service to our customers over the long-term.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Use OWASA's water main prioritization model and risk framework to inform investment decisions for the condition assessment and replacement of the drinking water distribution system.	Annual		X
2. Complete periodic model updates to assess pipe and project risk changes and accuracy of the model.	Ongoing		X
3. Continue the programmatic replacement of aging galvanized water mains throughout the distribution system.	Ongoing		X
4. Update the prioritization model's risk framework to account for current data sources and statistical trends in main break history.	Ongoing		X
5. OWASA inspected all critical and previously uninspected valves in CY 2019. Staff has a goal of inspecting all valves every four years and inspecting all critical valves annually.	Ongoing		X
6. Continue to fund our water main renewal/replacement program to ensure system sustainability.	Annual	X	
7. Develop risk mitigation and emergency response procedures with key customers such as UNC, UNC Hospitals for water supply resiliency.	Ongoing		X
8. Maintain Presidents Award status by the Partnership for Safe Water (see chapter on "OWASA's Planning Environment") for Distribution System Operation.	Ongoing		X

Water System Audit

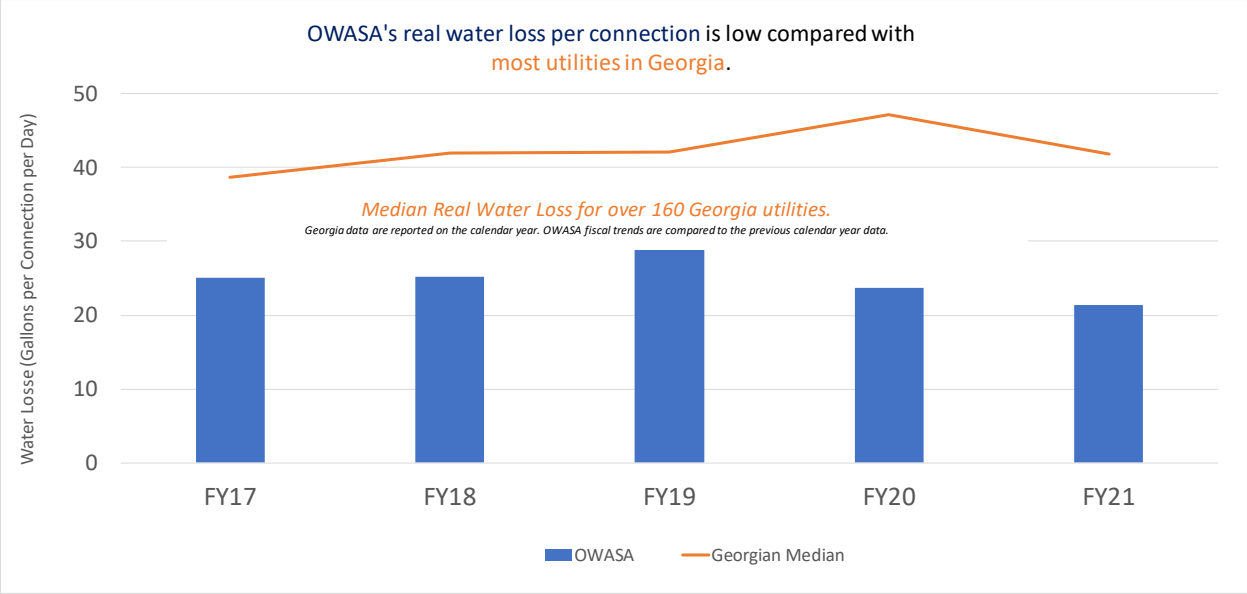


Figure 15. Historic Real Water Loss

Description: This trend evaluates the annual volume of water lost through leaks in the distribution system. Real loss is the difference between water supplied and authorized consumption; utilities also subtract out apparent losses associated with inaccuracies in metering, data errors, and estimated water theft.

Key Observations:

- OWASA's water loss remains less than other utilities. The median water loss for water utilities in Georgia (a state where all water providers that serve a population of 3,300 or more conduct annual, validated water system audits) averaged over 42 gallons per connection per day. The median water loss reported in this year's AWWA Benchmarking survey was 37.64 gallons per connection.

Regulations

There are no regulations to report for real water loss.

Technology and Research

The Drinking Water Distribution System Integrity trend includes information on acoustic leak detection.

Energy Management

Energy used to pump drinking water is shown in the Peak Day Drinking Water Demands section.

Strategic Plan Elements

Strategic Initiative 1 includes the development of a Water Conservation Plan, an important element of our updated Long-Range Water Supply Plan. Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Understanding the amount of water loss in our system helps make investment decisions. Maintaining and replacing our infrastructure when needed enables us to maintain high levels of service to our customers over the long-term.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Update water audit information	Annual		X

Wastewater Collection System Integrity

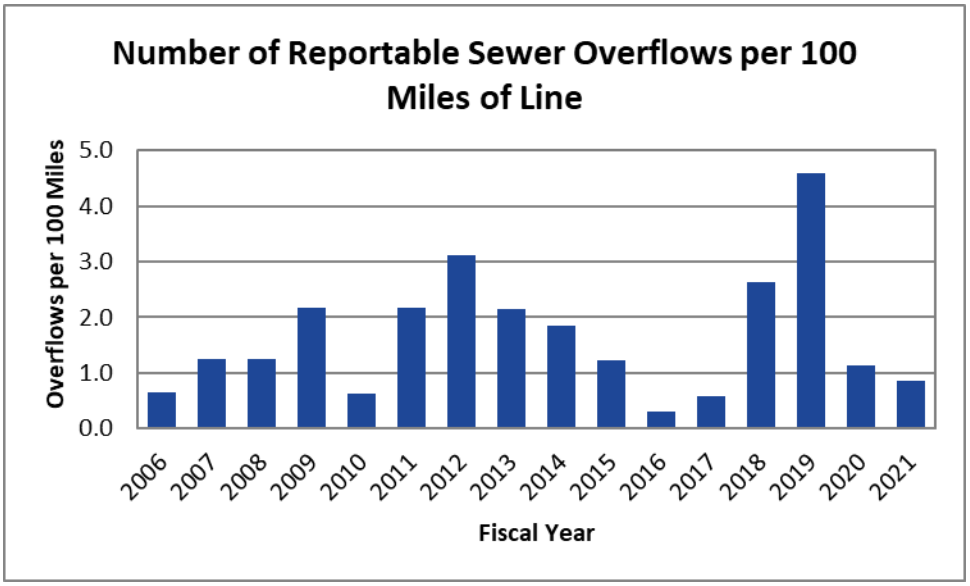


Figure 16. Historic Reportable Sanitary Sewer Overflows

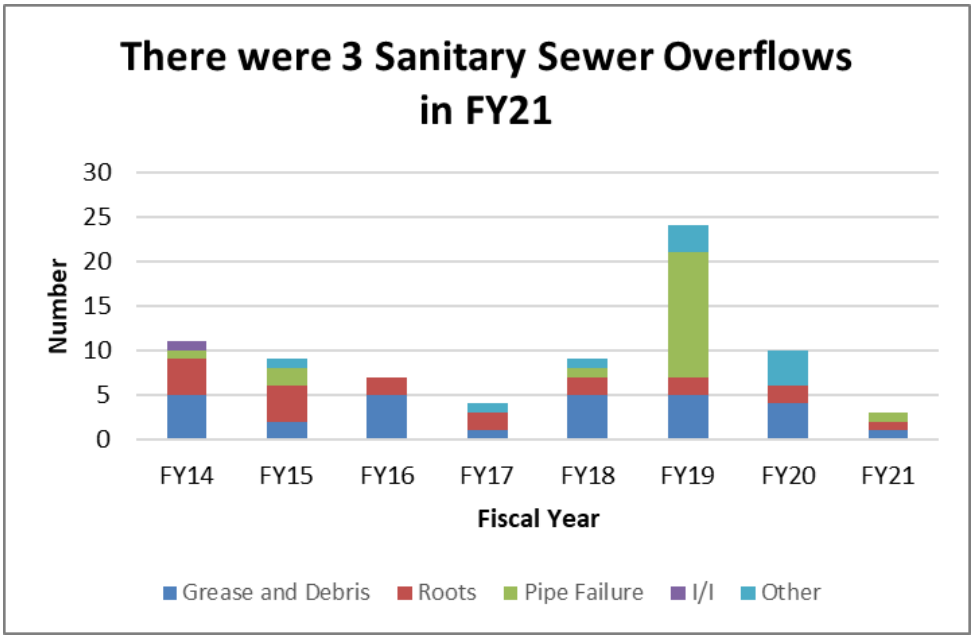


Figure 17. Historic Causes of All Sanitary Sewer Overflows

Description: This trend evaluates the number of reportable sewer overflows, which is an important indicator of the integrity of our wastewater collection system. It also evaluates the causes of all sewer overflows.

Key Observations:

- The number of reportable overflows is less than 3.0 per 100 miles of pipeline, which is the national median per the American Water Works Association 2021 Benchmarking report. Per DEQ guidance, OWASA strives to have no overflows.
- In FY 2021, there were three overflows attributed to grease and debris, roots, and pipe failure. Grease, debris, and roots are typically the primary causes of overflows. Reducing grease will require proactive, recurring education of our customers – especially those in the food service sector. Customers can also help minimize potential root intrusion by not planting trees near our sewer lines.

Regulations

There are no upcoming regulations to report for our wastewater collection system.

Technology and Research

- Advanced, automated flow measurement technologies are available for real-time monitoring of wastewater collection systems. These flow monitors may be connected to our Supervisory Control and Data Acquisition (SCADA) system. When monitors indicate that water levels inside a pipe increase, it may be an indication that the line is blocked downstream or there is substantial inflow and infiltration (I&I) during rain events. Recent work with consultants on our hydraulic model has indicated that a permanent flow monitoring system may have merit in identifying areas susceptible to I&I. OWASA purchased two flow monitors and rain gages, but they have not yet arrived; they will be placed in neighborhoods with high I&I in FY 2022. Additionally, to better understand the I&I throughout the collection system an I&I dashboard has been developed. This dashboard utilizes existing flow meters at the Rogerson Drive Pump Station and the Wastewater Treatment Plant along with rainfall data. We plan to use this dashboard to track progress of various activities in the collection system on removing I&I from the system over time. Furthermore, a cross-departmental collection system group has been formed from staff from the Engineering and Planning, Distribution and Collection, Wastewater Treatment, and Administration (communications) Departments to better prioritize and plan for collection system improvements and projects. These projects may include, smoke testing high priority neighborhoods, improving customer communication about private side sewer laterals, and targeted rehabilitation based on improved sewer CCTV activities, among others. These efforts are complemented by improved preventive maintenance efforts by using GIS technology to better track our maintenance efforts and inspection results. Distribution and Collection staff are smoke testing more neighborhoods and updating our root control program to focus on problem pipe materials and areas with heavy roots.
- Acoustic monitoring to detect sewer line blockages is available. A device sends a sound down a line to help find obstructions. A pilot test of this type of technology indicated that it was not yet reliable and cost-effective.
- Robotic Pipeline Monitoring and Maintenance Systems which can complete robotic inspections of pipelines are also being developed. This method is still in its early stages and still not cost effective

to deploy throughout the collection system. Historically, this technique has been used by other utilities to assess the wastewater constituents rather than the pipeline condition.

Energy Management

Wastewater is primarily conveyed through the force of gravity; however, wastewater pumping stations are necessary to transport wastewater when gravity flow is not possible. All of our wastewater pumping stations are powered by electricity, with diesel fuel or natural gas being used to power emergency standby generators when electrical service is unavailable. Electricity use by OWASA's wastewater pumping stations has been relatively consistent over the last four years, with the Rogerson Drive Pump Station accounting for about 65 to 70 percent of the electricity used for collection system pumping.

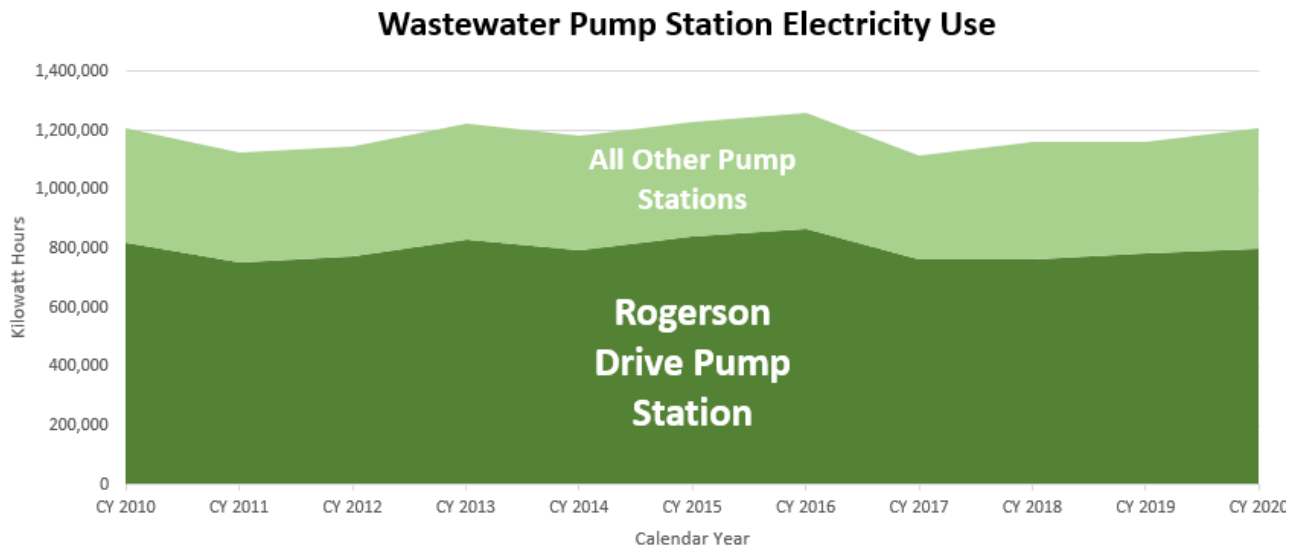


Figure 18. Wastewater Pump Station Electricity Use

The 2020 Energy Management Plan Update proposes funding for an investigation to evaluate new technologies at Rogerson Drive Pump Station, such as pulsed large bubble mixing and pure oxygen infusion, that could improve operations and reduce energy use at this site.

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Maintaining and replacing our infrastructure when needed helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action? Yes	Board Action? No
1. Continue to use the findings and recommendations from the 2020 Sewer System Master Plan and subsequent Sewer Evaluation Reports as a guide for prioritizing funding for sewer system evaluation, rehabilitation and replacement. Update the Master Plan's modeling efforts periodically as flow demand patterns change. The goal of these actions is to reduce inflow and infiltration.	Ongoing		X
2. Integrate the results of the sewer system modeling and field condition assessment work into the comprehensive asset management program so that the trade-offs of different capital improvements investment decisions can be consistently evaluated and prioritized.	Annual		X
3. Investigate the feasibility of installing flow monitoring equipment in the collection system to identify areas susceptible to I&I.	Installing 2 monitors in FY 2022		X
4. Continue to inspect, clean, and rehabilitate our sewer lines and wastewater pumping stations as needed to prevent overflows, reduce infiltration and inflow, and ensure adequate capacity.	Ongoing		X
5. Continue to monitor and maintain sewer easements to ensure our equipment and personnel can access the sewer system for maintenance and repair work, and to ensure tree root intrusion into sewers is minimized and corrected.	Ongoing		X
6. Continue to educate the public on the importance of not pouring fats, oils and grease, medications, etc. down the drain and not flushing items other than toilet paper.	Ongoing		X
7. Continue to fund the sewer system renewal/replacement program and operations and maintenance activities to ensure system sustainability.	Annual	X	
8. Identify potential energy savings opportunities for wastewater collection in Energy Management Program	Ongoing	X (as part of Energy Mgmt Plan)	

Mason Farm Wastewater Treatment Plant Maximum Month Flows

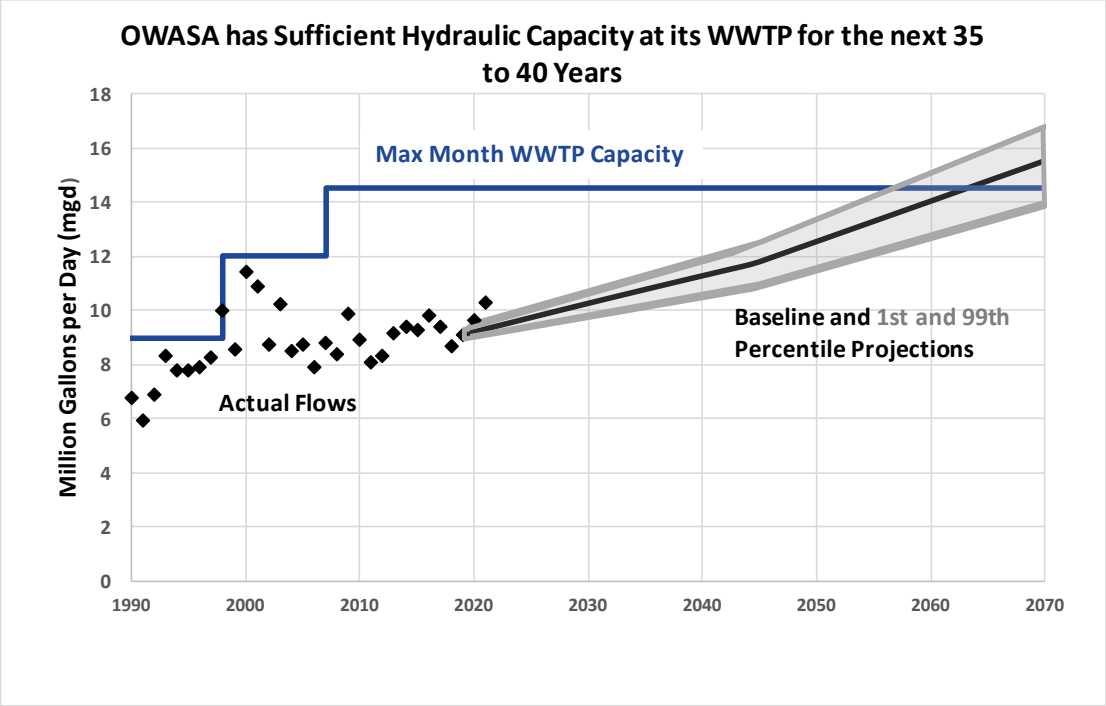


Figure 19. Mason Farm WWTP Capacity and Demands

Description: The Mason Farm Wastewater Treatment Plant (WWTP) has a permitted capacity of 14.5 mgd, which is the maximum average daily flow which can be treated in any given month. This trend tracks historical annual maximum month of flow and compares those against the permitted capacity of the WWTP.

Key Observations:

- OWASA's maximum month wastewater flows have declined from a peak of 11.5 mgd in FY 2000. This corresponds to reduced drinking water demands by our customers, as well as our continuing investments in the rehabilitation and replacement of sewer lines and manholes.
- In FY 2021, the maximum month flow was 10.3 mgd, which is about 71 percent of the WWTP's permitted flow capacity and is higher than the past few years and our predicted trend line. The maximum month occurred in February when we received about 7.4 inches of rain in Carrboro, which is about twice the long-term February average; all other months were in line with the average daily flow at the WWTP.
- The projected maximum month flows indicate that we have adequate hydraulic capacity in our treatment plant for the next 35 to 40 years assuming inflow and infiltration rates do not increase.

However, if the frequency of high intensity storms increases with climate change, we may need to address our hydraulic capacity earlier than anticipated.

Regulations

- Important regulations pertaining to wastewater treatment are related to nutrient removal at the WWTP, which is described in the Mason Farm WWTP Nutrient Capacity section of this report.
- As mentioned previously in this report, PFAS are emerging compounds of concern. Drinking water and wastewater are not sources of PFAS. PFAS compounds are present throughout the environment because they are highly persistent and have been widely used for decades, including in industrial applications, household and consumer products, food packaging, and firefighting foams. On the wastewater side, health concerns about PFAS persistence throughout the treatment process revolve around these chemicals "passing through" wastewater treatment plants and being reintroduced into the environment. Two potential pathways for PFAS to reenter the food supply chain that EPA is investigating are wastewater discharges into receiving waters, which are absorbed into aquatic systems and wildlife, and through land application of treated biosolids onto crop fields. As a component of their PFAS Action Plan, EPA is currently conducting risk assessments for PFAS exposure in biosolids. Information regarding risk assessment in biosolids and the state of the science was made available in late 2020, and their PFAS Strategic Roadmap indicates that the risk assessment is expected to be complete in Winter 2024. In August 2021, EPA published a draft analytical method for the analysis of 40 PFAS compounds in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue; validation is not expected to be completed until sometime in 2022, at which time it may be used for regulatory purposes. EPA's Roadmap also proposed monitoring requirements in NPDES permits and will be developing ambient water quality criteria for PFAS. OWASA expects to add PFAS monitoring for our biosolids products in the near future now that a draft analytical method has been published and laboratories build capacity and competence in its use. At the state level, the DWR continues to monitor the Cape Fear River Basin for emerging contaminants. Utilities in the Cape Fear River Basin with significant industrial dischargers of PFAS compounds determined through previous investigations, were required to work with those dischargers to reduce/eliminate the PFAS compounds. OWASA does not have any significant industrial dischargers and therefore is not required to incorporate an industrial pretreatment program. However, we believe it is important for us to know what is in our wastewater and what we release into the environment. In June 2019, OWASA began proactively monitoring the influent into our wastewater treatment plant and its effluent for PFAS compounds. In 2020 we added a monitoring site within our treatment process. Although there are currently no regulatory or health advisory limits on PFAS compounds in wastewater or biosolids, the total PFOS+PFOA in our treated effluent have remained consistently lower than 70 ppt, the health advisory level for drinking water described earlier in this report. In conjunction with our PFAS monitoring of our treated drinking water and raw water from Cane Creek Reservoir, we will continue to monitor our wastewater influent and effluent quarterly. As of summer 2021, PFAS

results for both the WTP and WWTP are being published on the OWASA website as a PFAS Monitoring Program interactive dashboard.

Technology and Research

- In FY 2022, a CIP project to replace our gravity belt thickeners with rotary drum thickeners, which thicken solids prior to anaerobic digestion, was completed. The rotary drum thickeners have two advantages: (1) better odor control which also extends the life of equipment in the solids thickening building and (2) better control of the solids concentration and reduced operating costs.
- Staff at the WWTP periodically evaluate the chemicals used at the plant to ensure we are using the best available to meet our treatment goals in the most sustainable manner and to ensure that we do not foresee shortages in chemicals we use which could impact treatment or their price. At this time, staff believe we are using the correct blend of chemicals, and no shortages are foreseen in their supply.
- OWASA is updating the WWTP Master Plan, which will evaluate some new technologies. Staff is closely following advancements in technology and actual industry experience for resource recovery at the WWTP. This includes energy generation such as the biogas to energy alternatives being evaluated as part of the Energy Management Program, nutrient recovery for beneficial reuse, and direct and indirect potable reuse. Biogas recovery strategies are being evaluated as part of the Energy Management Plan, and opportunities for greater reuse were evaluated as part of the Long-Range Water Supply Plan. Potable reuse technologies that are cost-effective are not legal in North Carolina.
- OWASA provides wastewater samples for COVID-19 surveillance, which provides early warning to public health officials where more outbreaks may occur. The North Carolina Department of Health and Human Services has developed a dashboard to aid in communications with the public regarding COVID-19.

Energy Management

The Mason Farm WWTP uses the most energy of any of our facilities. Since 2010, our electricity use at the WWTP has decreased by 40 percent. This is largely attributable to a $10.4 million capital improvement project that reduced electricity use, further reduced off-site odor releases, improved plant performance, and prepared us to meet future standards for treated wastewater quality. In 2018, our use of natural gas declined significantly because we restored our biogas-to-boiler system. Our use of biogas was briefly interrupted in 2020 due some technical challenges that have since been remedied (i.e. we are now utilizing our biogas-to-boiler system). Natural gas is used primarily as a supplemental fuel for running the two boilers that heat anaerobic digesters for solids treatment. Methane – or biogas – is produced as a by-product of the digestion process, and under normal operations, is used as the primary fuel in our boilers at the plant. However, from 2015 through March 2018, we had to rely almost exclusively on natural gas to heat the boilers while two digesters and our gas storage unit were undergoing major rehabilitation. In 2020, we used 17 percent less natural gas than we did in 2010.

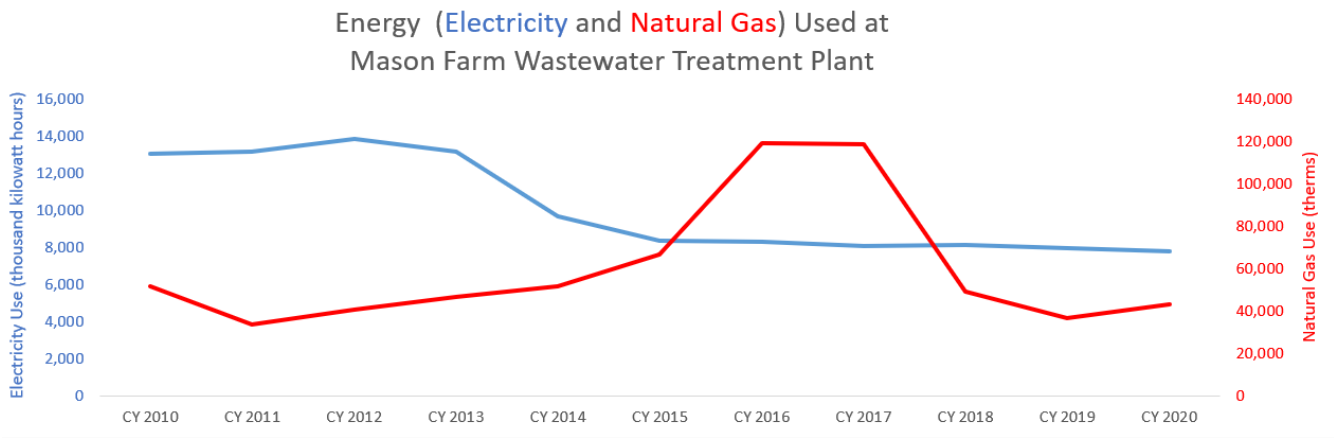


Figure 20. Energy Use at the Mason Farm WWTP

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our wastewater treatment capacity is adequate, and timing expansions properly, helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor growth and development activity and projections in our service area by working closely with the Towns of Carrboro, Chapel Hill, and UNC to ensure we have adequate wastewater treatment capacity for the future.	Annually with ongoing communication		X
2. Continue to inspect, rehabilitate, and replace our sewer lines when necessary to reduce infiltration and inflow.	Ongoing		X
3. Identify potential energy savings opportunities for wastewater treatment and pumping in Energy Management Program.	Ongoing	X (as part of Energy Mgmt Plan)	
4. The Partnership for Clean Water (see chapter on "OWASA's Planning Environment") Phase III self-assessment has been completed and is under review. We are awaiting the news on whether we received the Directors Award status. Regardless, we continue to work through action items and have made significant progress.	Ongoing		X

Mason Farm WWTP Nutrient Capacity

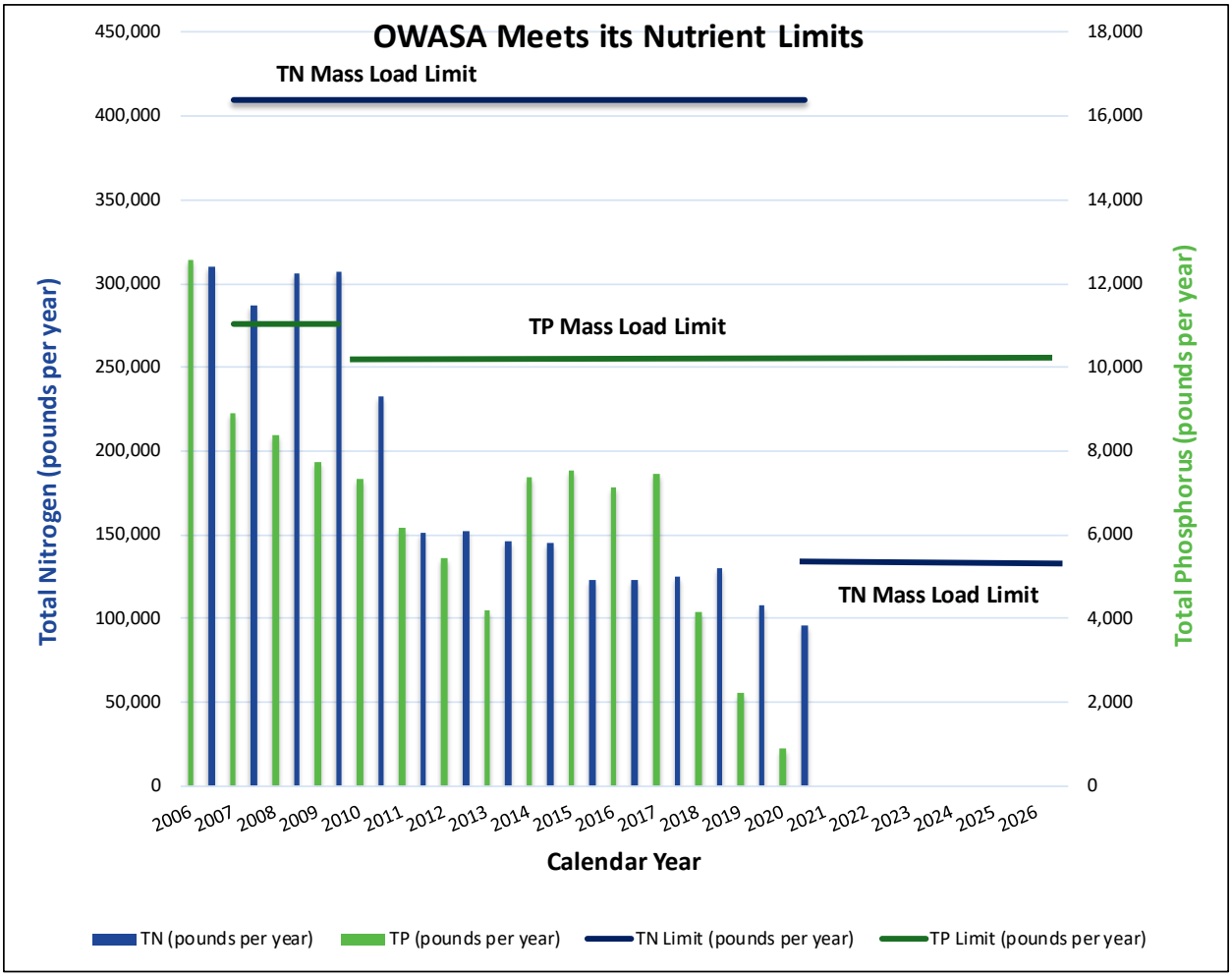


Figure 21. Mason Farm WWTP Annual Nutrient Loading

Description: The state's Jordan Lake nutrient management rules require point sources to reduce their discharge of Total Phosphorus (TP) and Total Nitrogen (TN). OWASA's new TN limit took effect in calendar year 2021. We report nutrient loading on a calendar year basis rather than a fiscal year basis since our permit limits for TN and TP are on a calendar year.

Key Observations:

- OWASA has met its TP limit since the annual mass load limit was first incorporated into our permit in 2007. We expect to continue to meet the limit within the 20-year planning horizon without the need for additional major capital improvements for TP removal.
- OWASA better optimized its biological phosphorus removal process which is reflected in the decrease in TP in 2018, 2019, and 2020.

- OWASA has consistently met its current TN limit. Staff continues to focus efforts on plant optimization to improve the denitrification process, but may need to operate our filters in denitrification mode and incur considerably greater energy and chemical costs to meet the more stringent limits. Staff is performing inspections and testing to ensure the denitrification filters are operationally ready should they be needed.

Regulations

As part of OWASA's participation in the Partnership for Clean Water, OWASA strives to meet 95 percent of the TN and TP limits described in this section.

Technology and Research

- OWASA evaluates the treatment technologies we have at our WWTP to ensure we can meet upcoming standards with current treatment technologies. OWASA can meet all applicable permit limits but may need to operate our filters in denitrification mode to remove nitrogen when revised limits become effective. Carbon must be added to achieve denitrification in the WWTP filters, and there are different operational, safety, financial, and environmental considerations associated with different carbon sources. We will evaluate the advantages and disadvantages of alternative carbon sources and conduct pilot and plant-scale testing as needed to inform our decisions regarding the preferred source.
- Sidestream flow is process water from the solids treatment process that flows back into the main treatment process. This sidestream flow is often high in nutrients. Sidestream treatment includes processes that capture and treat this water to reduce nutrients before returning it to the main treatment process. Sidestream treatment for greater nutrient removal is a process that may be considered for the Mason Farm WWTP if we decide to dewater a greater portion of our biosolids. Sidestream treatment would help to reduce nitrogen loading in the liquid treatment process. Modeling studies indicate that if we dewater all of our biosolids, sidestream treatment could provide annual chemical and energy cost savings of approximately $200,000 and have a payback of less than ten years. Sidestream treatment could also provide additional process flexibility in meeting TN limits; it may also allow a rerating of the plant to a higher treatment capacity, thereby providing substantial cost savings for our customers. Sidestream treatment will be evaluated as part of the update of the WWTP Master Plan.

Energy Management

See the section titled Mason Farm Wastewater Treatment Plant Maximum Month Flow Projections for energy use information at the WWTP. As noted above, certain advanced nutrient recovery technologies may have the potential to further reduce energy use for the liquid wastewater treatment process.

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our wastewater treatment technology

can meet permit requirements and incorporating changes in operations to meet limits helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor nutrient loadings at the plant.	Monthly		X
2. Continue to optimize denitrification performance in the aeration basins.	Ongoing		X
3. Evaluate ability of existing filters (and advantages and disadvantages of alternative carbon sources) to meet TN permit limits.	2021-2022		X
4. Evaluate benefits and costs of different nutrient removal strategies as part of Mason Farm WWTP Master Plan update.	FY 2022 – FY 2023		X

Reclaimed Water

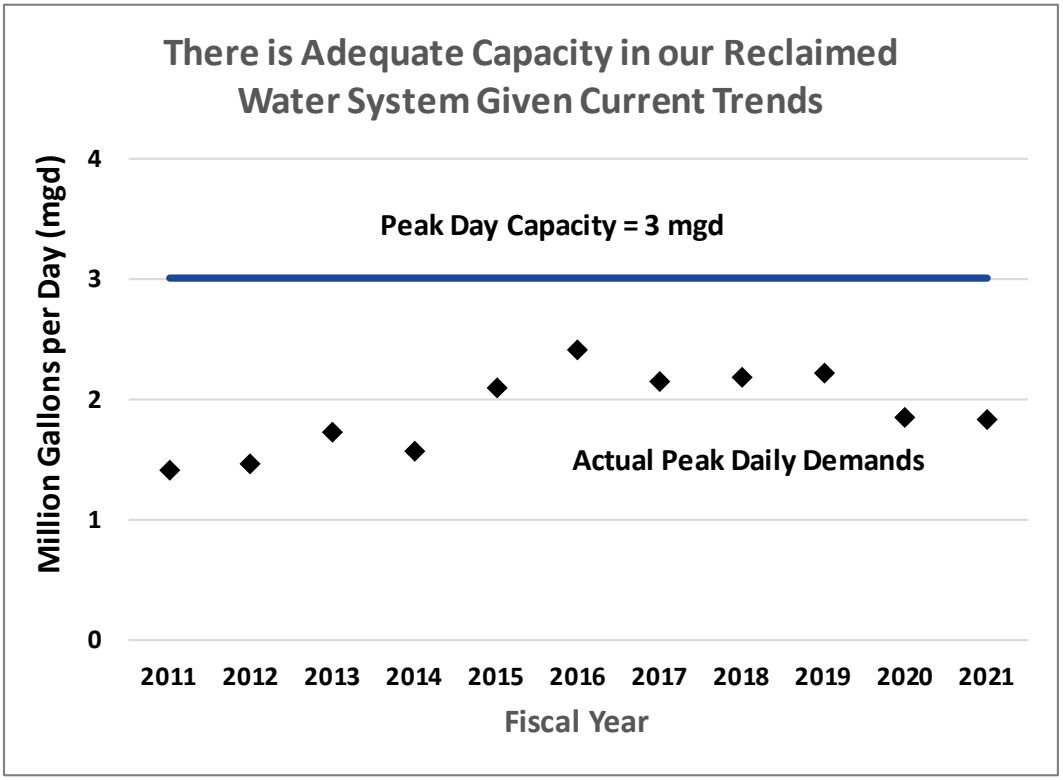


Figure 22. Reclaimed Water System Capacity and Demands

Description: This trend tracks historical annual peak day reclaimed water (RCW) demands and compares those against the peak day capacity of the Mason Farm WWTP's RCW system.

Key Observations:

- The majority of RCW is used for chilled water and irrigation of landscaping and athletic fields and these demands peak during warm months (April-October). Demands are typically lower during cold months (November-March).
- Peak daily demand of 2.4 mgd occurred in August 2016 when it was very hot and humid. The RCW system is currently configured to meet a total peak day demand of 3 MGD (average daily demand of 1.2 MGD); however, the system is designed and constructed to allow cost-effective expansion to 5.2 MGD by adding only an additional transfer pump and additional chemical feed system capacity (if that feed system is deemed necessary).
- There is no anticipated significant change in demand for the next 15 years, and therefore the RCW system can meet projected RCW demand for the foreseeable future.

Regulations

There are no upcoming regulations to report for our RCW system.

Technology and Research

One aspect of reuse is recycling water within a building, which has been done in other parts of the country. One example (Solaire) is a high rise building in New York City which uses various filtration (membranes) and disinfection (ultraviolet light) technologies to produce reclaimed water that is beneficially recycled within the building and used for flushing toilets, cooling tower make-up water, and irrigating the green roof. The WaterHub at Emory University is an onsite wastewater reclamation system which uses ecological processes and stormwater capture to meet the campus's nonpotable water demands. A similar stormwater capture and treatment system is being planned for Chatham Park in Chatham County. These types of facilities were evaluated as part of the update to the Long-Range Water Supply Plan, but are not cost-effective at this time.

Energy Management

In February 2015, we began sub-metering and monitoring the energy uses of a few specific processes at the WWTP, including the RCW system. The RCW system is not just important for its impact on our use of raw water resources, but it is a more energy-efficient way to meet demands. The energy required to treat and deliver reclaimed water is about 20 percent less than that is required to treat and deliver raw water to the community.

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our RCW system capacity is adequate will help meet the community's water needs. This also ties to Strategic Initiative 1; the use of RCW reduces the demand on our drinking water supplies which will help meet our community's long-term water supply needs. Finally, the use of RCW uses less energy than treating and delivering raw water, which ties to Energy Management Program in Strategic Initiative 4.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Verify RCW meters are properly calibrated and recording flows accurately.	Annual		X
2. Closely monitor RCW demands in order to ensure RCW system capacity expansion is planned, designed, and funded in time to meet future demands.	Ongoing		X
3. Pursue cost-effective opportunities to expand the RCW system to serve non-drinking water demands of non-UNC customers as new growth and development/redevelopment occurs.	Ongoing – evaluated some options as part of LRWSP update	X	
4. Complete water quality evaluation to included potential addition of a corrosion inhibitor and investigate conductivity levels to ensure water meets UNC needs.	FY 2022		X

Biosolids

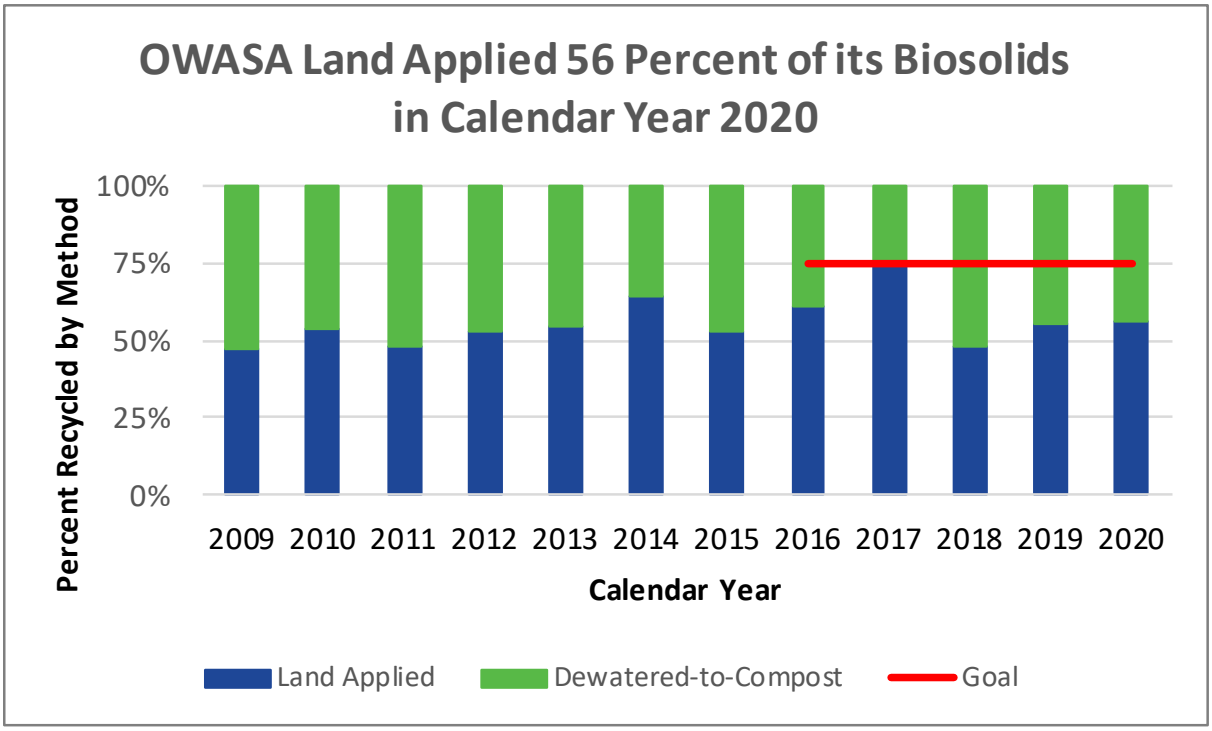


Figure 23. Historic Biosolids Application

Description: This trend evaluates the amount of biosolids which OWASA applies to land and the amount it dewaters for composting. The WWTP produces about four dry tons of biosolids each day. Most of this is applied in liquid form to agricultural land and a portion is dewatered to the texture and consistency of moist soil and transported to a private composting facility in Chatham County. For the liquid form, OWASA has 1,462 acres of farm land in Orange, Chatham and Alamance counties available for its Class A land application program (see Figure 26). 90 percent (1,309 acres) is privately owned. The remaining 153 acres are owned by OWASA as part of a 700-acre tract west of Orange Grove Road in Orange County. At its October 8, 2015 work session, the Board of Directors agreed that OWASA's goal is to apply 75 percent of our biosolids in liquid form, and to dewater 25 percent of our biosolids. The Board of Directors understands that there are factors including weather conditions which may keep staff from meeting the goal.

Key Observations:

- From CY 2009 to CY 2014, OWASA consistently land applied about half of its biosolids and dewatered and composted the remaining half.
- In CY 2020, OWASA land applied 56 percent of its biosolids and did not meet the goal. Our ability to meet this goal is dependent in part on weather and staffing. Our opportunities to land apply biosolids were limited in 2020 due to wet conditions and short-staffing. Instead, we dewatered

higher amounts of biosolids while meeting all applicable regulatory requirements for our biosolids treatment and recycling program.

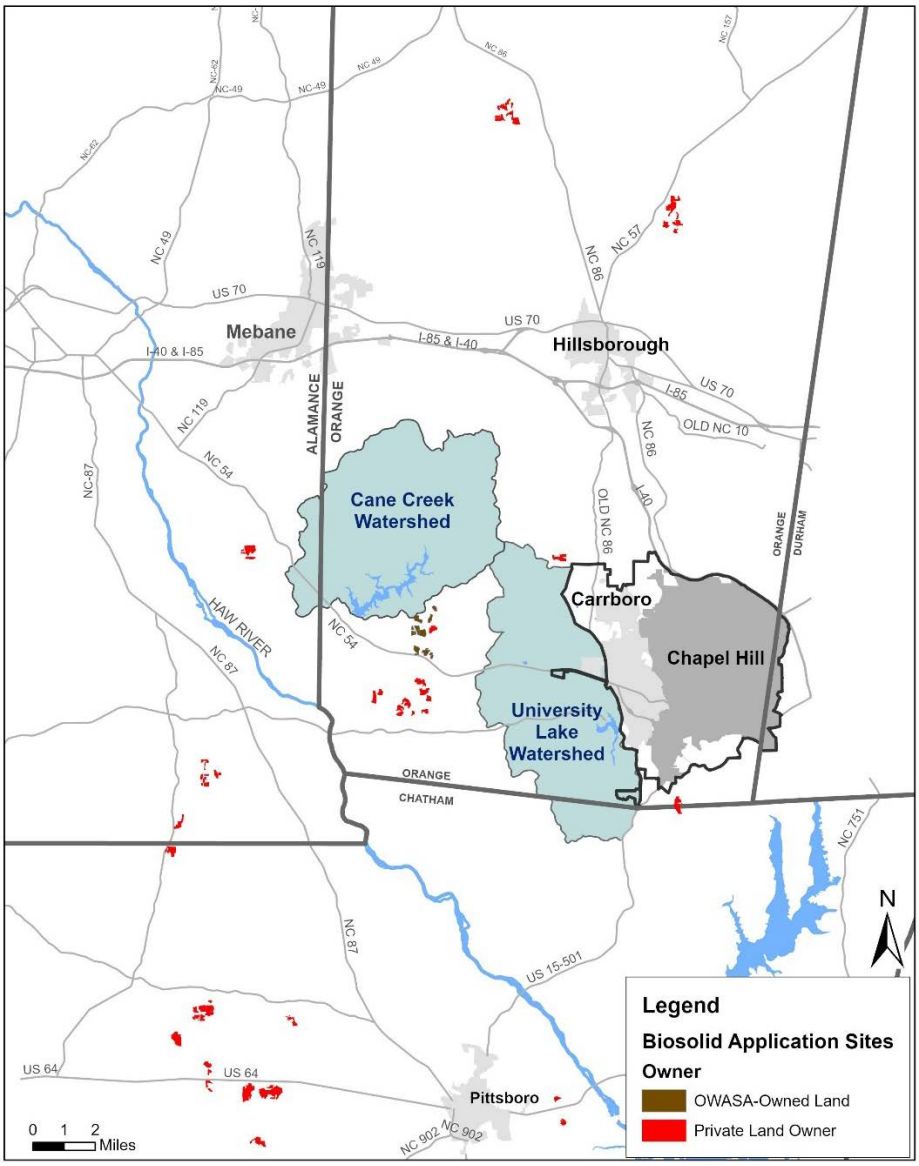


Figure 24. OWASA Biosolids Application Sites

Regulations

Federal and state regulations specify the agronomic rates at which biosolids may be land applied for designated crops (the maximum amount of biosolids that can be applied to a given field is currently determined by the nitrogen content of the biosolids and is limited to the nitrogen requirements of the particular crop to which it is being applied). OWASA closely monitors the application rates on each individual field and historically has applied at rates well below the maximum allowed by regulation. Some states also limit land application of biosolids based on the phosphorus content of the biosolids

and the soil; however, North Carolina does not have such a loading limit. If North Carolina adopts this approach, the amount of land needed to support our land application program would increase considerably.

The NC Department of Environmental Quality (DEQ) modified its regulations concerning biosolids in September 2018. The modifications reduced the set back from streams for Class B biosolids from 100 feet to 32.8 feet, and Class A setbacks remained at 100 feet. The state indicated that General Statute 150B-19.3(a) prohibits agencies from adopting a rule that imposes a more restrictive standard, limitation, or requirements than those imposed by federal law or rule. There is no federal setback requirement for Class A residuals and hence the existing 100-foot state requirement remains.

EPA initiated a risk assessment to evaluate the potential public health impacts of PFAS in biosolids. They are currently on the first step of the process, problem formulation which is used to (1) establish the purpose of the risk assessment, (2) define the problem, (3) identify exposure pathways, and (4) present tools and data to analyze and characterize the risk. As described in other sections, staff follows ongoing work regarding PFAS.

Technology and Research

Information on technology concerning our solids thickening process is provided in the Mason Farm WWTP section.

Energy Management

The primary energy uses of OWASA's biosolids management program are for vehicle fuel, biosolids loading, running the rotary press for dewatering, treating the nutrient-rich dewatering filtrate loads returned to the aeration process, and mixing the biosolids holding tanks.

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our biosolids program meets federal and state requirements and protects public health, helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Evaluate our performance against the 75 percent liquid land application goal and report it to the Board	Annually as part of this report		X
2. Evaluate the amount of land in our biosolids program to ensure it is adequate to meet liquid land application goal	As needed (if farmers drop out of program)		X