York Water District Public Water System Report for Comprehensive Plan

York Water District's Public Water System Report for the Town of York Comprehensive Plan Update, March 2022

YORK WATER DISTRICT, YORK MAINE

MAR 2022

Public Water System Report for the Town of York Comprehensive Plan Update

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York Water District, York Maine

March 2022

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Executive Summary

The York Water District (YWD) is governed by an elected Board of five trustees. The YWD is regulated as a quasi-municipal, community public water system by the Maine Drinking Water Program (MDWP) program and the Maine Public Utilities Commission (MPUC). The YWD's administrative and operations center is located on Woodbridge Road in York Village.

The YWD serves approximately 5,360 customers in the Town of York in southern Maine. The YWD's primary source of supply since 1896 has been Chase's Pond. The YWD has protected over 1,700 acres of land in the watershed to protect this valuable resource. Along with land surrounding the Kittery Water District supplies, also located in the Town of York, over 5,000 acres of land is protected in the Town of York by these two utilities. The land is actively managed to protect water quality but is available for general use by the public in accordance with a comprehensive watershed management plan developed by the YWD.

The YWD is a well-managed, progressive utility that use master plans as a guide for maintaining and improving the water system. The YWD completed a partial master plan update in 2018 and most recently in 2021. Earlier master plans were also completed or updated in 1980, 1994, 2004, and 2016. The YWD uses the annual capital improvement planning process to maintain the level of service to customers and renewal of aging infrastructure and maintain compliance with existing and future water quality regulations.

ES-1.1 Water Supply Source

The YWD's primary source of supply is Chase's Pond in York, Maine. The dam at Chase's Pond was constructed in 1906. This original dam has been modified and modernized over the years. A chronological history of improvements made to the dam is presented in herein. A description of the watershed lands, dam structures and reservoir properties follow.

ES-1.1.1 Safe Yield

The YWD has been proactive with managing the YWD's only drinking water supply resource with a robust watershed protection program, water quality monitoring, and land acquisition within the watershed. The YWD has collaborated with the Town of York to support watershed protection ordinances that protect the quality of Chases Pond and regulate development within the watershed. It is important that the YWD and Town of York continue to collaborate on watershed protection policy development and implementation to ensure the continued protection of Chases Pond as a public water supply for the community.

A Safe yield analysis was performed by Wright-Pierce for Chases Pond as part of the 2004 Master Plan. The safe yield for Chases Pond was determined using graphical techniques to be 2.05 MGD. The yield was based on the 1963-1967 drought, the drought of record for much of northern New England and a bathymetric survey conducted in 1994 which determined the impounded volume of the reservoir to be 387 million gallons (MG) with the flashboards installed at Chases Pond Dam.

ES-1.1.2 Emergency Interconnections

The YWD maintains emergency interconnections with Kennebunk, Kennebunkport, & Wells Water District (KKW) to its north on Route 1 and Kittery Water District (KWD) to its south on Route 1. The YWD maintains booster pump stations to supply existing customers at the extremities of Route 1 north and south, while maintaining pumping infrastructure to wheel water during an emergency or planned maintenance event from KKW or KWD. KKW maintains very similar treated water quality including use of chloramines for disinfection, therefore, the primary emergency interconnection utilized is generally the KKW interconnection from an operations standpoint.

During periods of drought in past summers, the YWD has purchased water from KKW to ease the draft on Chase's Pond during dry periods that coincide with higher water demand summer months. The YWD also maintains an emergency siphon pipeline between Folly Pond and Chases Pond that can be used for emergency transfers of water to supplement Chases Pond. Since Folly Pond is part of the reservoir supply system for Kittery Water District, the use of this emergency water supply interconnection must be closely coordinated with the operational needs of Kittery Water District if activated during an emergency or period of extended drought conditions.

ES-1.2 Existing Land Use and Community Growth Patterns

York Village, York Beach, and Cape Neddick are the primary population areas served by the YWD. York is a service community with light commercial shopping areas along US Route 1, a regional hospital and many small seasonal businesses in York Beach. Much of the land west of Interstate 95 is protected watershed lands of the York and Kittery Water Districts. Opportunities for large scale expansion of the water system west of Interstate 95 will require boosted pressure to serve higher elevation areas and would be funded by the project proponent as regulated by the MPUC. These influences are impediments to large scale development in the Town of York.

York presently serves no large industrial customers. Metered water consumption is primarily residential with smaller numbers of commercial and government accounts. Large areas of the distribution system, primarily in Cape Neddick and York Beach, are served by seasonal water mains.

All new customers are required to pay a system development charge (SDC) to connect to the water system. This income is used to renew the water system with investment to offset growth driven needs. Understanding how growth will occur in the future will allow the YWD to adjust or change the (SDC) to meet these projected demands.

Future growth in the service area is anticipated to be primarily residential and light commercial growth directly related to increases in population. Commercial land use is also anticipated to increase in response to residential growth. Additional future commercial growth is anticipated to be concentrated in existing commercial land-use zones within the Town of York. No major industrial developments are currently under consideration in the service area.

ES-1.2.1 Projected Average-Day and Maximum-Day Demand Summary

The average-day and (MDD) projections are summarized on Tables 3-9 and Table 3-10 and graphically on Figure 3-13. The factor of 2.45 for the average ratio of ADD to MDD during the last 15-year period was used to project the future (MDD's) in years 2028 and 2038.

Table ES-1 Projected Average-Day Demands York Water District

Projected Water Demand	Year 2020* (gpd)	Year 2028 (gpd)	Year 2038 (gpd)
Residential Demand	637,000	607,400	642,800
Commercial Demand	236,600	250,900	268,800
Additional Governmental/Public	40,200	43,400	47,400
Non-Revenue Water	157,200	200,600	213,400
Projected Average-Day Demands	1,071,000	1,102,300	1,172,400

*2020 data represents actual observed data.

The 2020 actual residential demand was about 20% - 25% higher than the previous five-year trend and primarily attributed to an increased number of people working from home and increased use of seasonal residents during the COVID-19 pandemic. The average residential demand from 2016 – 2020 was approximately 540,000 GPD and the total metered residential demand in 2019 was approximately 506,00 GPD. The other customer classifications did not vary significantly in 2020 from prior years compared to the residential customer demand trend.

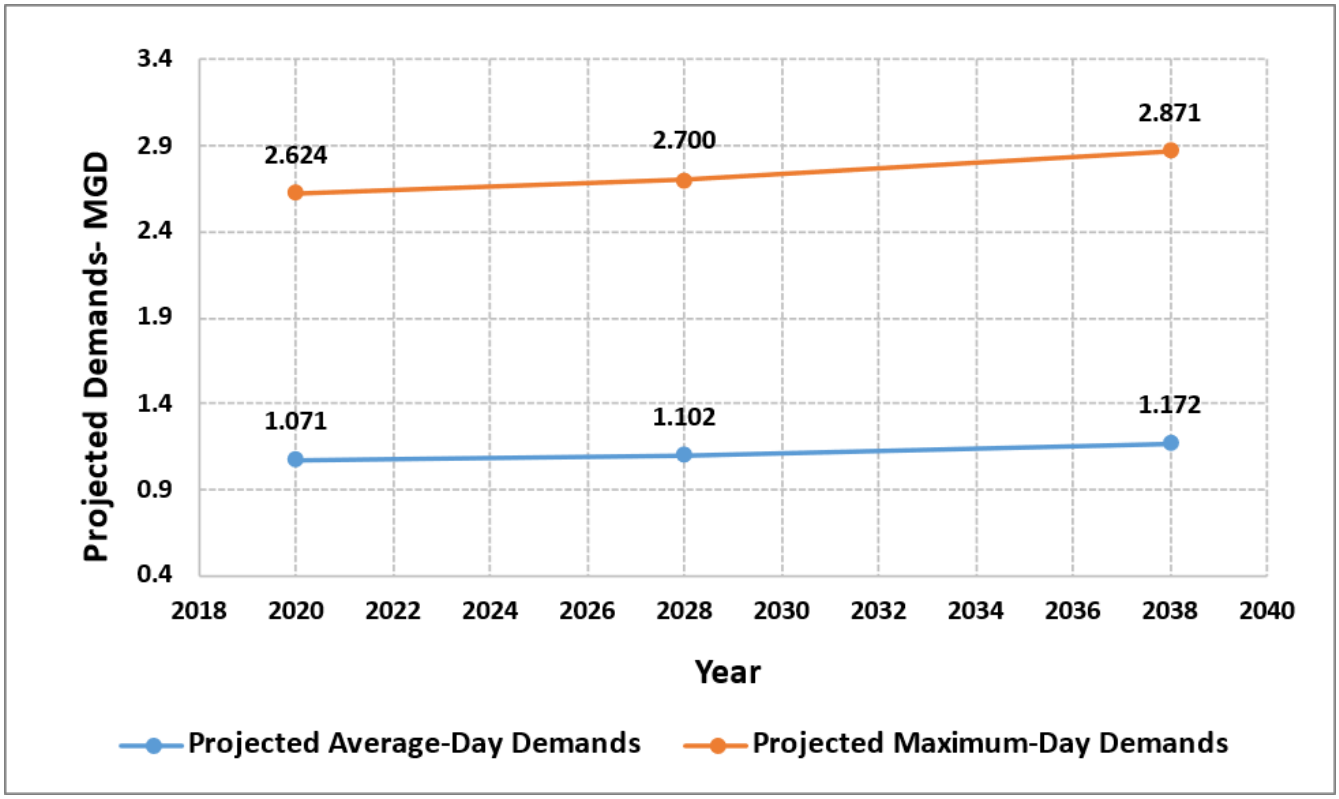
The projected average day demand (average annual demand) projected for 2038 is 1.17 MGD compared to the current estimated safe yield during the drought period of record (2.05 MGD) suggests that Chases Pond has ample capacity for slow to moderate growth in system water demand over the next 15 – 20-year period. Under average precipitation years, the available average day yield of Chase's Pond has been projected at about 2.97 MGD. However, the community and District should be mindful of the maximum day demands that occur during the summer months. The maximum day demand is projected to grow by 10% or about 250,000 gpd. The maximum day demand projection is approximately 0.9 MGD lower than the plant capacity of 3.7 MGD with both treatment units in service.

Table ES-2 Projected Demand Summary York Water District

Year	Average-Day Demand (MGD)	Maximum-Day Demand (MGD)
2020	1.071*	2.624
2028	1.102	2.700
2038	1.172	2.871

*2020 data represents actual observed data.

Figure ES-1 Projected Average-Day and Maximum-Day Demands York Water District



Maintaining the emergency interconnection is important in the event of disruption to the treatment operations or one treatment train during the summer months. YWD and neighboring utilities of KWD and KKW have water supply quantity limitations that will become more stressed in the future with continued land development and redevelopment projects that add new water demands to the system. The YWD must seek approval from KKW and KWD if water is needed for emergency use. During the dry summer months, these utilities also experience supply limitation, which may limit the availability of supplemental emergency water supply to York.

It is recommended that Town of York as part of the comprehensive plan process, develop a "build out" analysis of undeveloped parcels and potential redevelopment areas in growth areas to assess the potential future water supply needs to support continued sustainable growth in York. Policies should be evaluated by the Town and the YWD to ensure that future desired development growth does not create water demands that exceed the safe yield from Chases Pond. The YWD and Town should continue to collaborate on land-use policy implementation to recognize the water supply capacity constraints and participate in regional planning of water supply development to support continued growth in York.

ES-1.3 Regional Cooperation

In 2005, the State of Maine passed water utility-sponsored legislation for the formation of regional water councils. These councils were formed to explore solutions to common water supply issues within regional areas of the state. The legislation (Maine Public Utilities Commission Rules and Regulations - Chapter 68: Regional Water Councils)

authorized "two or more water utilities" to organize and form a non-profit corporation as a forum to address issues to the water suppliers within the region which the council is formed.

The Southern Maine Regional Water Council (SMRWC) was formed under the authorization of Chapter 68 in 2005 with the sole purpose of promoting regional cooperation in southern Maine. The York Water District joined this effort to help improve service and to deliver a better value to its customers. The SMRWC membership includes the following utilities:

- Kittery Water District
- Portland Water District
- Kennebunk-Kennebunkport-Wells Water District
- York Water District
- South Berwick Water District
- Maine Water Company Saco-Biddeford Division
- Sanford Water District

The overarching goal of the council is to improve service and to lower the cost of water for the customer base served by the water systems. Combined, the SMRWC members serve over 250,000 persons throughout 23 communities in York and Cumberland County. The membership extends from the Portland Water District to the north to the Kittery Water District at the southern end of the service area.

The primary motivation for forming the Southern Maine Regional Water Council (SMRWC) was to collectively seek ways to address common issues facing water suppliers in southern Maine and to improve customer service. Since its inception, the SMRWC has explored many opportunities and synergies between members.

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Section 1 Introduction

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The YWD serves approximately 5,360 customers in the Town of York in southern Maine. The YWD's primary source of supply since 1896 has been Chase's Pond. The YWD has protected over 1,700 acres of land in the watershed to protect this valuable resource. Along with land surrounding the Kittery Water District supplies, also located in the Town of York, over 5,000 acres of land is protected in the Town of York by these two utilities. The land is actively managed to protect water quality but is available for general use by the public in accordance with a comprehensive watershed management plan developed by the YWD.

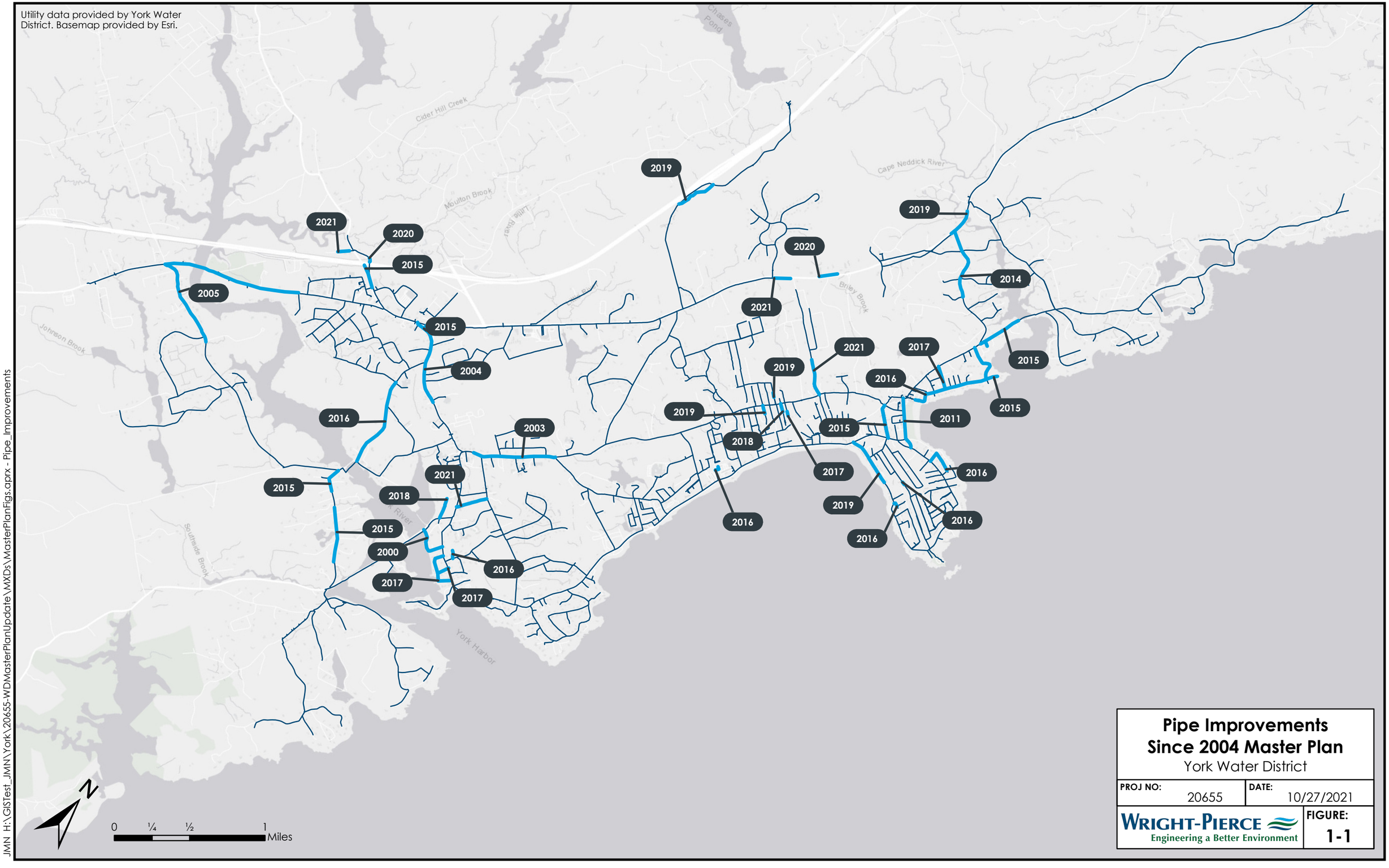
In 1989, the YWD constructed and commissioned the Josiah Chase Water Filtration Plant (JCWFP) to treat and filter Chase's Pond in accordance with EPAs Surface Water Treatment Rule (SWTR) requirements. This facility has been well maintained and continues to produce excellent water quality meeting all state and federal regulations.

The York distribution system consists of over 98 miles of seasonal and year-round distribution and transmission piping, three water storage tanks, and two small, pressurized high service zones supplied by booster pumping stations. Most customers are served from the primary service zone. The entire distribution system is located between Interstate 95 and the Atlantic Ocean. York Beach, York Village, York Harbor, and Cape Neddick areas of York are all served by the York Water District.

The YWD is a well-managed, progressive utility that use master plans as a guide for maintaining and improving the water system. The YWD completed a partial master plan update in 2018 and most recently in 2021. Earlier master plans were also completed or updated in 1980, 1994, 2004, and 2016. The YWD uses the annual capital improvement planning process to maintain the level of service to customers and renewal of aging infrastructure and maintain compliance with existing and future water quality regulations.

To save cost for the rate payers, the District in their planning process, leverages opportunities to work with the Town of York, MaineDOT, and the York Sewer District to complete water main projects in areas of the Town that may be undergoing planned paving projects, storm drain, or sewer upgrade projects. A summary of the water main projects completed by YWD since 2004 is presented in Figure 1-1.

Utility data provided by York Water District. Basemap provided by Esri.



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Pipe Improvements Since 2004 Master Plan

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FIGURE: 1-1

2

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Section 2 Public Water System Introduction

2.1 Water System Overview

The Town of York is supplied public water from three public water utilities: (1) (YWD), (2) Kennebunk-Kennebunkport-Wells Water District (KKW), and (3) Kittery Water District (KWD). The YWD is the predominate and largest water utility in town serving York Village, York Beach, York Harbor, Cape Neddick, and the US Route 1 corridor. The KWD is chartered to serve an area west of Interstate 95 and along the Route 91 corridor from Scotland Bridge Road to Interstate 95. KKW serves a small area in Cape Neddick near the Ogunquit town line. The Cliff House is a major customer in this portion of the KKW system. The York distribution system is interconnected to the KWD system on US Route 1 to the south and to the KKW system on US Route 1 to the north with booster pumping stations (BPS). The extent of the service territories for the three water utilities in the Town of York are shown in **Figure 2-1**.

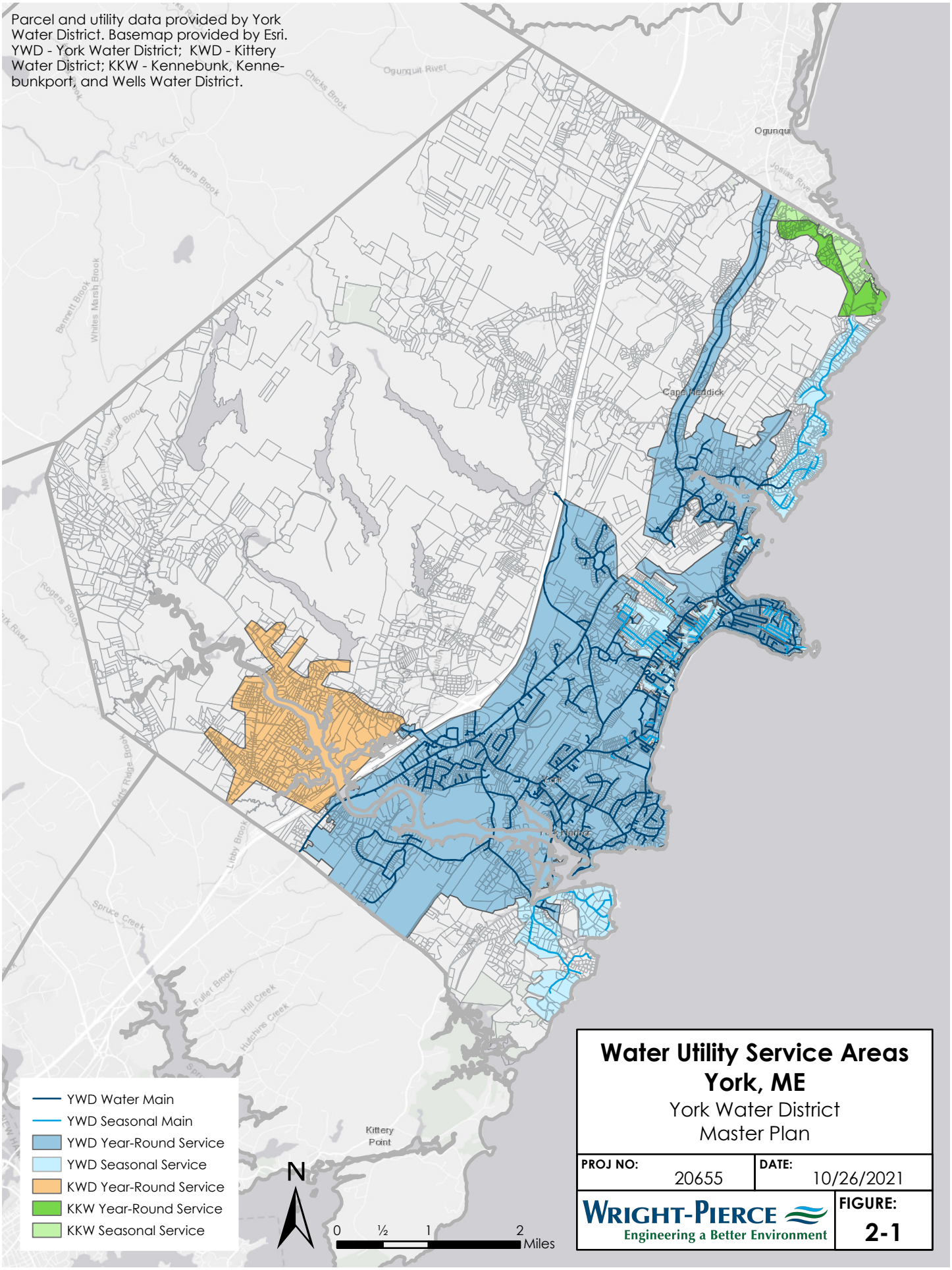
The primary distribution system operates on a common pressure gradient (hydraulic gradeline) at El. 190 feet. Two smaller high-pressure zones serve large residential developments in higher elevation areas along US Route 1. Fire protection in the main system is provided by two standpipes.

2.2 Water Supply Source

The YWD's primary source of supply is Chase's Pond in York, Maine. The dam at Chase's Pond was constructed in 1906. This original dam has been modified and modernized over the years. A chronological history of improvements made to the dam is presented in herein. A description of the watershed lands, dam structures and reservoir properties follow.

2.2.1 Safe Yield

The YWD has been proactive with managing the District's only drinking water supply resource with a robust watershed protection program, water quality monitoring, and land acquisition within the watershed. The YWD has collaborated with the Town of York to support watershed protection ordinances that protect the quality of Chases Pond and regulate development within the watershed.



Water Utility Service Areas
York, ME

York Water District
Master Plan

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FIGURE: 2-1

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The quantity of water to meet the current and future needs of the public water system in York has also been monitored over many years. The water supply available with Chases Pond is not infinite and understanding its quantity limitations is important for future planning.

The safe yield of a reservoir is defined as the average daily withdrawal available during a sustained drought period of record. Safe yield is an average withdrawal rate used to manage water supplies over a long period of time. A safe yield analysis can be performed two ways:

- Graphical methods (Rippl diagram) using run-off estimates translated from a nearby-gauged watershed, or
- Using numerical modeling methods

A Safe yield analysis was performed by Wright-Pierce for Chases Pond as part of the 2004 Master Plan. The safe yield for Chases Pond was determined using graphical techniques to be 2.05 MGD. The yield was based on the 1963-1967 drought, the drought of record for much of northern New England and a bathymetric survey conducted in 1994 which determined the impounded volume of the reservoir to be 387 million gallons (MG) with the flashboards installed.

Additional yield analysis was completed in 2008 to understand the yield during normal precipitation years, or an average yield. Similar to the 2004 safe yield analysis, graphical translation techniques using the data from the Oyster River watershed in Durham, NH, was used for this analysis.

Streamflow and precipitation data were evaluated from 1936 to 2007 to select a year that best represented average flow conditions. The annual mean values for both watershed inflow and rainfall were screened for this period. Based on these mean values, 1994 was selected as the best fit for a normal or average rainfall year with average streamflow. Since the cumulative inflow yield calculation is a seasonal calculation and not correlated to the calendar year, the fall of 1993 through winter 1994 were selected at the time as the representative period.

The analysis found that during a year with average precipitation, the average reservoir yield is approximately 2.97 MGD. Since this additional study work was completed, southern Maine experienced an acute but short duration drought in 2016 and again in 2020 and 2021. The YWD instituted voluntary water conservation measures when lake levels approached historical low levels during the summer of 2016. Water levels decreased to approximately 4.0 feet below the spillway during this period. The lowest level ever recorded in Chase's Pond was approximately 5.2 feet below spillway. The maximum useable depth is 9.1 feet.

2.2.2 Emergency Interconnections

The YWD maintains emergency interconnections with Kennebunk, Kennebunkport, & Wells Water District (KKW) to its north on Route 1 and Kittery Water District (KWD) to its south on Route 1. The YWD maintains booster pump stations to supply existing customers at the extremities of Route 1 north and south, while maintaining pumping infrastructure to wheel water during an emergency or planned maintenance event from KKW or KWD. KKW maintains very similar treated water quality including use of chloramines for disinfection, therefore, the primary emergency interconnection utilized is generally the KKW interconnection from an operations standpoint.

During periods of drought in past summers, the YWD has purchased water from KKW to ease the draft on Chase's Pond during dry periods that coincide with higher water demand summer months.

The YWD also maintains an emergency siphon pipeline between Folly Pond and Chases Pond that can be used for emergency transfers of water to supplement Chases Pond. Since Folly Pond is part of the reservoir supply system for Kittery Water District, the use of this emergency water supply interconnection must be closely coordinated with the operational needs of Kittery Water District if activated during an emergency or period of extended drought conditions.

2.2.3 Water Quality Monitoring

Raw water quality in Chase's Pond has typically been excellent but within the past ten years it has experienced stretches of poorer water quality from major storms and flooding as well as Golden/Blue-Green algae blooms, which are a concern. In August of 2015, an aeration/circulation system was installed in the 15 acres nearest the intake to improve overall water quality and combat issues with algal blooms. The district also maintains a DEP permit to add copper sulfate to control algal blooms. Source water protection has been the key to maintaining the quality of this valuable resource and will be a critical policy to maintain the quality of Chases Pond into the future. In 2000, the YWD implemented a water quality monitoring program to further protect the future of Chase's Pond watershed. The objective of the watershed surveillance program is:

- To educate and inform the public,
- To monitor changes in raw water quality in the reservoir that may impact the health of the reservoir,
- To identify potential threats to water quality in the watershed,
- To develop pre-emptive plans to manage any threats identified to the greatest extent possible,
- To understand raw water quality changes that may impact the treatment facility.

Over the years, the YWD has identified potential sources of contamination in the watershed including unauthorized dumping. Failed septic systems have been removed from the watershed. The program has collected over 20 years of information on tributary and in-pond water quality so that unusual events might be identified.

The aggressive program seeks to limit introduction of nutrients to the watershed which may accelerate eutrophication and impact the long-term water quality of Chase's Pond. Impacted water quality could create additional treatment costs and compromise compliance with regulations.

The monitoring program provides for sampling of each tributary stream into Chase's Pond and within the reservoir at the mixing zones for each stream. Samples have been taken at various depths within the reservoir to understand the effects of water temperature, dissolved oxygen and pH have on water quality at various depths within the reservoir. A periodic report is prepared by the YWD summarizing the results of the sampling program. The report identifies any corrective actions or additional sampling needed on a regular basis.

2.2.4 Watershed Property Description

Chase's Pond receives flow from Welch's Pond and numerous small streams in the head waters of a branch of the Cape Neddick River. The watershed lands are primarily in the Cape Neddick River drainage basin, but small portions of land are owned through contiguous parcels in the York River basins. The drainage area, most of which is owned by the district, consists of large areas of wetlands and the steep slopes of Mount Agamenticus to the northwest.

The 2.93 square mile watershed drainage area is located entirely in York as shown in **Figure 2-2**. The water surface area of Chase's Pond and Welch's Pond comprise approximately 0.23 square miles of the total watershed. Hooper's

Swamp, located to the south, was diverted to the York River in the 1950's because of poor water quality reducing the natural flow into the Chase's Pond drainage area.

The YWD maintains an active land acquisition program in the Chase's Pond watershed. It is the YWD goal to own all the land in its watershed, including seeking partnerships with conservation interests where appropriate. The YWD presently owns approximately 90% of the 1,877 acres within the Chase's Pond watershed. More than 95% of land within the watershed remains undeveloped. The YWD continues to be pro-active in seeking to acquire through fee purchase or purchase of development rights on the remaining properties within the watershed.

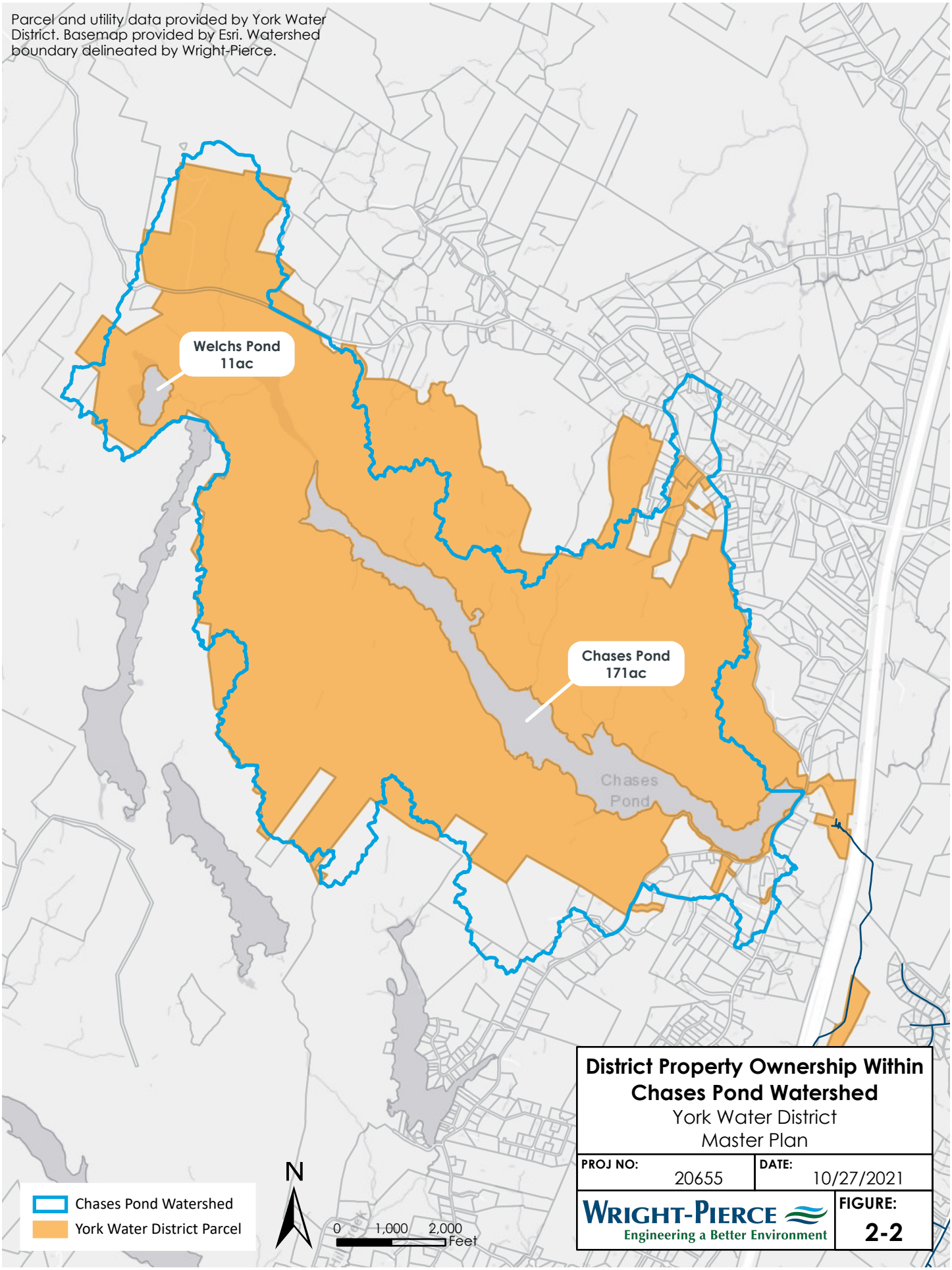
2.2.5 Watershed Management

In addition to land protection in the watershed, the YWD has a patrol and comprehensive management plan and strategy to manage passive uses of the lands through patrols, public education, and management of activities in the watershed. The current resource protection patrol program by the YWD began 1997. The original program was initiated because of increasing pressure from illegal activities and land-uses that posed a threat to preservation of water quality in Chase's Pond. The program has evolved into a multi-faceted land protection program that is a model for protection of water quality by a medium sized water utility in New England.

In 2009, the YWD developed a comprehensive 10-year management plan to manage the 1,877 acres within Chase's Pond watershed. The primary purpose of the plan is to protect water quality. The plan has several components:

- Guidelines for Management and/or Restriction of Recreational Activities
- Forest Management Guidelines
- Source Water Quality Protection and Monitoring
- Property Protection
- Patrol and Surveillance
- Public Education

In 2003, the (YWD) in cooperation with the York Police Department developed a Watershed Enforcement Agreement. The agreement in part created a mechanism to train and deputize a (YWD) employee as a reserve police officer to enforce laws and regulations within the watershed. Gary Stevens, Resource Protection Manager/Assistant Superintendent, has filled this position since its creation.



District Property Ownership Within Chases Pond Watershed

York Water District
Master Plan

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FIGURE: 2-2

The watershed patrols are jointly funded with the KWD on adjoining lands owned by the KWD. Watershed equipment and activities are managed at the District's Resource Protection Office located at 9 Eber Drive in York. The two water districts have jointly protected over 5,000 contiguous acres of watershed lands in the Town of York. A brief chronology and history of land protection efforts in the watershed follows.

- **February 1997** – The watershed protection program began in 1997. Early efforts focused on routine patrols on the watershed lands. Treatment plant personnel shared the responsibility of patrolling the district trails twice per week during normal business hours. These early patrols were not effective in controlling trash dumping in remote areas.
- **July 2000** – Expanded patrols using a mountain bike was initiated in the summer of 2000. A Primary Patrol Person (PPP) position was established to document problems and prepare written patrol reports. The program also initiated a point of contact for the YWD with the public to improve relations and to educate users of the watershed.

These earliest efforts were geared towards public education. The PPP was equipped with ensigned clothing to improve the presence of the YWD and to begin to attempt to enforce early land-use protection rules. The program began to evolve, and it was determined that the PPP needed more legal authority.

- **November 11, 2003** – As discussed, the YWD and the York Police Department entered into a Natural Resources Patrol Agreement in 2003 to create a Reserve Police Officer or Primary Patrol Officer (PPO) position in the Town of York to patrol the watershed areas of York as a police officer. The (KWD) saw value at this time in having support to control illegal activities on their land as well. An agreement between the Kittery and (YWD's) to have a PPO provide joint patrol of both Districts watershed lands and reservoirs, all located in the Town of York, was executed at this time.
- **July of 2004** – Joint watershed patrols began in 2004 and continue today as a collaborative effort by the (KWD), (YWD), and York Police Department. The patrols been beneficial for both utilities. Routine patrol reports are generated and submitted to both Districts and the York Police Department. End of year contact reports are generated for each property to document land activities and problems.

These patrols have generated thousands of contacts, mostly focused on educating landowners and the public on best practices for activities in the watershed. Unwanted activities in the watershed declined steadily after routine patrols were initiated in 2004.

- **Spring 2005** – The York Police Department began securing grants in 2005 from the newly created Maine All-Terrain Vehicle (ATV) Law Enforcement (ATV LE) Grant Program through the Maine Department of Inland Fisheries and Wildlife (MIFW). There are 3 types of grants available to law enforcement:

    1. **General Enforcement Grants** – A grant that funds law enforcement agency ATV LE trained police officers to patrol trails and backlands to enforce ATV laws and protect natural resources.
    2. **Multijurisdictional Enforcement Grant** – A grant that funds an approved law enforcement agency to partner with other law enforcement agencies to conduct multi-jurisdictional (joint) ATV LE patrols. The York Police Department partners with the Maine Warden Service to conduct joint patrols of the entire Mount Agamenticus region, which extends beyond the town boundary into South Berwick.

3. **Training and Equipment Grants** – This grant approves a law enforcement agency to partner with others to provide training on ATV law and operation, safety and equipment use. Equipment grants are used to help purchase ATVs used on patrols. Equipment grants require a 50% match.

During this period, it was recognized that patrols needed to be expanded to year-round to surveil fall and winter activities. Access to trails where motorized use was restricted was also identified as a problem. The greater Mount Agamenticus area regularly sees 50,000 visitors or more per year. Most are hikers, mountain bikers and sightseers. Control of dogs and dog waste was also identified as a potential threat to water quality.

- **2005 – 2017 - In 2005**, the watershed patrol program expanded to a year-round program using ATV LE grant funds. All trails and backlands in York are now patrolled, including land with trails not owned by the Kittery and (YWD's).

The YWD has continued to receive this grant funding for a continuous 13-year period to support this work beginning in 2005. The grant is important in continuing this work at a comprehensive and thorough level. The program is a statewide model for a successful resource management program providing cooperation with ATV owners and others to utilize District lands responsibly. In the past 13 years, the grants have supported half the cost of 7 ATVs for the Town of York. The in-kind match for the remaining cost of each ATV has been funded by the (YWD).

Although most interactions with the public are acceptable, the patrol officer is empowered to issue summons as needed to change behavior and protect the land and water resources of the District. The program has reduced illegal dumping, property damage from ATVs, illegal activities such as thefts, and violations of ordinances and District rules. The patrol position and program has proved invaluable in changing use of the watershed and has contributed to protecting the natural resources in the entire area.

The YWD's reserve police officer or staff now conducts routine patrols of the watershed lands using ATVs, mountain bikes or by foot patrol. All activities are logged and documented. Staff are equipped with communication equipment and clothing that identifies them as watershed patrol employees.

The watershed management plan includes 22 rules of use to manage activities in the watersheds:

- Wheel Vehicles (Trucks, Jeeps etc.) are prohibited.
- No motorcycles, dirt bikes or motor driven cycles.
- ATV's by permit only.
- No gasoline powered engines allowed on the ponds at any time.
- Stay on marked trails.
- Stay out of closed areas.
- The making of new trails is strictly prohibited.
- No boating, swimming, or camping.
- No fishing, open water, or ice fishing.
- No fires of any kind at any time.
- No tree cutting.
- No littering, carry out what you carry in.
- The maximum speed on all trails is 15 m.p.h.
- Pet owners must follow the town of York animal control ordinances.
- Pet owners must also follow the York & (KWD) Public Water Supply Animal Control Policy. Please pick up your pet's waste.
- No tree stands.
- Hunting is allowed.
- Obey all signs.
- No organized group activities.
- No rock climbing, rappelling.
- The possession or consumption of alcohol is prohibited.

- No recreational uses on the ponds at any time, open water, or ice.

Formal policies exist for some of the activities. New policies are needed for remaining activities. A brochure entitled "Watershed Protection Area - Rules of Use" is available for public information.

Passive, low impact recreation uses such as hiking, mountain biking, cross-country skiing, and nature observation are acceptable and managed. The YWD presently permits the use of motorized ATVs on established maintenance roads and wooded trails by permit only. Only residents of Eliot, Kittery and York are allowed ATV permits. These activities are not encouraged, and the YWD does not partner with advocacy groups for these activities. These policies have proven to be effective in protecting the water quality in York and (KWD's) reservoirs.

In 2009, the YWD updated its forest management plan. The plan was amended in 2013. The plan identifies several areas within the watershed where timber harvesting activities are appropriate. Sustainable harvesting practices are followed to meet the primary objective of protecting water quality in Chases Pond.

The watershed lands provide environmental protection for several rare or threatened indigenous species, including Blanding's turtles, spotted turtles, eastern box turtles, wood turtles, ribbon snake and the northern spring salamander. The watershed lands provide broader value to the community, region, and State of Maine by preserving and protecting open space in Southern Maine and allowing limited use.

In summary, the watershed property management plan seeks to meet the following objectives. These principles should be retained during the next 20-year planning period.

- Purchase all reasonable remaining property within the watershed under current private ownership,
- Restrict or control any sources of pollution or contamination that may be a threat to water quality,
- Continue routine water quality monitoring of Chase's Pond,
- Implement an Emergency Response and Spill Prevention Plan for the watershed,
- Conduct a coordinated Emergency Response Drill every 5 years with interested parties and agencies,
- Retain staff with appropriate criminal justice training and credentials to patrol watershed lands in partnership with the York Police Department,
- Continue monitoring and managing recreational activities on District lands,
- Develop a public education program on timber harvesting activities in the watershed,
- Encourage establishment of softwood tree species through timber harvesting practices to maintain water quality in Chase's Pond,
- Continue cooperative land use planning and protection with local partners,
- Manage and maintain trail systems for District use.

Forest management practices that encourage softwood species has a direct bearing on water quality in Chase's Pond. Natural succession of forests in Southern Maine often led to high concentration of Northern Oak. Oak trees can generate tannins from decomposing leaves and acorns which can enter Chase's Pond from run-off. Tannins are difficult to remove with coagulation and can contribute to disinfection by-product formation. The current forest management practices generate income for the YWD through carefully managed, selective cutting while contributing to a forest mix that supports water quality goals.

The YWD recognizes its responsibility to provide managed access to its watershed lands for the public. However, public access creates risks that must be mitigated and managed to protect water quality. Road systems are present to allow access to the lake and watershed by District staff. These roads are maintained for the YWD needs, not for recreational purposes. The YWD's overarching goal is to protect the water supply for drinking water purposes.

The YWD's efforts to promote public awareness, education and effective signage are all positive contributors to continued high quality source water in Chase's Pond. The active land patrol program coupled with management of recreational activities on the lands has reduced threats to Chase's Pond from contamination.

2.2.5.1 Water District Land-Use Policies

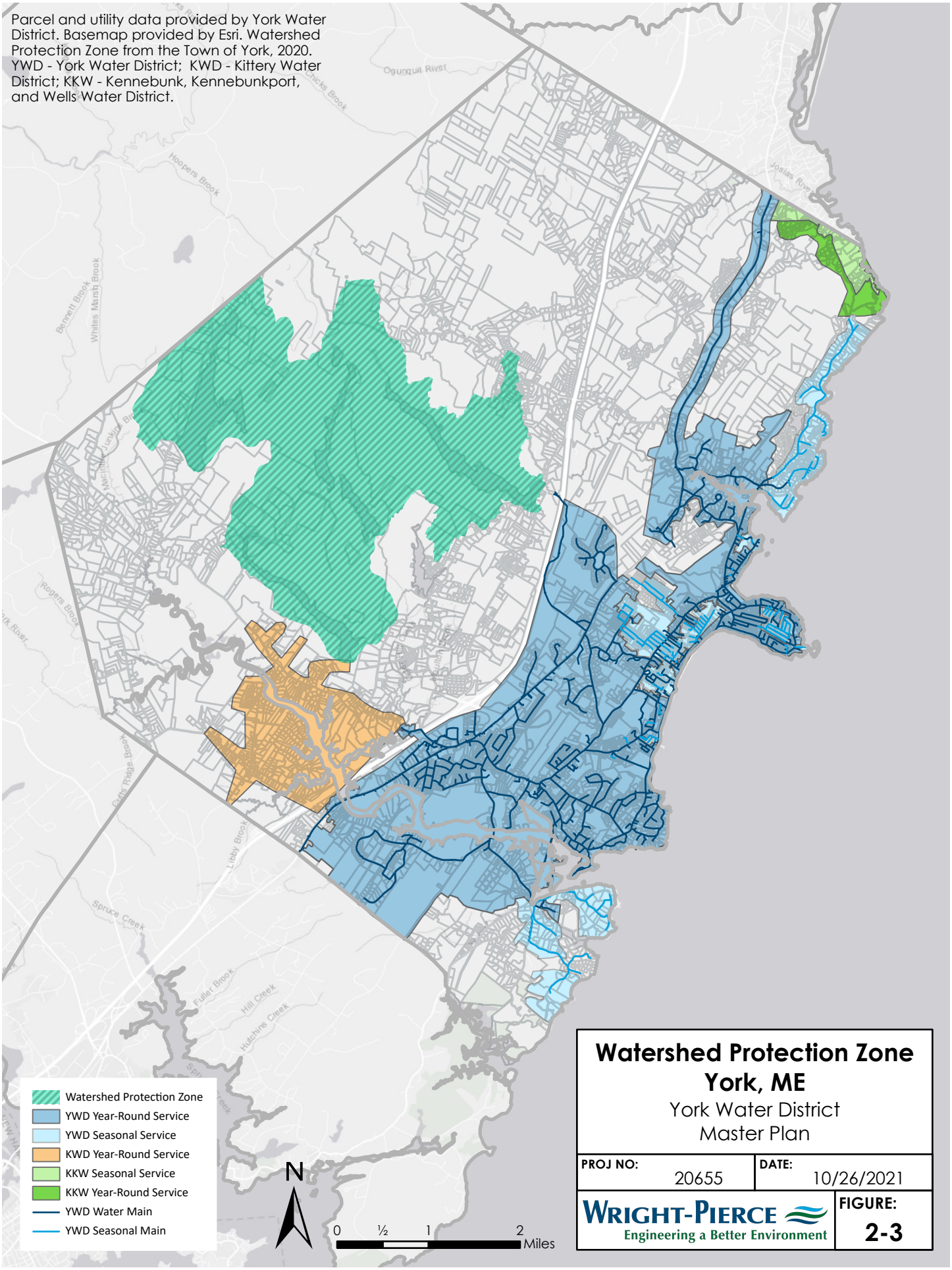
The YWD has adopted three specific land-use policies that have been jointly adopted in 2017 by the KWD as well:

- Watershed Recreational ATV Permit and Recreational ATV – This policy establishes guidelines for ATV use in the watershed. A permit is required for ATV use in the watershed. Only residents of Kittery, Eliot and York can apply for a permit.
- Hunting Use Policy – Hunting is allowed on the watershed lands with some restrictions. The policy stipulates when permission is required and defines best management practices in the watershed.
- Animal Control Policy – This policy requires leashing of all dogs and removal of dog waste from watershed lands.

2.2.5.2 Local Land Use Zoning Ordinance

In addition to the active management of the watershed by the YWD, land-use activities in the Chase's Pond Watershed are protected by local ordinance administered by the Town of York. A Watershed Protection Overlay District encompasses the entire 1,877-acre watershed of Chase's Pond. The overlay also encompasses the drainage basins of Boulter Pond, Bell Marsh Reservoir, Folly and Middle Ponds which are water supplies for the (KWD) The base land-use zone in the ordinance is designated as General Development 2 (GEN-2 designation), a general development zone for rural areas of the Town of York. The overlay district is critical to support the surveillance activities undertaken by the YWD to protect water quality and to restrict and manage land-use activities in the watershed. **Figure 2-3** shows the boundary of the Watershed Protection Overlay District.

Figure 2-4 shows the current base land-use zones in the Town of York. All watershed lands are zoned for general rural uses although new residential development within the watershed is limited to a minimum of 10-acre lot size.



Watershed Protection Zone
York, ME

York Water District
Master Plan

PROJ NO:	DATE:
20655	10/26/2021

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FIGURE: 2-3

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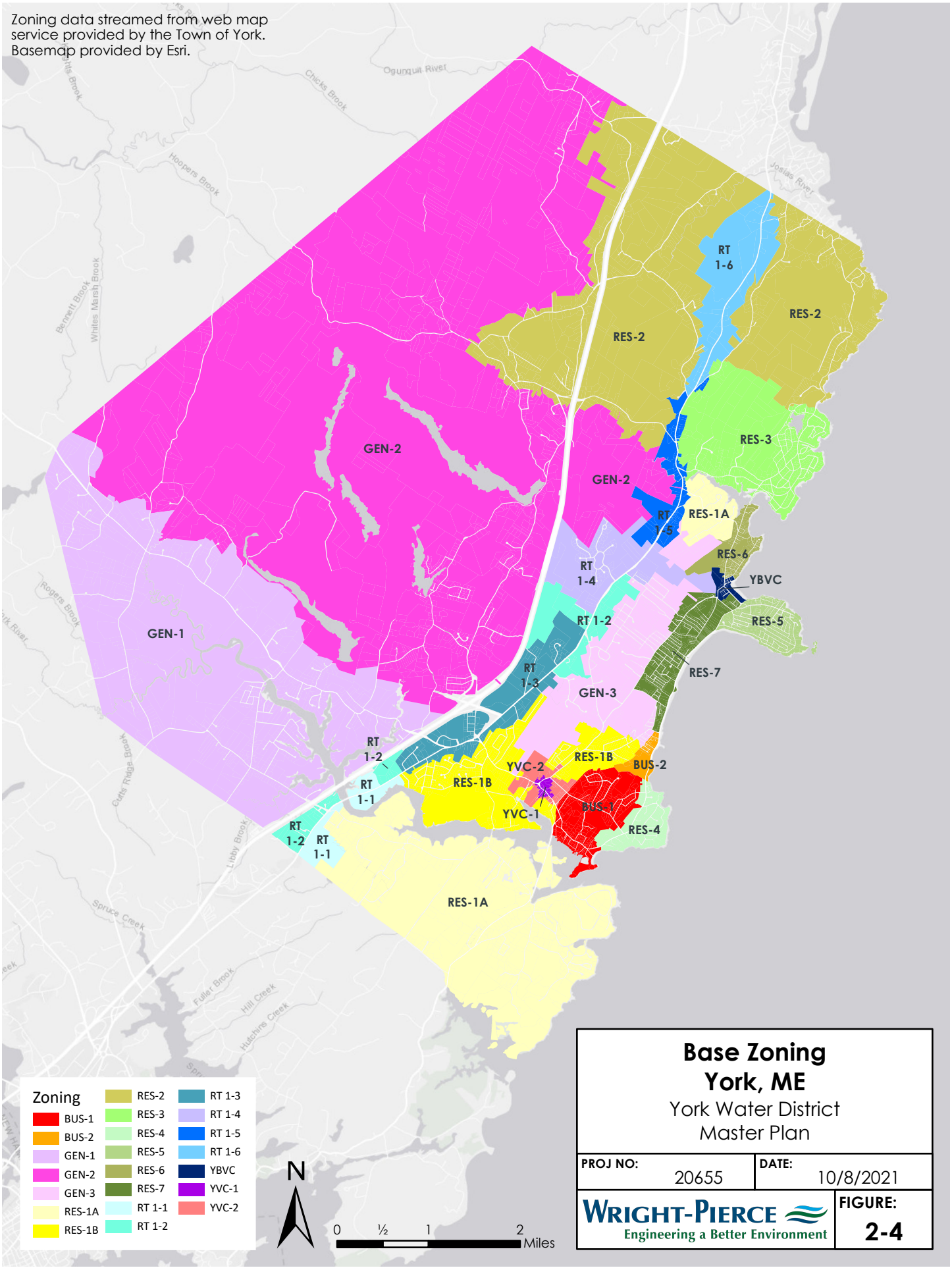

Base Zoning
York, ME
York Water District
Master Plan

PROJ NO:	DATE:
20655	10/8/2021

WRIGHT-PIERCE
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FIGURE: **2-4**

JMN W:\GIS_Development\Projects\ME\York\20655-WDMasterPlanUpdate\MXDs\MasterPlanFigs.aprx - Zoning

2.3 Chase's Pond Dam

Chase's Pond Dam is a curved earth embankment located at the east end of Chase's Pond with a concrete spillway and gate structure discharging to the Cape Neddick River basin.

The embankment crest is either covered with grass or stone. The earthen berm crest is located at El.165 feet with a width of approximately 10 to 20 feet. The core of the earthen berm is constructed with impervious fill which is keyed into the foundation soils. The upstream side of the embankment consists of a low height, precast concrete block retaining wall and rip rap slope (2H:1V). The downstream side is sloped at approximately 2H:1V and is grass covered. The earthen berm terminates at the left abutment. The dam crest length is approximately 645 feet long and the dam is approximately 20 feet high at the spillway.

The spillway has an ogee shape cross-section and is constructed of stone masonry overlain with concrete. The spillway crest is cantilevered on the upstream side, and is supported by six 12-inch diameter, reinforced concrete piles cast within a steel pipe sleeves. The steel piles are reported to be severely corroded.

An approximate 1-foot-high wooden flash board exists on top of the spillway crest. The downstream discharge channel is formed by exposed bedrock. Discharge through the spillway flows through a culvert under Chase's Pond Road to Little Pond. Little Pond Dam, an unregulated dam, impounds Little Pond.

A concrete gravity retaining wall with a curved alignment abuts the left side of the gate structure and terminates at the earthen berm. The top of the retaining wall is at El. 162.7 feet.

A concrete, cantilevered retaining wall forms the right spillway training wall terminating at an earth embankment. The top of the retaining wall is at El. 162.7 feet. The upstream side of the retaining wall is backfilled with rip rap which slopes down to meet the top of the precast concrete block retaining wall which runs along the water's edge. An earth embankment constructed with impervious fill abuts the south side of the cantilever retaining wall and terminates at the right abutment.

An earthen dike is located at the southern end of Chase's Pond, approximately 1,300 feet southwest of the dam. The crest of the dike is at El. 162.7 feet, similar to other embankment sections of the dam. The crest of the dike is about 10-feet wide, and grass covered. The upstream slope is protected by rip rap pitched approximately 2H:1V. The downstream slope is approximately 4H:1V and grass covered.

Discharge from the Chase's Pond Dam spillway flows through a culvert under Chase's Pond Road to Little Pond, then to the Cape Neddick River. A flood mitigation berm was added to the Cape Neddick River adjacent to the WTP in 2016. An existing footbridge over the Cape Neddick River was removed in 2018 to further improve flood prevention.

2.3.1 Dam Inspection & Emergency Action Procedures

In 2001, the YWD completed an emergency action plan (EAP) for the facility. The EAP has been updated biannually since that time, which is consistent with requirements for high or significant hazard dams in the State of Maine. The plan includes a description of the dam, inundation mapping, emergency response procedures and testing and notification procedures during dam failure. The EAP included procedures for flashboard removal which may be triggered as early as Stage 2 in the EAP. The inundation mapping was based on a dam breach analysis. Notification procedures include all residents and business located within the inundation zone.

Routine inspection checklists are included in the EAP with specified inspection frequencies for specific components of the dam. For example, routine visual inspections are conducted quarterly. Other critical components are inspected during high water conditions. A routine dam inspection and evaluation report is completed by a professional engineer every 5 years as described above.

The plan provides for annual review and biannual testing of the EAP and specifies an emergency response procedure to guide first responders and District staff in an emergency. The YWD updated the EAP in 2021 and has begun the process of providing updated EAP information to the Town of York and other stakeholders involved in the EAP.

2.4 Water Treatment Facility

The YWD maintains the Josiah Chase Water Filtration Plant (JCWFP) at Chase's Pond in York. The treatment plant uses a two-stage direct filtration technology.

The (JCWFP) was constructed in 1989 adjacent to the Cape Neddick River, downstream of the screen house. The site was selected to allow gravity flow from the pond to prevent the need for raw water pumping. The facility is well maintained and continues to meet the needs of the YWD. The facility replaced an older pumping station and chlorination facility at the site. In 2016 the district rebuilt and inspected the four mixed media filter basins and replaced each underdrain system, retaining media, and filtration media. The aeration discs in both Clarifiers were also changed to enhanced technology. In 2015, the YWD constructed a berm system along the access road to the plant to mitigate flooding from the Cape Neddick River. Other than this improvement, the site and facility are relatively unchanged since the plant inception. A description of major facility systems and recent improvements at the facility follows.

The primary filtration/clarification process uses packaged treatment vessels manufactured by Westech Engineering (formerly CPC Engineering, Microfloc Products). The facility is designed for a maximum flow of 4 (MG) per day (MGD). Two parallel treatment modules each with a capacity of 2 MGD are provided for redundancy and allow operation of one train during maintenance periods of low demand. Each module consists of one adsorption clarifier and two mixed-media filters. At the design flow of 4 MGD the hydraulic loading rates on the clarifiers and filter are 10 gallons per minute (gpm) per square foot (SF) (gpm/sf) and 5 gpm/sf, respectively. On an average production basis, at maximum plant flow, the plant can produce about 3.7 MGD when backwash waste and clarifier flush water is discounted.

2.4.1 Lagoons and Drying Bed

During normal operation, filter backwash and clarifier flush water is diverted to two lagoons. Solids in the water settle to the bottom of the lagoon and supernatant is drawn off the surface into the outlet structure and washwater return pump station. Flow can be diverted to the other lagoon if the sludge blanket in the lagoon in use gets to an appreciable thickness. Stop logs in the outlet structure can then be removed (or added) one at a time to reduce the volume of water in the lagoon to further consolidate the sludge blanket.

A suction pump is used annually or biannually to transfer sludge from the lagoons to the freeze-drying bed. The sludge is dewatered and air dried during the warm months and frozen during the winter. Sludge is typically applied to the drying bed in layers and allowed to dry or freeze before the next layer is applied.

The sludge is retained in the lagoon for up to 10 years or more and then excavated for disposal. Up to approximately 150 cubic yards of dewatered sludge may be stockpiled on site awaiting final disposal. Dried treatment plant residuals were last landfilled in 2019.

2.5 Distribution System

2.5.1 Pressure Zones and Service Areas

The York distribution system has one primary pressure zone operating at a hydraulic gradeline of approximately El. 190 feet. Pressure is controlled by the two water storage tanks. From this main service zone, pressure is boosted to two small residential developments with BPSs. These two smaller pressure zones do not have gravity storage and are expected to have been built out fully. The York distribution system is shown in Figure 2-5.

2.5.2 Distribution Storage

Storage of water within the distribution system is typically used to provide for peak hourly demands, firefighting needs, and emergencies. The YWD has two distribution storage tanks: (1) York Heights and (2) Simpson Hill. In addition, a third tank located at the treatment plant is used for backwashing the filters at the treatment plant.

Water level trends in the Simpson's Hill tank and the York Heights tank are recorded in the SCADA system. During summer months when demands increase in York Beach, water level in the Simpson Hill Standpipe controls start-stop operation of the water treatment facility. York Heights controls plant operation during the remainder of the year. Physical data on the 3 storage tanks is included in Table 2-1 below.

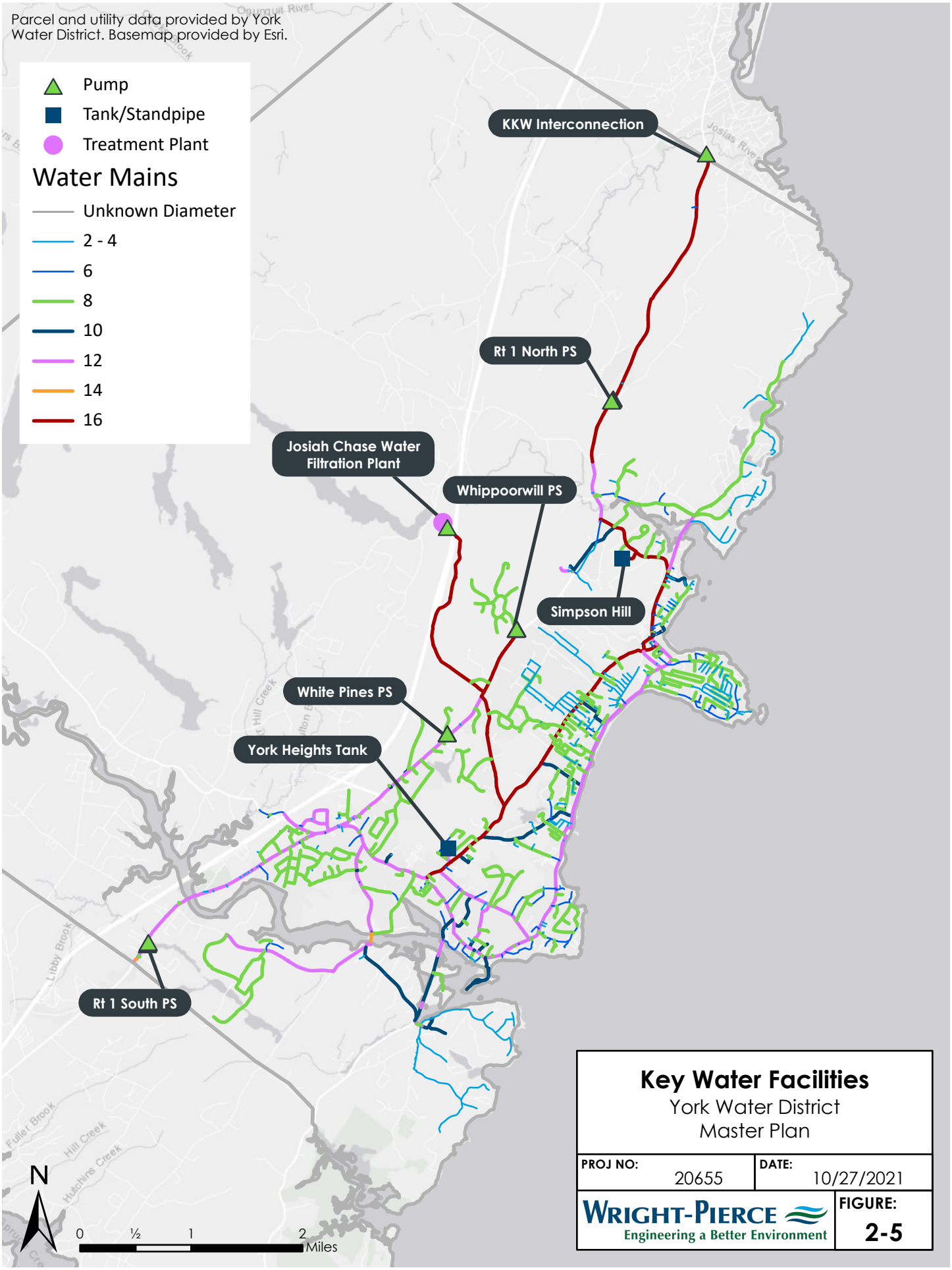
Table 2-1 Storage Facilities

Location	Year Constructed	Total Capacity (MG)	Diameter (feet)	Height (feet)	Base Elevation (feet-USGS)	Overflow Elevation (feet -USGS)
York Heights	1969	2.0	72	65	125	190
Simpson Hill	1982	3.0	67	113	77	190
JCWFP Backwash	1979	0.7	60	33	143	176

2.5.3 Booster Pumping Stations

The YWD, the York Fire Departments, and the (Maine PUC) have established the following criteria for pressures and flows for new residential developments in York:

1. Minimum Service Pressure – The YWD policy states that all new residential subdivisions must provide a minimum of 35 psi at bathroom fixtures on the second floor of a residence under normal operating conditions (Peak-hour condition on a maximum water-use day).
2. Fire Flows – A new residential development must be able to provide a minimum of 1,000 gpm at all hydrant locations within the development under worst case conditions in the distribution system. This is a requirement of the York Fire Departments.
3. Residual Pressures during a Fire Condition – The Maine PUC and Maine Department of Health and Human Services (DHHS) requires a minimum pressure at all service connections to water mains of 20 psi during a fire condition.



Key Water Facilities

York Water District
Master Plan

PROJ NO:	DATE:
20655	10/27/2021

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FIGURE: 2-5

JMN H:\GISTest_JMN\York\20655-WDMasterPlanUpdate\MXDs\MasterPlanFigs.aprx - System Map

If a proposed development cannot meet these minimum requirements, then a booster pump station (BPS) is required. The YWD has two pressure zones that are closed systems (no elevated storage) which are supplied by BPSs which draw water from the main zone; (1) Whippoorwill Booster Pumping Station and (2) White Pines Booster Pumping Station. A third booster pump station is expected to be constructed in 2022, to serve the Gulf Hill subdivision project.

2.5.4 Transmission System

The York distribution system is supplied via a single primary 16-inch transmission main that extends under Interstate 95 to the distribution system on the east side of the highway. Much of the original 16-inch main have been replaced with ductile iron.

The original transmission system constructed in 1896 consisted of two transmission mains from Chase's Pond. A 14-inch cross country main to York Beach which has since been abandoned and a second 16-inch branch to York Village extending down Newtown Road. This second branch has also been abandoned. A new 16-inch ductile iron main was constructed to replace a portion of the transmission system which parallels Interstate 95 in the 1980s. A second cross-country section constructed in 1957 from the end of this newer transmission main section connects to the distribution system at US Route 1. The remaining pipe segment between the Interstate 95 and the treatment facility dates was also replaced in the 1950's.

2.5.5 Distribution System

The YWD maintains a 98.5 miles water distribution system consisting of mains ranging in size from 1.5-inch diameter to 16-inch diameter. The distribution system predominately consists of ductile iron pipe with lesser but substantial amounts of cast iron and HDPE.

The general distribution of main sizes in the system by pipe diameter is shown in **Figure 2-6**. **Figure 2-7** shows the current distribution of pipe materials in the distribution system. The majority of the small diameter 2, 3 and 4-inch mains are HDPE seasonal lines. The District has also been very proactive replacing older cast iron mains in the system. Side streets with older 6-inch cast iron have been routinely replaced with 8-inch pipes explaining predominance of 8-inch mains in the York system. Critical spines of the system are 12-inch and 16-inch mains.

Figure 2-6 Water Main Distribution In York By Pipe Diameter

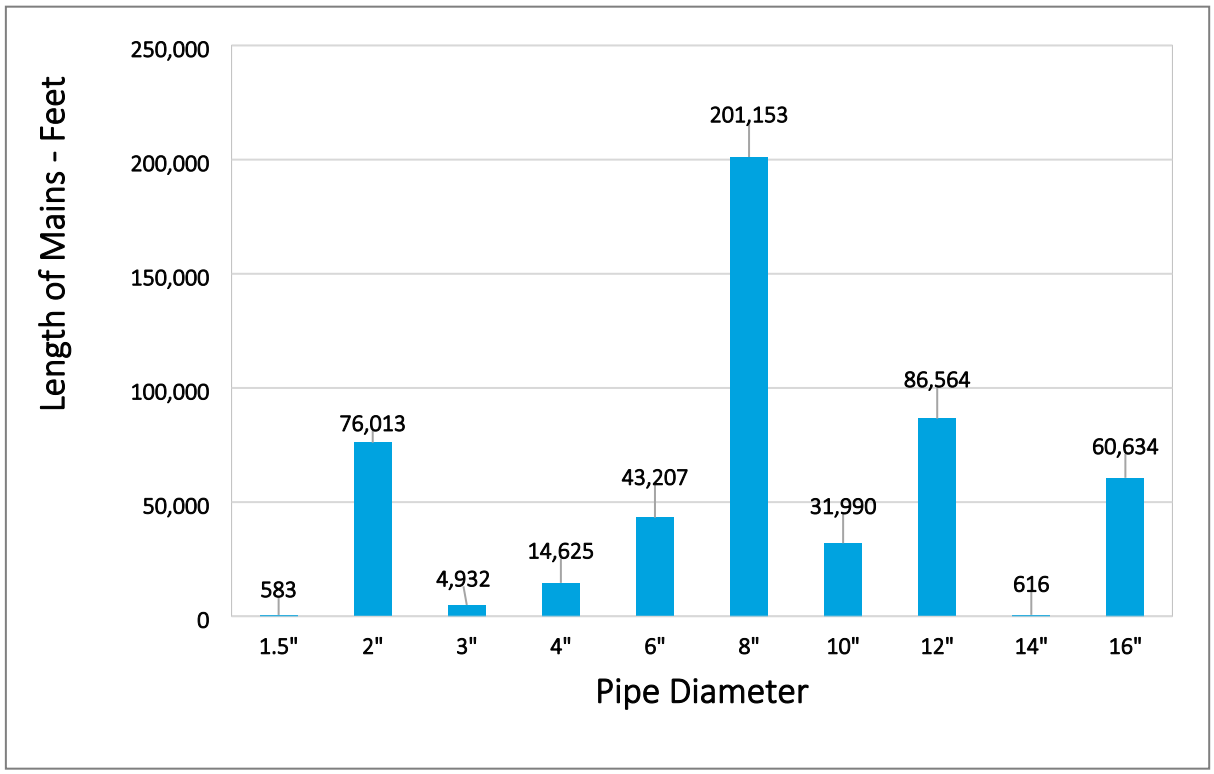
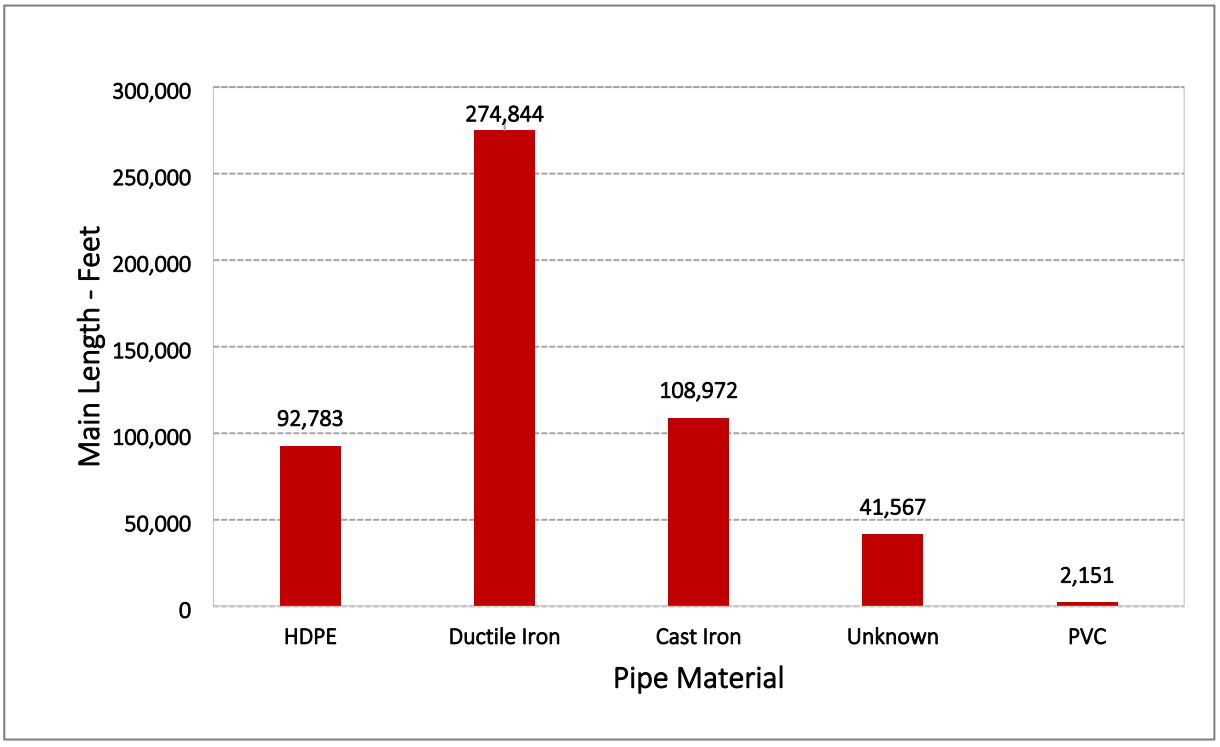


Figure 2-7 Water Main Distribution In York By Material Type



2.5.5.1 Public Fire Protection

Approximately 377 public fire hydrants are connected to the distribution system and are available for fire protection purposes. These hydrants are widely distributed throughout the distribution system and provide coverage to most of the service area except those areas serviced by water mains less than 6-inch in diameter. The YWD also maintains 67 private fire hydrants.

The YWD provides and maintains all the hydrants in the system using the District's GIS database. The YWD routinely flushes all hydrants in the spring. During flushing, a complete inspection of the hydrant occurs including documenting inoperable or damaged components, missing caps, and a general overall assessment. Reported defects are documented and scheduled for repairs.

Portions of the service area are subject to MS4 regulations regarding discharge of chlorinated water to surface water bodies from fire hydrants. The YWD has purchased 2 tablet dechlorinators and use best management practices to control release of chloramine during flushing. The YWD documents which hydrants are located in an MS4 designated area.

The Insurance Services Office (ISO) assesses fire protection in a given community roughly every 10 years. The effort culminates in a report issuing each service community in a District's service territory a Public Protection Classification (PPC). This classification assigns a value ranging from 0 to 10 to classify the level of fire protection in a given community. Class 1 represents exemplary fire protection, and a Class 10 represents a system that does not meet minimum fire protection criteria. Development of the classification is quite complex considering a variety of factors. The three primary factors effecting the classifications are:

- Fire Alarm and Communication Systems - This factor includes an assessment of community's ability to handle and dispatch fire alarms. This task accounts for 10 percent of a community's rating.
- Fire Department - This factor accounts for 50% of the total classification and focuses on such factors as distribution of engine companies and fire stations, pumping capacity, reserve apparatus, training, and staffing issues.
- Water Supply System - The water supply accounts for 40% of a community's classification. Factors affecting the rating include hydrant flow capacity, hydrant inspection protocols, condition of hydrants and other factors.

The 40 ISO points controlled by a water utility in a community are subdivided into three subcategories:

- Credit for Needed Fire Flow (35 points) – This is the largest and most important factor influence the fire rating. For maximum credit, the required or needed fire flows at each test location in the community must meet the minimum fire flows dictated by ISO.
- Credit for Hydrants (2 points) – For maximum credit, all hydrant branches must be constructed in accordance with NFPA standard 1142. Hydrants must have a 6-inch hydrant branch from the supply main to the hydrants and have a pumper outlet in accordance with AWWA C-503 standards.
- Credit for Hydrant Inspection (3 points) – For maximum credit, hydrants need to be inspected biannually in accordance with AWWA standard M-17.

In 2016, ISO changed its classification system. Prior to 2016, a community received a split classification based on properties within 1,000 feet from the distribution system and less than 1,000 feet from a hydrant (Class "A") and properties beyond 1,000 feet from a hydrant (Class "B"). A designated split classification would be assigned a composite number denoted A/B. The new system changed the designation for properties over 1,000 feet from a hydrant to a new numbering system using either 6X or 6Y as the numerical value. Because ISOs last testing period occurred before 2016, the old naming nomenclature is reflected in the rating. The next ISO rating study will incorporate the new naming nomenclature.

The YWD has a routine hydrant inspection program which increases the fire classification for the water supply component. The program includes testing and recording operations problems, painting, bolt inspection and replacement, and flushing annually.

The ISO completed its latest study of the Town of York in September 2012. The Town of York received a classification of Class 4/9. In the State of Maine, only about 10% of the community water systems meet this standard.

The Town of York water supply received a rating of 35.88% out of a total score of 40%, an excellent rating. The total score for the town, including the water supply rating, was 68.62 points out of a total of 100 points. The point totals obtained from the ISO testing in 2012 are summarized in **Table 2-2** below.

Table 2-2 ISO Water Supply Credits For The Town of York – September 2012

Credit	Earned Credit	Maximum Credit
Credit for Needed Fire Flow	31.33	35.0
Credit for Hydrants	2.0	2.0
Credit for Hydrant Inspection	2.55	3.0
Total	35.88	40.0

The ISO rating is based on all hydrants within the geographic boundary of the town, so hydrants on the (KWD) and Kennebunk-Kennebunkport-Wells Water District systems also impact the town's ISO rating. Only 3 of the 19 tests on the (YWD) system did not meet the minimum ISO requirements for those locations. Fire flow tests completed by ISO in 2012 are presented in **Table 2-3**. The YWD continues to work diligently towards increasing flows in deficient areas. In summary, the (YWD) continues to provide an excellent flow regime in the Town of York to meet fire protection needs.

A number of fire flow tests were conducted in 2017 to determine the flow capabilities of hydrants at representative areas of the system. Individual test results are compared on a common basis by calculating the flow that would be available at a residual pressure of 20 psi in the main.

Two fire departments exist within the Town of York, each with a designated area of primary and secondary responsibility. The York Village Fire Department, located near the village square off York Street, has approximately 3 full-time/career and 57 volunteer firefighters. The York Beach Fire Department is located on Railroad Avenue and is comprised of about 3 full-time/career and 50 volunteer firefighters. The Departments are equipped with pumper trucks, tank trucks, an aerial ladder truck, off-road forestry vehicles and rescue vans. The YWD also purchased a "firelight" implement that is mobile for firefighting in the watershed. This equipment is stored by the YWD.

The Town of York requires all new residential developments to provide a minimum of 1,000 gpm fire flow to new fire hydrants added to the system and served by public water.

Table 2-3 ISO Flow Test Results Conducted In The Town of York – September 2012 York Water District

Test No.	Land-Use Description	Test Location	Service Zone	Residential Flow Test (GPM)	Pressure (psi)		Flow @ 20 psi		Adequate?
					Static	Resid.	Needed	Avail.	
1B	Commercial	Hyd @Shore Road and Main Street	York Water District	1020	66	65	2000	8100	Yes
2B	Commercial	Hyd @Ocean Ave. and Main Street	York Water District	1630	75	72	3500	7800	Yes
3B	Commercial	Hyd @ Church Street and Long Beach Ave.	York Water District	1010	68	59	2000	2500	Yes
4B	Commercial	Hyd. @ Shelton Street and Nubble Road	York Water District	790	69	36	1750	1000	No
5B	Commercial	Hyd. @ Long Beach Ave./Morningside Drive	York Water District	1970	76	68	1750	5600	Yes
6C	Residential	Hyd. @ Ridge Road and Juniper Park Lane	York Water District	930	56	53	500	3600	Yes
7B	Commercial	1st Hyd. @ High School	York Water District	2070	76	70	3500	6900	Yes
8A	Commercial	Hyd. @ Long Beach Ave. and Mitchell Road	York Water District	750	68	64	4500	2900	No
8B	Commercial	Hyd. @ Long Beach Ave. and Mitchell Road	York Water District	750	68	64	2250	2900	Yes
9B	Commercial	Hyd. @ Woodbridge Avenue and Scott Ave.	York Water District	2070	60	54	2500	5800	Yes
10C	Residential	Hyd. @ Norwood Farms and Milbury Lane	York Water District	730	53	51	750	3300	Yes
11B	Commercial	Hyd. @ York Street and Varrell Lane	York Water District	1500	52	49	3500	5400	Yes
12B	Commercial	Hyd. @ Organug Road and Indian Trail	York Water District	3500	0	0*	3500	3500	Yes
13B	Commercial	Hyd. @ Route 1 and Cider Hill Road	York Water District	3750	0	0	3500	3750	Yes
14A	Commercial	Route 1 (location not specified in ISO report)	York Water District	3000	0	0	7000	3000	No
14B	Commercial	Hyd. @ Route 1 and New Town Road	York Water District	3820	0	0	3000	3000	Yes
15C	Residential	Hyd. @ Cider Hill Road and New Boston Rd.	Kittery Water District	1240	52	40	500	2100	Yes
16B	Commercial	Hyd. @ Beech Ridge Road and Betty Welch	Kittery Water District	1240	60	50	2500	2600	Yes
17B	Commercial	Hyd. @ Route 1 and Rogers Road	York Water District	3800	0	0	3500	3800	Yes
18B	Commercial	Hyd. @ Route 1 and Pine Hill Road	York Water District	1400	0	0	2250	1400	Yes

*Data provided to ISO by the York Water District
**Refer to Table 6-2 for current system comparison to ISO requirements.

2.6 Administration Functions

2.6.1 Office

The YWD business office and operations center is located on a 1.94-acre parcel at 86 Woodbridge Road in York Village. This facility supports District administration, distribution system staff, vehicle and equipment storage, financial administration, billing, customer service, and management staff. Customers access this building for bill payment.

2.6.2 System Development Charge

The YWD has a system development charge (SDC) or impact fee for new customers, designed and approved in accordance with the (MPUC) requirements under Chapter 61 of the Rules and Regulations Related to Water Rates. The fee structure is a special type of impact fee intended to fund system expansion driven by growth. The York (SDC) was approved in April 2003.

The (SDC) is structured by using information generated in a water system master plan report. This report will segregate recommended needs into two categories; (1) Capital needs required to adequately serve existing customers and (2) Projected capital needs to support anticipated future growth in water demands. This format will allow the District to extract the needed information from the plan to update the (SDC) after this report is complete.

2.6.3 Organization and Staffing

The YWD currently has 20 employees excluding the Board of Trustees under the direction and oversight of the District Superintendent. The District staff by job category is summarized in **Table 2-4**. An organizational chart showing the reporting structure for staff is included as **Figure 2-10**.

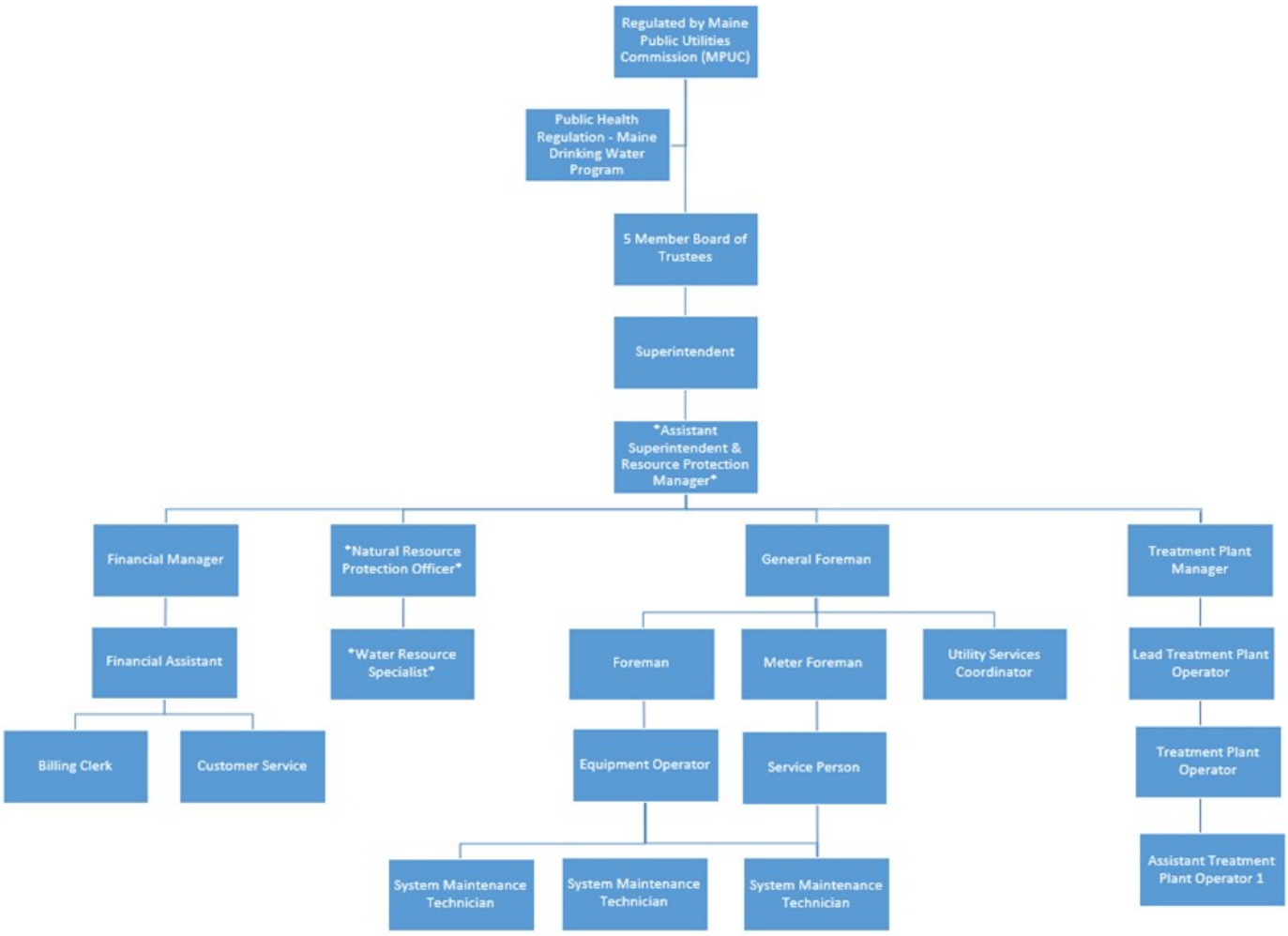
Table 2-4 York Water District Staffing By Job Category York Water District

Job Category	Number of Positions
Superintendent	1
Assistant Superintendent and Watershed	1.5
Water Treatment Facility and Pumping Stations	4.5
Distribution System	9
Water Services	1
Accounting and Financial	2
Billing and Customer Relations	2
Total Staff	21

The YWD is managed by a Superintendent whom the Assistant Superintendent reports to. The Assistant Superintendent is also the Natural Resource Protection Manager and Natural Resource Protection Officer. The Assistant Superintendent has four direct reports: (1) Financial Manager, (2) Water Resource Specialist, (3) Treatment Plant Manager, (4) General Foreman. In general, the Financial Manager is responsible for all financial oversight, annual MPUC reporting, administration of the (SDC) for new customers, customer relations and billing. The Natural Resource Protection Manager oversees all watershed management activities. The general foreman oversees all distribution system operations. The Treatment Plant Manager is responsible for operation of the treatment facility, water quality, and operation of remote facilities including storage tanks, and BPSs.

The YWD is well managed and has been proactive managing and modernizing the water system. The Board of Trustees meet monthly. The five Board members are elected to 5-year terms. The YWD's terms and conditions are MPUC approved.

Figure 2-8 Organization Chart



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Section 3 Water Use & Projections

3.1 General

York is like many coastal resort communities in southern Maine. In addition to year-round residents, seasonal residents staying at trailer parks, vacation homes, hotels, and campgrounds cause the summer population to swell. The York comprehensive plan estimates that the summer overnight population during peak summer period swells to over 20,000 people. The transient daytime population has been estimated to exceed 30,000. Understanding the influences that drive the maximum demand days during the summer is important in developing reasonable water-use projections into the future.

The District has improved its infrastructure to increase hydraulic efficiency and system reliability within the current water system. Approximately 25% of the recommended piping enhancements from the 2016 Master Plan have been implemented.

A growth projection of water-use was completed during the 2021 master plan update to confirm that future facilities are adequately sized to meet projected demands and to determine adequacy of aging piping and other infrastructure.

3.2 Existing Land Use and Community Growth Patterns

York Village, York Beach, and Cape Neddick are the primary population areas served by the YWD. York is a service community with light commercial shopping areas along US Route 1, a regional hospital and many small seasonal businesses in York Beach. Much of the land west of Interstate 95 is protected watershed lands of the York and Kittery Water Districts. Opportunities for large scale expansion of the water system west of Interstate 95 will require boosted pressure to serve higher elevation areas and would be funded by the project proponent as regulated by the MPUC. These influences are impediments to large scale development in the Town of York.

York presently serves no large industrial customers. Metered water consumption is primarily residential with smaller numbers of commercial and government accounts. Large areas of the distribution system, primarily in Cape Neddick and York Beach, are served by seasonal water mains.

All new customers are required to pay a system development charge (SDC) to connect to the water system. This income is used to renew the water system with investment to offset growth driven needs. Understanding how growth will occur in the future will allow the YWD to adjust or change the (SDC) to meet these projected demands.

Future growth in the service area is anticipated to be primarily residential and light commercial growth directly related to increases in population. Commercial land use is also anticipated to increase in response to residential growth. Additional future commercial growth is anticipated to be concentrated in existing commercial land-use zones within the Town of York. No major industrial developments are currently under consideration in the service area. A current land-use zoning map for the town of York is shown in Section 2.

3.3 Population Demographics and Projections

The population data discussed herein will serve as the basis for projecting water use needs within the York service area and to determine the adequacy of existing pumping, distribution and transmission facilities and the need to expand or upgrade these facilities. There is generally a close relationship between a community's population and total water consumption. Residential water consumption is directly linked to population growth in a community.

Although less directly related, commercial, municipal, and industrial water consumption will also tend to vary proportionately with population growth in a community.

To better understand the population demographics in the service area, data for this study was collected and analyzed from the U.S. Census Bureau, Maine Department of Administrative and Financial Services (MDAFS), and Southern Maine Planning and Development Commission (SMPDC). The general population trends and projections for the Town of York and several neighboring communities are presented in Table 3-1. The data is also presented graphically in **Figure 3-1**.

Population growth in the Town of York has increased since the 1970's, although at a much slower pace over the past 15 years. Population growth in neighboring communities has slowed at a similar rate as York over this same period. York is a preeminent seaside resort in southern Maine continues to draw seasonal, transient visitors and new residents on a more sustained basis than other communities.

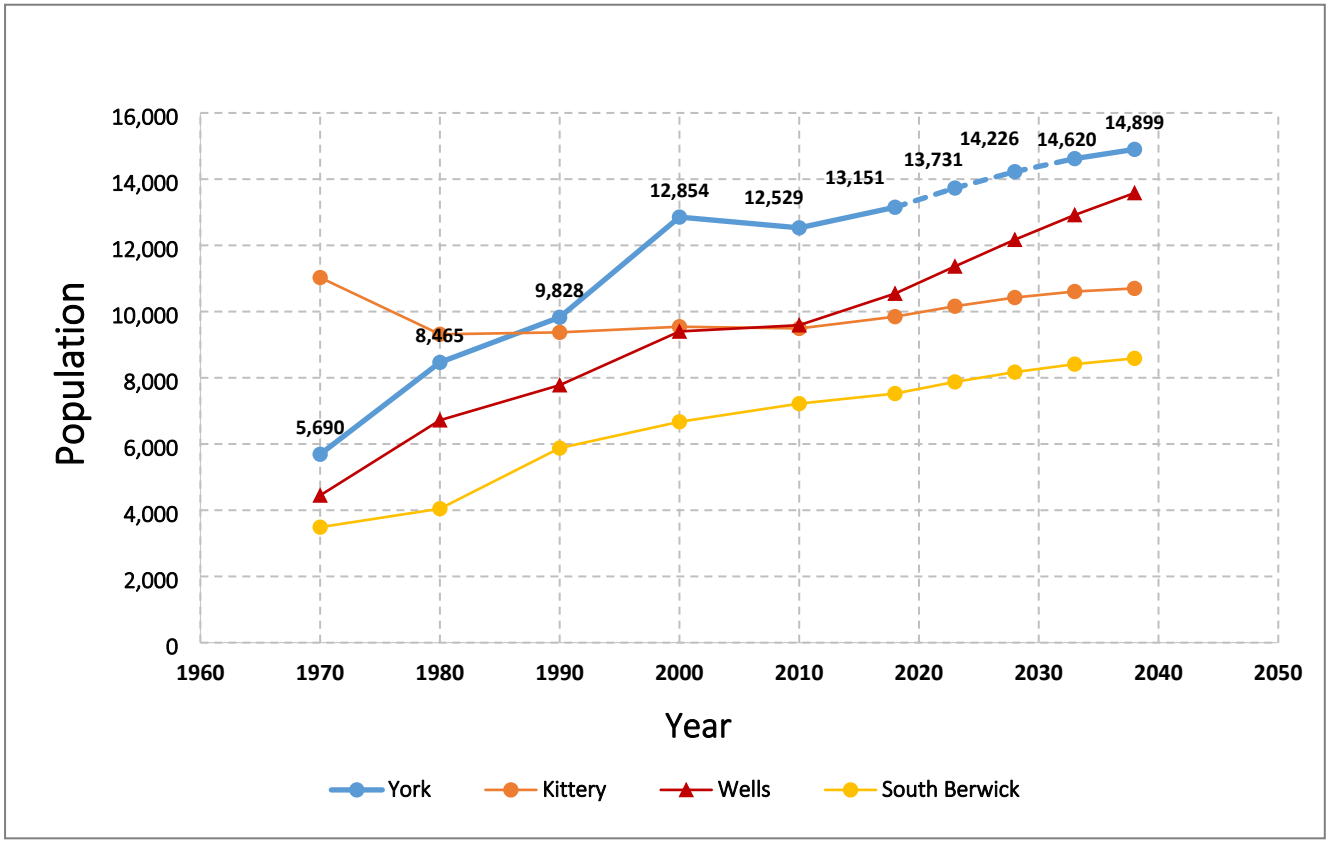
Table 3-1 Population Trends and Projections for York and Neighboring Communities

Year	York	% Increase	Kittery	% Increase	Wells	% Increase	South Berwick	% Increase
1970	5,690	-	11,028	-	4,448	-	3,488	-
1980	8,465	48.8	9,314	-15.5	6,719	51.1	4,046	16.0
1990	9,828	16.1	9,372	0.6	7,778	15.8	5,877	45.3
2000	12,854	30.8	9,543	1.8	9,400	20.9	6,671	13.5
2010	12,529	-2.5	9,490	-0.6	9,589	2.0	7,220	8.2
2018	13,151	5.0	9,846	3.8	10,544	10.0	7,524	4.2
2023	13,731	4.4	10,162	3.2	11,365	7.8	7,876	4.7
2028	14,226	3.6	10,424	2.6	12,171	7.1	8,172	3.8
2033	14,620	2.8	10,606	1.7	12,917	6.1	8,412	2.9
2038	14,899	1.9	10,700	0.9	13,582	5.1	8,587	2.1

*Data prior to 2018 was obtained from the U.S. Census Bureau

**Population projections were obtained from MDAFS and are based on U.S. Census Bureau 2016 population estimates.

Figure 3-1 Population Trends and Projections in York And Neighboring Communities



3.4 Housing Trends and Household Characteristics

The SMPDC reports housing stock trends in York County member communities. This information is useful in projecting population growth and future water use.

Housing demographics offer insights on growth in a community. The residential housing stock has increased in the Town of York from 8,053 housing units in 2000 to 9,585 single family housing units in 2020. It was not reported if the new dwellings were located within or outside the YWD's service area. Data on housing stock trends in the entire Town of York is presented in **Table 3-2**.

During the last 20 years, housing size decreased from 2.42 persons per dwelling to 2.26 persons per dwelling in the Town of York. The estimated family household size trends in York are presented in **Table 3-2**.

The housing stock data illustrates that the Town of York is experiencing an aging population base and smaller family size leading to stable or declining water-use despite an increase the housing stock during this period. The aggregate effect of smaller household size and increasing housing stock is shown in **Figure 3-2**. This trend is also occurring regionally and in core service communities throughout the State of Maine and New England.

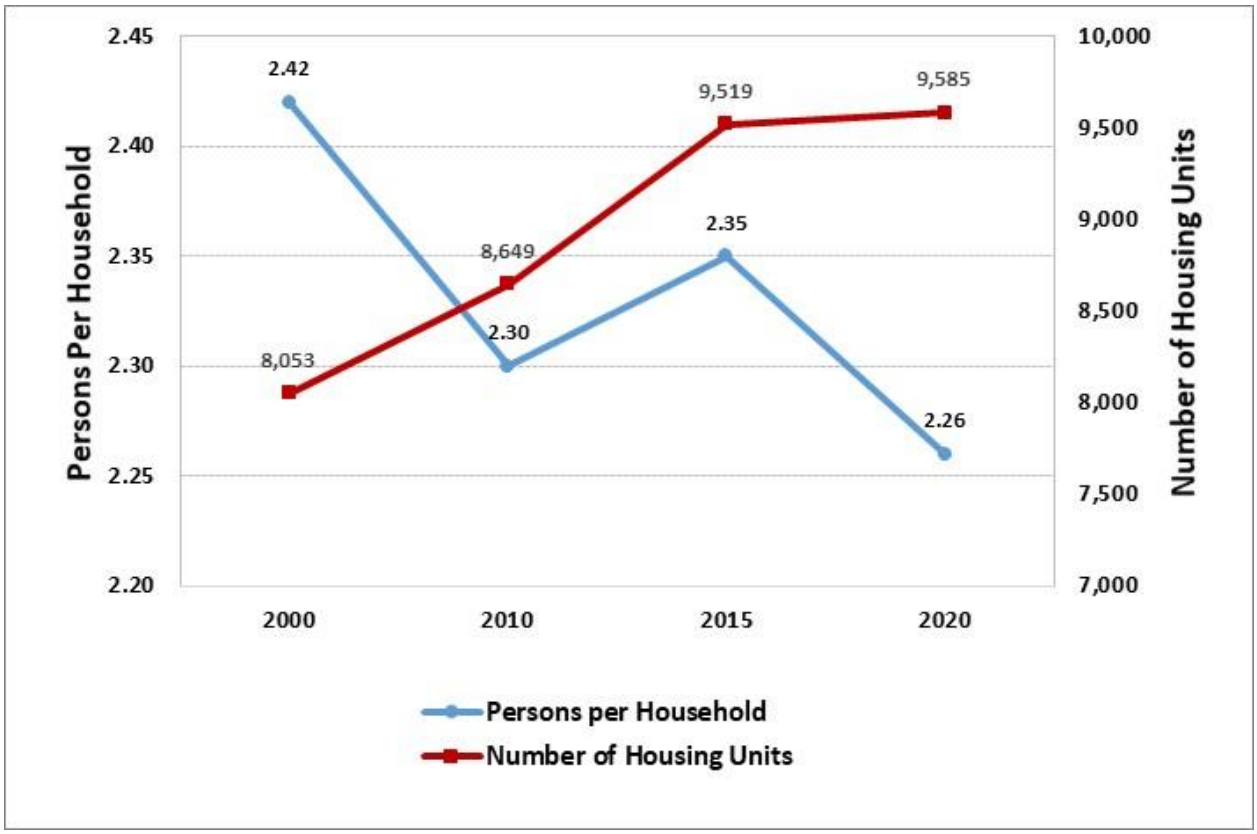
In conclusion, despite growth in the residential housing stock in the Town of York service area, water-use has stabilized or declined because of smaller household sizes, water conservation and conversion to low flow fixtures. Conversion of housing stock from seasonal to year-round homes is also likely affecting household size in York.

Table 3-2 Housing Trends and Household Size in the Service Area

Year	Number of Residential Housing Units	Average Household Size
2000	8,053	2.42
2010	8,649	2.30
2015	9,519	2.35
2020	9,585	2.26

[1] Data obtained from SMPDC

Figure 3-2 Housing Trends and Household Size in York and Neighboring Communities



3.4.1 Building Developments within YWD Service Area

Although a good starting point for population/demand projections, the data presented in **Table 3-1** and **Figure 3-1** do not capture the entire picture. The growth trends above are approximate and do not consider planned developments in Town if they are not known to the US Census Bureau or MDAFS. For this reason, we inquired as to what developments are known to be in the works in the Town of York. **Table 3-3** contains a list of known building developments, the anticipated completion year, and an estimate of the number of service connections tied to each development.

Table 3-3 Upcoming Building Developments In York Service Area

Development	Details	Anticipated Completion Year	Service Type	Total Service Connections
317 US Route 1	2 Buildings	2022	Commercial	2
Cape Neddick River Estates	6 Building Lots	2022	Residential	6
5 Hannaford Drive Housing	48 One Bedroom and 15 Two Bedroom Units	2022	Residential	63
296 US Route 1 – Moorehouse (Phase 1)	42 Unit Apartments and 10 Unit Townhouses	2022	Residential	52
298 York Street – Bristol Point	4 One Bedroom and 5 Two Bedroom Units	2022	Residential	9
296 York Street	4 One Bedroom and 5 Two Bedroom Units	2023	Residential	9
296 US Route 1 – Moorehouse (Phase 2)	30 Units	2023	Residential	30
Gulf Hill	52 Building Lots	2023	Residential	52
122 Long Sands Road – Elderly Housing	10 Two Bedroom Units	2023*	Residential	10
Woodstone	122 Building Lots	2023	Residential	122
Totals Service Connections				353

*Completion date is not known. Population increase will be reflected in 2024.

The services associated with these developments have been included in the population and demand projections within, and updated population projections including these developments can be found in **Table 3-4** and **Figure 3-3** below. Assuming 2.26 persons per service connection, these developments will bring approximately 800 customers to the system within the next 5 years. This assuming all new building developments have no vacancies and are at capacity.

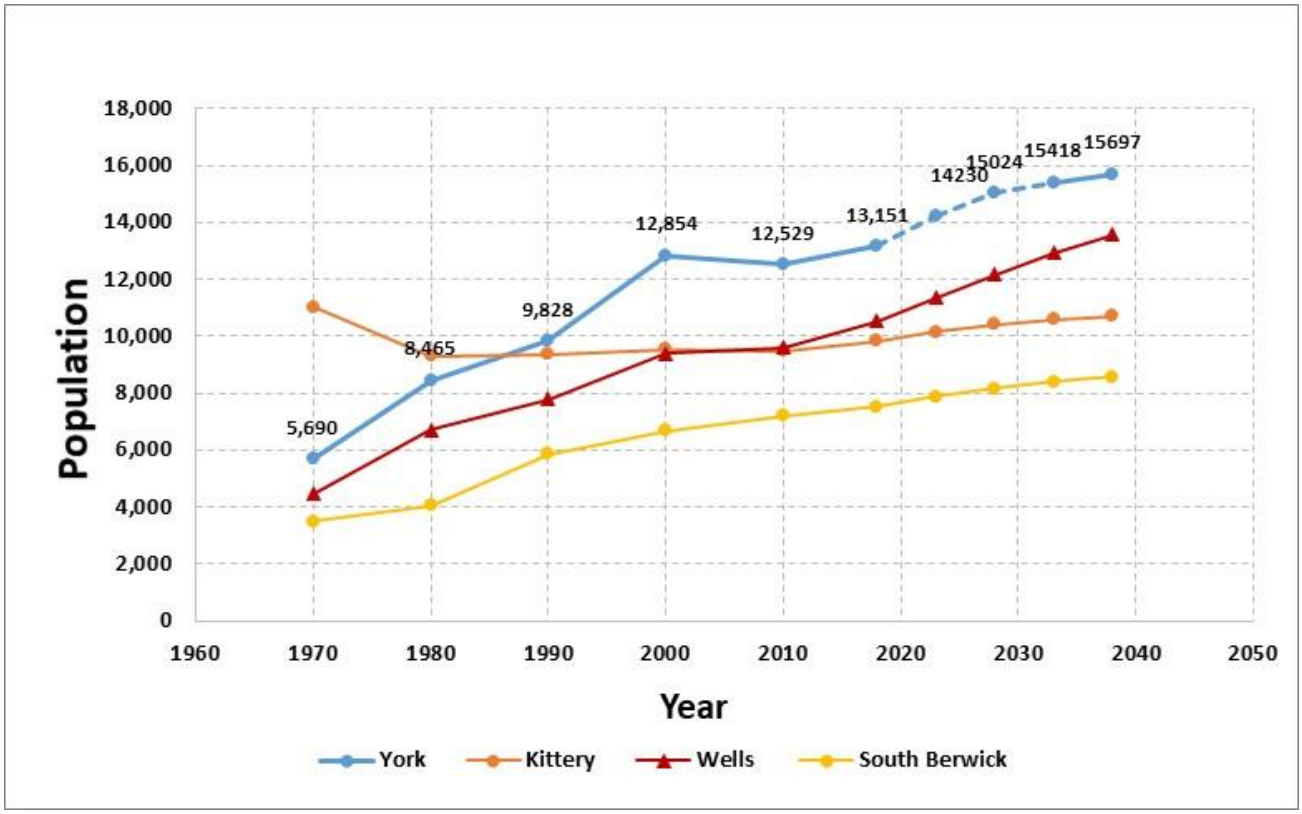
Table 3-4 Revised Population Trends and Projections for York and Neighboring Communities

Year	York	% Increase	Kittery	% Increase	Wells	% Increase	South Berwick	% Increase
1970	5,690	-	11,028	-	4,448	-	3,488	-
1980	8,465	48.8	9,314	-15.5	6,719	51.1	4,046	16.0
1990	9,828	16.1	9,372	0.6	7,778	15.8	5,877	45.3
2000	12,854	30.8	9,543	1.8	9,400	20.9	6,671	13.5
2010	12,529	-2.5	9,490	-0.6	9,589	2.0	7,220	8.2
2018	13,151	5.0	9,846	3.8	10,544	10.0	7,524	4.2
2023	14,230	8.2	10,162	3.2	11,365	7.8	7,876	4.7
2028	15,024	5.6	10,424	2.6	12,171	7.1	8,172	3.8
2033	15,418	2.8	10,606	1.7	12,917	6.1	8,412	2.9
2038	15,697	1.9	10,700	0.9	13,582	5.1	8,587	2.1

*Data prior to 2018 was obtained from the U.S. Census Bureau

**Population projections for Communities other than York were obtained from MDAFS and are based on U.S. Census Bureau 2016 population estimates.

Figure 3-3 Revised Population Trends and Projections in York and Neighboring Communities



3.5 Water Production and Demand

Water production records (including the Maine Public Utilities Commission (MPUC) Annual Reports from 2005 to 2020) were obtained from the YWD and analyzed to study recent water usage trends in the service area. An analysis of water-use patterns, existing and past trends is necessary to evaluate the existing system capabilities and to design for future needs.

The YWD has historically reported demands in two components; (1) revenue water and (2) non-revenue water, in accordance with MPUC reporting requirements. Revenue water or metered water is obtained from individual water meter readings from customers. All customers are metered. Non-revenue water is the difference in revenue water, or that quantity of water that was metered or billed to customers, and the total water produced from the treatment facility, which is also metered. Non-revenue water includes both known sources of non-revenue water such as water for flushing, firefighting, known leaks, etc., and lost or unaccounted-for water.

As reported to the MPUC, the YWD customers are classified into Residential, Commercial or Public Authorities (Schools, government facilities, etc.).

3.5.1 Average and Maximum Daily Demand Trends

Knowledge of the average and maximum daily demands of a water system is required to evaluate the existing system and plan for future needs. The annual average daily flow is useful in estimating total water demand, chemical needs associated with treatment, electric power consumption required for pumping, and long-term

supply capacity (Safe Yield). The maximum daily demand is generally used to size transmission mains, treatment processes and equipment, and storage facilities. Average-day demand (ADD) is defined as the total water-use in a year divided by 365 days. The maximum-day demand (MDD) is defined as the maximum day of water-use that occurs during a given year. The average-day and (MDD) trends in York are presented in **Table 3-5**.

The average-day and (MDD) trends in the York system are also shown graphically in **Figure 3-4** over the period of 2005-2020. Total water sold (revenue water) and non-revenue water is shown in **Figure 3-5**. Non-revenue water is discussed in more detail later in the report.

Table 3-5 Average-Day and Maximum-Day Water Demand Trends York Water District

Year	Average-Day Demands	Maximum-Day Demand	Ratio MDD/ADD
2005	0.998	2.470	2.47
2006	0.938	2.405	2.56
2007	0.984	2.405	2.44
2008	0.942	2.291	2.43
2009	0.873	1.970	2.26
2010	1.013	2.470	2.44
2011	0.953	2.863	3.00
2012	0.984	2.340	2.38
2013	0.993	2.334	2.35
2014	1.125	2.467	2.19
2015	1.050	2.420	2.30
2016	1.020	2.420	2.37
2017	0.940	2.380	2.53
2018	1.028	2.673	2.60
2019	1.011	2.456	2.43
2020	1.070	3.128	2.92
		Average	**2.45**

Figure 3-2 Average-Day and Maximum-Day Water Demand Trends

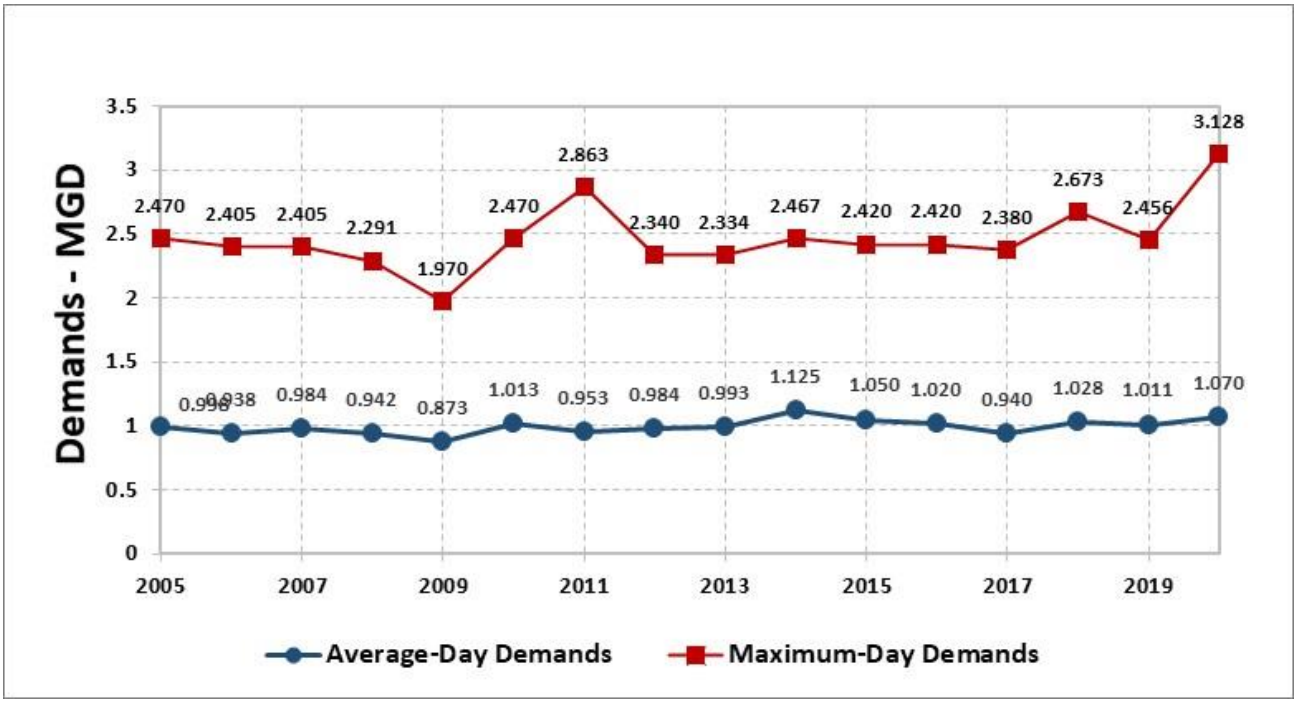
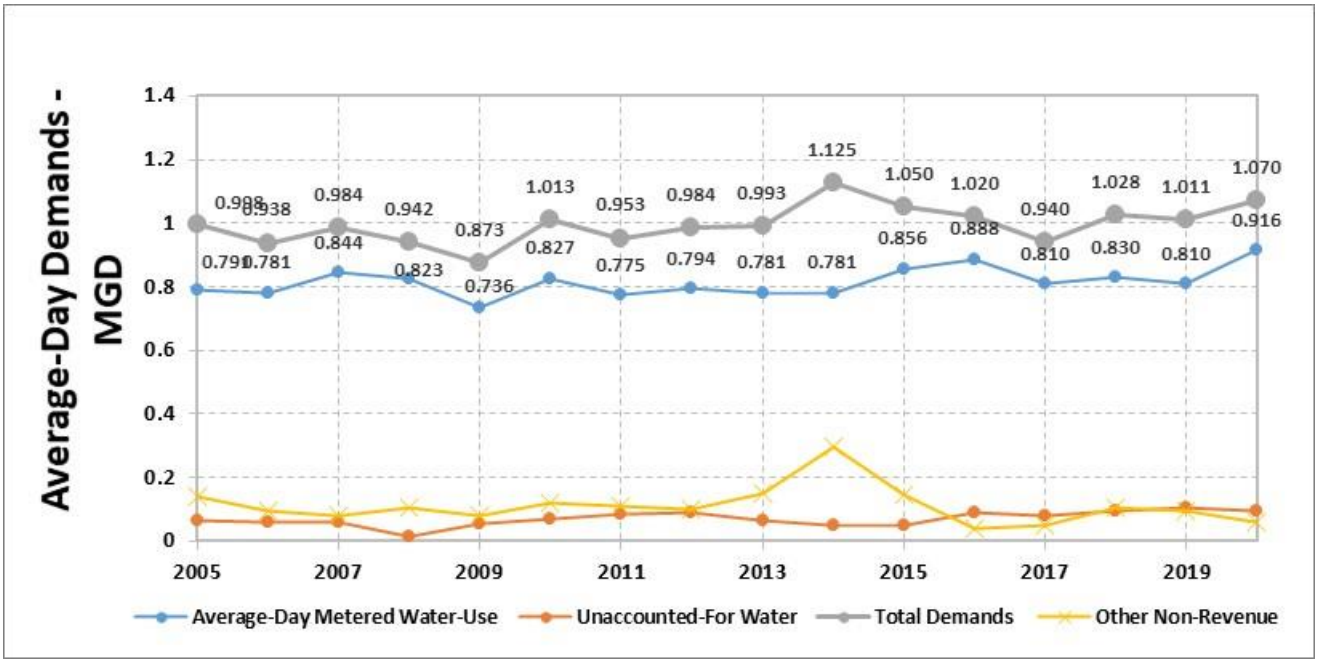


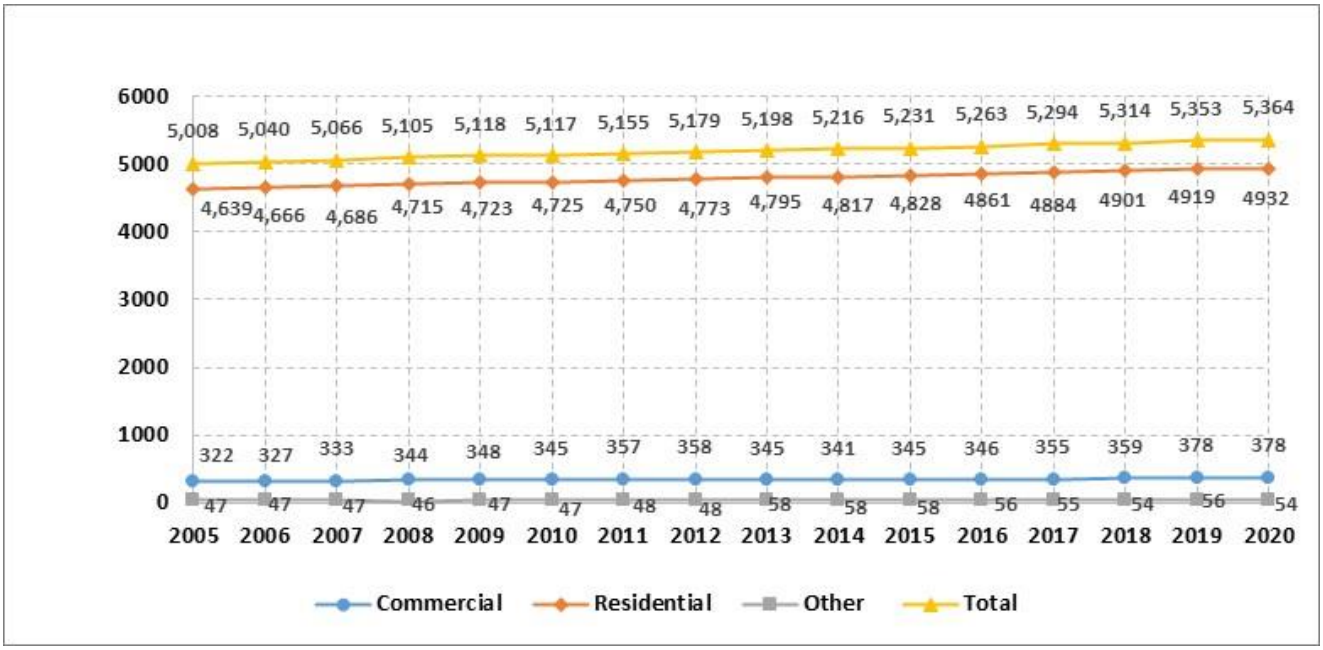
Figure 3-3 Average-Day and Non-Revenue Water-Use Trends



3.5.2 Service Connection Trends

A distribution of the YWD's service connections or meters by customer class since 2005 is presented in **Figure 3-6**. The number of service connections by customer class has experienced a net increase during this time period including commercial and residential accounts. Governmental accounts have been relatively stable during this period. The total number of service connections has been gradually increasing over the past 10 years.

Figure 3-4 Service Connections By Customer Class



3.5.3 Per Capita Water Consumption

3.5.3.1 Residential

Residential water-use in the YWD has two sub-populations in the service area.; (1) Seasonal Residents and (2) Year-round Residents. Residential users include single family and multifamily dwellings as well as apartments and trailer parks. On average, the residential component of total demand has ranged from 63-70% of the total water demands. The metered year-round and seasonal residential service connections and water-use is presented in **Figure 3-7** and **Figure 3-8**.

Figure 3-5 Seasonal and Year-Round Residential Service Connections

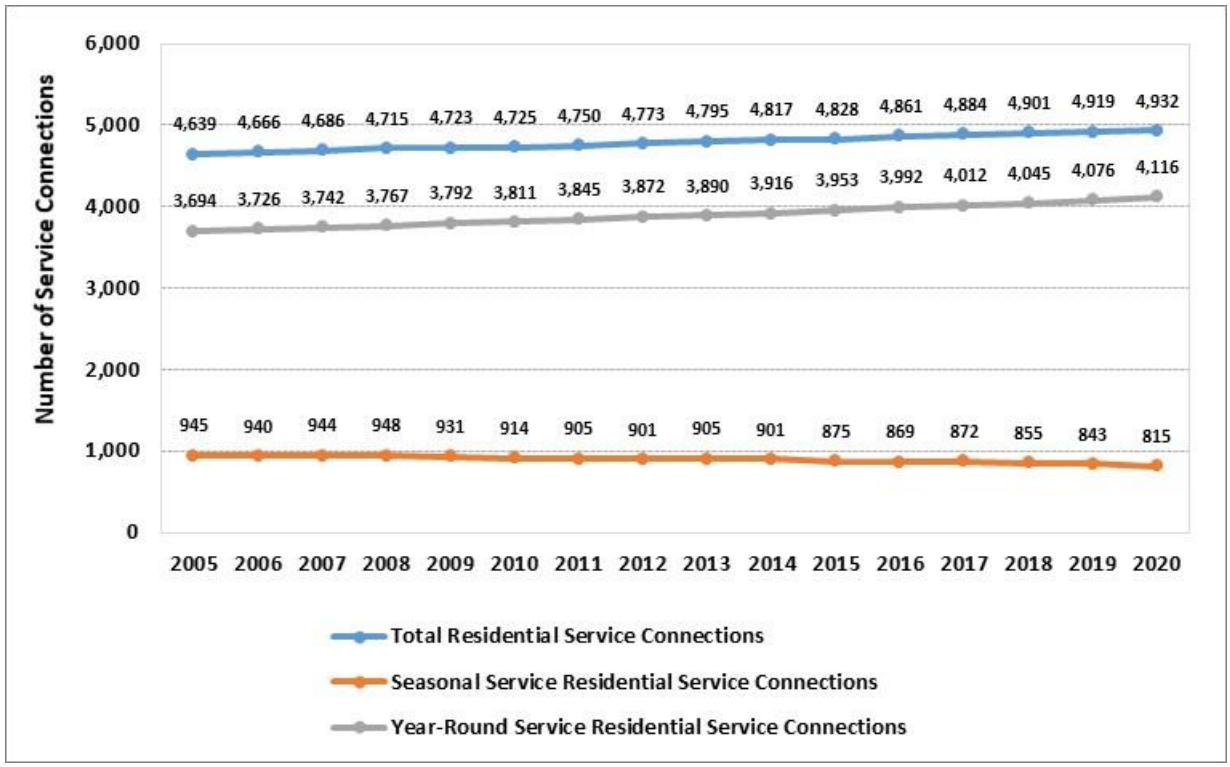
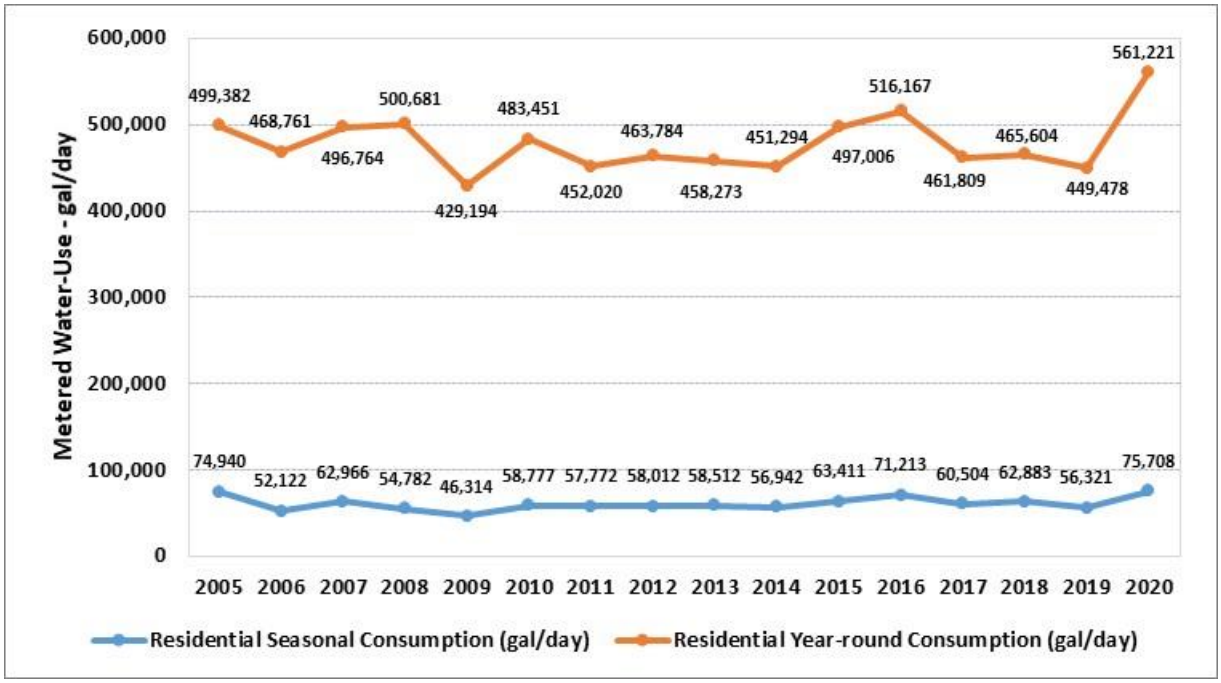


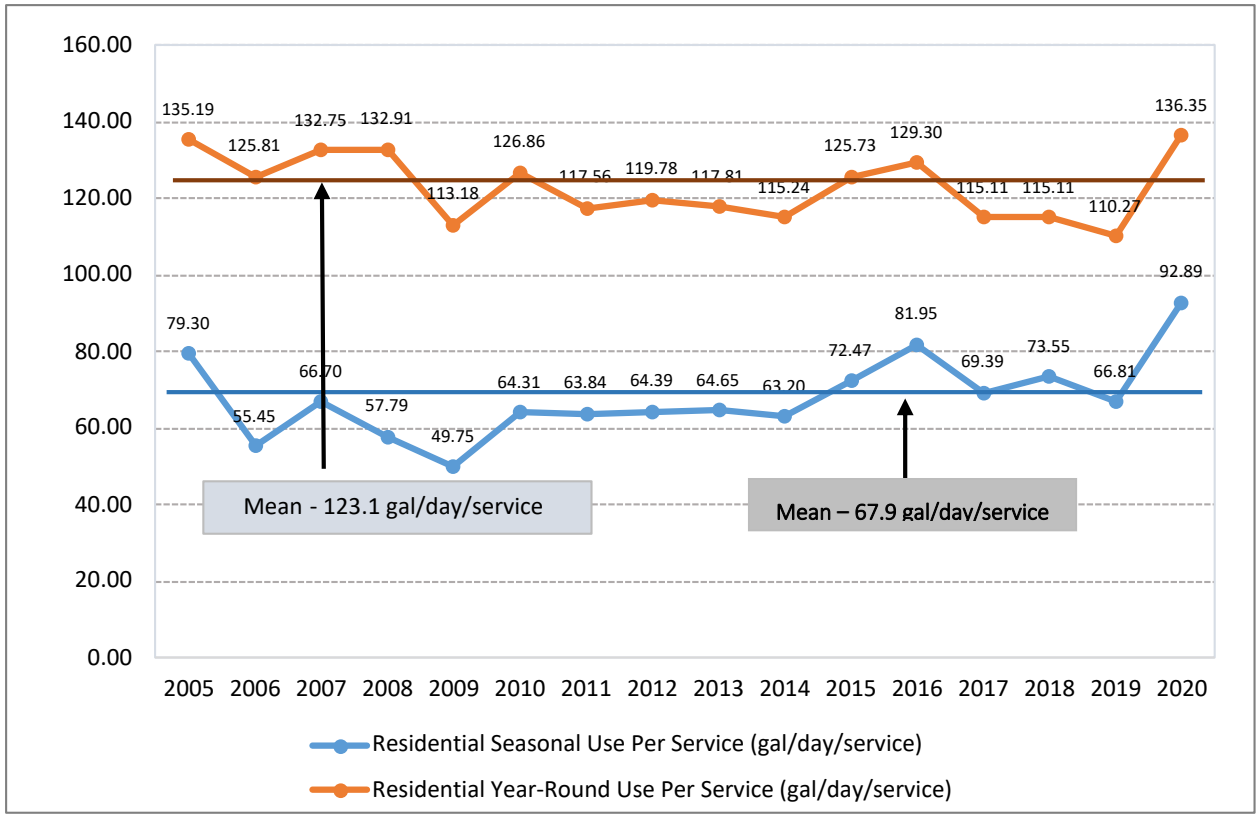
Figure 3-6 Seasonal and Year-Round Residential Metered Water-Use



The average water-use per residential service connection has averaged approximately 119 gallons per day per service connection since 2005, excluding 2020. Based on an average household size of 2.26 persons, this equates to a per capita water-use of about 54.5 gallons/day/person. The value decreased during much of this sample period before increasing sharply in 2019 and 2020. This decrease likely reflected water conservation and impacts from low flow fixtures. The dramatic increase in water-use likely reflects large numbers of people working from home while quarantined during the COVID-19 pandemic. By spending more time at the house, people are likely to run the sink, shower, and appliances more often. The YWD also noted that they needed to complete more flushing than normal due to increased Manganese levels. It is recommended that a per capita water-use of 54.5 gallons per day/person be used for future demand projections for residential water-use. In many other states in New England, a value of 80 gallons per day (gpd)/person is used as a benchmark to determine if demand side management strategies such as water conservation measures should be implemented. The low values in the YWD system likely also reflect periods when year-round homes are vacant. Approximately 20% of year-round services have been inactive over the past 5 years. Excluding these services may increase usage closer to the 65 gallon per day/person range. However, the unaccounted-for water in the YWD has remained low through the years and public water consumption has generally decreased due to low flow plumbing fixtures and water conservation measures.

Similarly, the average-per capita water consumption in the system for seasonal water connections is 67.9 gpd/service for the same sampling period. Because many of these seasonal customers are transient, rental homes or periodic residents, per capita water-use is difficult to understand and predict. Per capita water-use for both seasonal and year-round customers is summarized on **Figure 3-9** which follows.

Figure 3-7 Seasonal and Year-Round Residential Service Demands



3.5.3.2 Commercial Water Consumption (Non-Residential)

Commercial water-use is an important component of water-use in the York system. As a regional service community, the local hospital, regional shopping malls and small commercial accounts use about 26-32% of the water in the York system. Consumption for commercial establishments is very dependent on the type of commercial use. For example, golf courses and motels use significantly more water than retail businesses. Retail establishments, shopping malls, restaurants and other light commercial water-use predominates in the York service area.

The YWD tracks water-use separately for seasonal and year-round service connections. Approximately 82% of the commercial service connections are year-round accounts. The seasonal commercial customers tend to use more water in the concentrated summer tourist season. Year-round and seasonal commercial account trends are shown in **Table 3-6**. The total number of commercial accounts (year-round and seasonal accounts) and total commercial water-use over the past 10 years is presented in **Figures 3-10** and **3-11**.

Since 2005, commercial water-use has averaged approximately 658 gallons per day per year-round commercial service connection. Over the past 5-year period, this value increased to 667 gallons per day per year-round service connection. When both year-round and seasonal accounts are considered, the average (since 2005) increases to 685 gpd and the 5-year average is 687 gpd. The linear regression analysis shown in Figure 3-10 suggests the system is experiencing an average of 2-3 new commercial service connections annually. However, 20 service connections were added in 2019. The aggregate commercial demand is increasing at an average rate of approximately 1,786 gpd annually as shown in **Figure 3-11**.

For water-use projections, the recent 5-year average for the combined year-round and seasonal service connections in aggregate captures the most conservative trend for projecting future commercial water-use.

3.5.3.3 Public Water Consumption (Government Use)

Similar to commercial water-use, the YWD tracks water-use separately for seasonal and year-round public or governmental service connections. These customers include schools, fire departments, public buildings, and utilities. Approximately 4-6% of demands are from public water-use on an annual basis. Year-round and seasonal public account trends are shown in **Table 3-6**. The total number of public accounts (year-round and seasonal accounts) and total governmental water-use since 2005 is presented in **Figures 3-10** and **3-11**.

Since 2005, the government water-use has averaged approximately 733 gallons per day per year-round service connection. Over the past 5-year period, this value decreases to 686 gallons per day per year-round service connection. When both year-round and seasonal accounts are considered, the average (since 2005) increases to 756 gpd and the 5-year average is 776 gpd per connection.

Figure 3-8 Public and Commercial Service Connection Trends York Water District

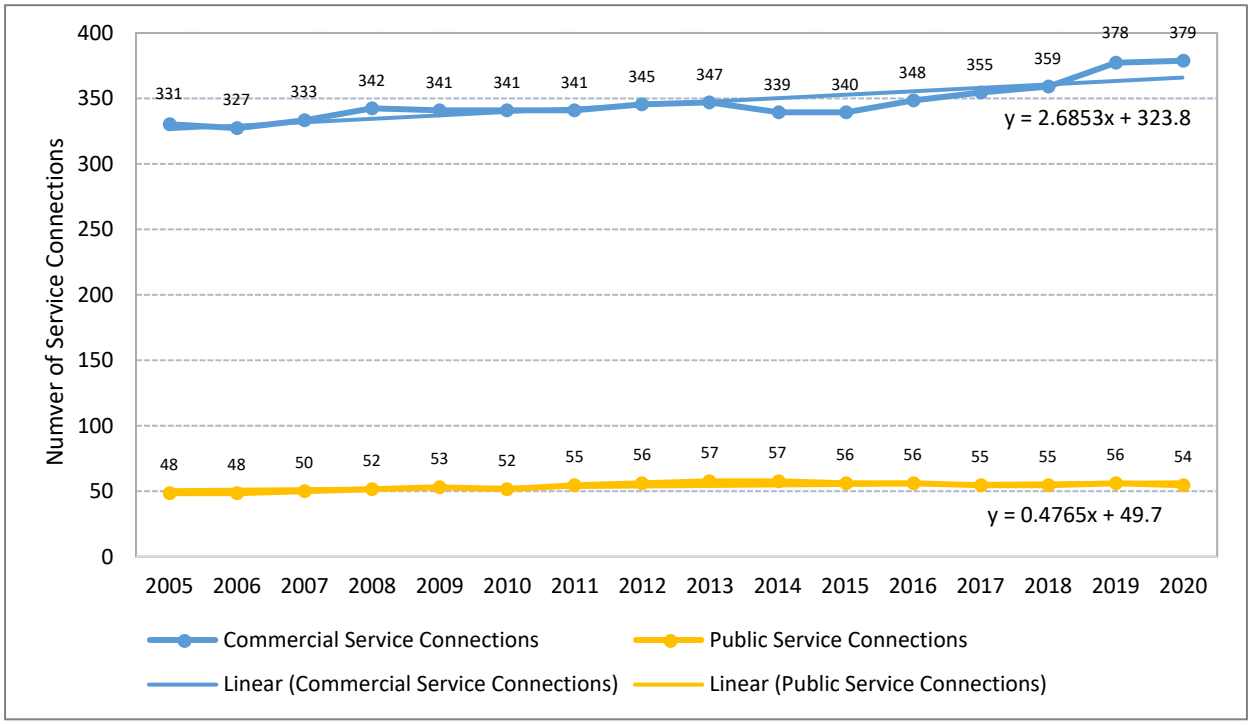


Figure 3-9 Public and Commercial Water-Use Trends York Water District

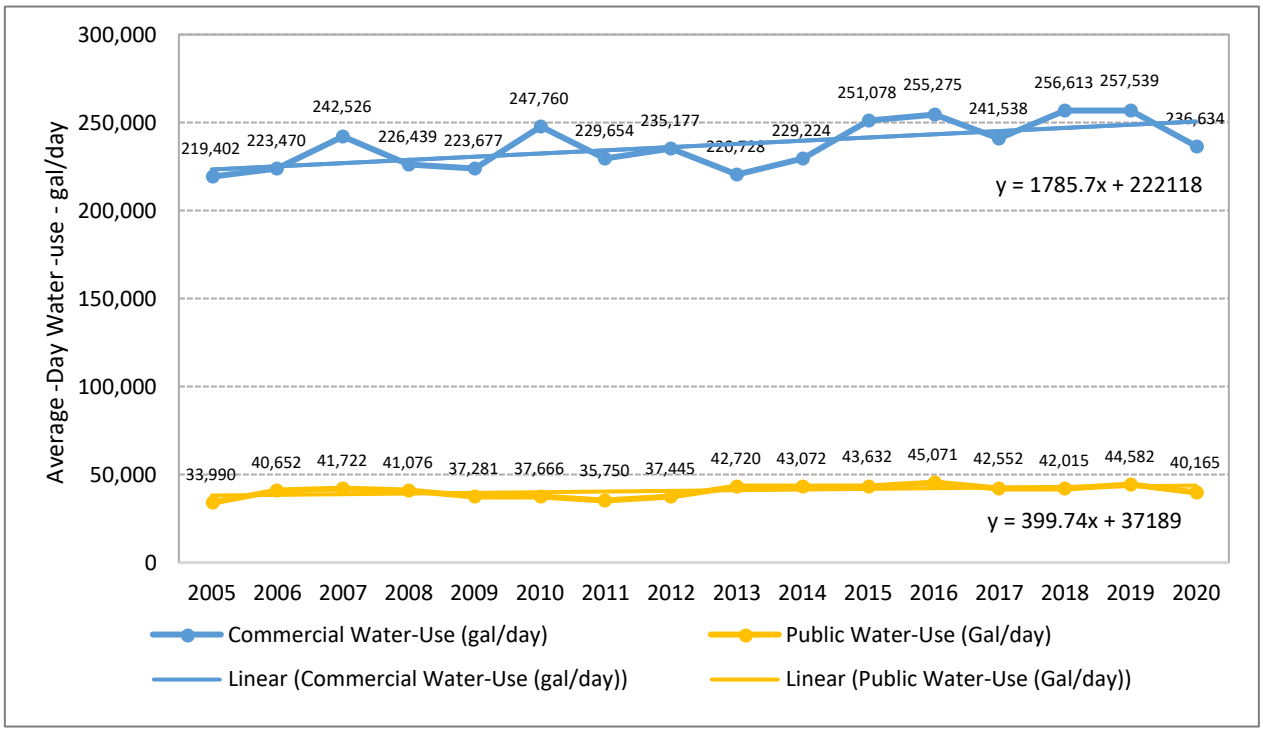


Table 3-6 Average Water-Use Per Service Connection For Commercial Customers York Water District

Year	Service Connections	Average-Day Demand (gpd)	Water-Use per Service (gpd/service)	Service Connections	Average-Day Demand (gpd)	Water-Use per Service (gpd/service)	Total Customers	Average Water-Use (gpd/service)
	Year-Round Commercial			Seasonal Commercial				
2005	267	166,958	625	64	52,540	821	331	663
2006	261	174,626	669	66	48,843	740	327	683
2007	267	187,451	702	66	55,065	834	333	728
2008	275	181,981	662	67	44,457	664	342	662
2009	276	181,780	659	65	41,896	645	341	656
2010	278	195,343	703	63	52,417	832	341	727
2011	282	182,170	646	59	47,484	805	341	673
2012	283	180,481	638	62	54,696	882	345	682
2013	286	169,513	593	61	51,214	840	347	636
2014	282	174,011	617	57	55,212	969	339	676
2015	288	196,751	683	52	54,327	1045	340	738
2016	293	200,939	686	55	54,335	988	348	734
2017	302	198,452	657	53	43,087	813	355	680
2018	305	213,334	699	54	43,279	801	359	715
2019	309	214,942	696	69	42,597	617	378	681
2020	313	187,416	599	66	49,218	746	379	624
Average	**285**	**187,884**	**658**	**61**	**49,417**	**815**	**347**	**685**
Last 5 Years			**667**			**793**		**687**

Table 3-7 Average Water-Use Per Service Connection For Governmental Customers York Water District

Year	Service Connections	Average-Day Demand (gpd)	Water-Use per Service (gpd/service)	Service Connections	Average-Day Demand (gpd)	Water-Use per Service (gpd/service)	Total Customers	Average Water-Use (gpd/service)
	Year-Round Governmental			Seasonal Governmental				
2005	39	28,955	742	9	5,035	559	48	708
2006	39	36,193	928	9	4,459	495	48	847
2007	41	36,996	902	9	4,725	525	50	834
2008	43	35,924	835	9	5,151	572	52	790
2009	43	32,570	757	10	4,711	471	53	703
2010	43	31,328	729	9	6,338	704	52	724
2011	45	29,760	661	10	5,990	599	55	650
2012	45	30,361	675	11	7,084	644	56	669
2013	46	31,145	677	11	11,574	1052	57	749
2014	46	31,859	693	11	11,213	1019	57	756
2015	46	32,162	699	10	11,470	1147	56	779
2016	46	30,818	670	10	14,253	1425	56	805
2017	45	32,359	719	10	10,193	1019	55	774
2018	46	31,707	689	9	10,308	1145	55	764
2019	47	34,183	727	9	10,400	1156	56	796
2020	46	28,703	624	8	11,462	1433	54	744
Average	**44**	**32,189**	**733**	**10**	**8,398**	**873**	**54**	**756**
Last 5 Years			**686**			**1,236**		**776**

The linear regression analysis shown in **Figure 3-10** suggests the system is experiencing an average of less than 1 new public service connection annually. The aggregate public demand shown in **Figure 3-11** is increasing at an average rate of approximately 400 gpd annually.

For water-use projections, the recent 5-year average for the combined year-round and seasonal service connections in aggregate captures the most conservative trend for projecting future governmental water-use.

3.5.4 Non-Revenue Water and Unaccounted-For Water

Non-revenue water is water-use that is not metered. Sources of non-revenue water include York operations, hydrant usage, leaks in the distribution system, accuracy of meters, and lost or unaccounted-for water. Other sources of non-revenue water may include main breaks, pipe leaks within distribution system, unauthorized use, and drainage of storage facilities for maintenance or repair, or non-functioning meters. Non-revenue water has been less than 18% of total demands in the system over the past 15 years.

The portion of non-revenue water that is unaccounted-for in YWD has averaged less than 8% over the past 15-year period. However, unaccounted-for water totals have been creeping up since 2016. Industry standards generally suggest that unaccounted-for water should be less than 10% of a system's overall production water depending on the size of the distribution system. York has done an excellent job reducing lost water in the system and replacing aged mains. The YWD maintains excellent water accounting procedures and quantifies all potential sources of non-revenue water on its annual report in accordance with MPUC procedures. Although unaccounted-for water totals are below industry standard, we recommend YWD investigate the reasoning behind recent increases. The YWD has scheduled a system wide leak detection survey for 2022.

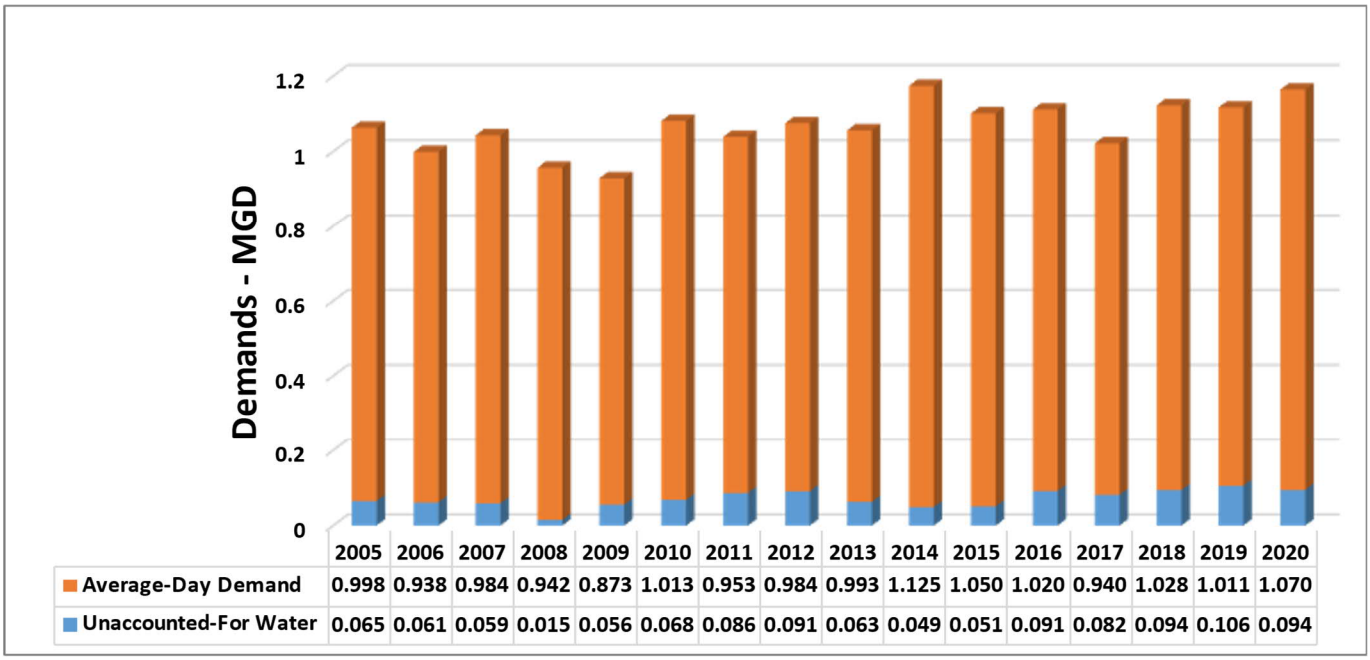
This data is presented in **Table 3-8** and graphically in **Figure 3-12**.

Table 3-8 Non-Revenue and Unaccounted-for Water Analysis York Water District

Year	Total Production Average-Day (ADD) (MGD)	Average-Day Metered Water Use (ADD) (MGD)	Other Non-Revenue Water (NR) (MGD)	Total Unaccounted-For Water (UA) (MGD)	Unaccounted-For Water % (ADD/UA)
2005	0.998	0.791	0.142	0.065	6.51%
2006	0.938	0.781	0.097	0.061	6.50%
2007	0.984	0.844	0.081	0.059	6.00%
2008	0.942	0.823	0.104	0.015	1.59%
2009	0.873	0.736	0.081	0.056	6.41%
2010	1.013	0.827	0.118	0.068	6.71%
2011	0.953	0.775	0.11	0.086	9.02%
2012	0.984	0.794	0.099	0.091	9.25%
2013	0.993	0.781	0.149	0.063	6.34%

Year	Total Production Average-Day (ADD) (MGD)	Average-Day Metered Water Use (ADD) (MGD)	Other Non-Revenue Water (NR) (MGD)	Total Unaccounted-For Water (UA) (MGD)	Unaccounted-For Water % (ADD/UA)
2014	1.125	0.781	0.295	0.049	4.36%
2015	1.050	0.856	0.143	0.051	4.86%
2016	1.020	0.888	0.041	0.091	8.97%
2017	0.940	0.810	0.048	0.082	8.68%
2018	1.028	0.830	0.103	0.094	9.18%
2019	1.011	0.810	0.095	0.106	10.45%
2020	1.070	0.916	0.060	0.094	8.83%
Ave.	**0.995**	**0.815**	**0.110**	**0.071**	**7.10%**

Figure 3-10 Unaccounted-for Water York Water District



3.5.5 Water Demand Projections

A water demand projection for the York service area is required to determine adequacy and sizing of facilities and equipment to meet future needs. A water-use projection based on new service connections in each customer class was selected as a methodology based on recent trends. Because the service area is projected to continue to add population over the next 20-years, residential water-use growth will continue to be important in the York system in the future. We projected demands to increase in line with U.S. Census Bureau population projections as outlined above.

3.5.5.1 Projected Residential Demands

The population growth in York is projected to increase to 15,697 in year 2038, an increase of 1,953 persons over the 2020 Esri population estimate of 13,744. Based on an average household size of 2.26 persons, an additional 864 residential service connections are anticipated by year 2038. If all of these potential customers were located within the service area and were year-round customers, the projected additional system demand would be approximately 102,800 gpd based on an average residential customer demand of 119 gpd. This estimate is conservative and assumes all of the new customers will request public water service. The projected residential demand will increase from 540,000 gpd in 2020 (Adjusted) to 642,800 gpd in year 2038. It is important to note (and as mentioned above) that 2020 was an extreme outlier compared to a typical production year for the YWD. The COVID-19 pandemic forced many people to work from home which increased water demands. YWD also increased flushing in order to resolved Manganese issues within the system. Between 2005 and 2020, YWD averaged 540,000 gpd residential demand. When compared to the 2015-2019, the demand also averaged 540,000 gpd. For this reason, additional demand projections were added to the typical demand observed in York with 2020 data removed as an outlier.

3.5.5.2 Projected Commercial Demands

Commercial water-use can be difficult to estimate and is very specific for the type of commercial establishment. Two approaches were selected using the linear regression trends for commercial water-use and new commercial service connections.

The linear regression analysis shown in **Figure 3-11** suggests that commercial demand in the system is increasing at a rate of approximately 1,786 gpd annually. Using this approach, the projected demand in year 2038 if this linear trend continues would be an additional 32,200 gpd of commercial water-use. The projected commercial water-use for the system would increase from 236,600 gpd in 2020 to approximately 268,800 gpd in 2038.

A second approach would be to consider trends for new commercial service connections. The linear regression analysis shown in Figure 3-10 suggests that new commercial service connections increasing in the system at a rate of approximately 2.69 per year in the system. Using this approach, 46 new commercial accounts would be added to the system, by year 2038. At an average use of 687 gpd per commercial service connection, the system would add approximately 31,600 gpd of commercial demand. On this basis, a projection based on demand projections is more conservative and recommended.

3.5.5.3 Projected Governmental Demands

Governmental water-use is a small and static component of demand in the York system. This demand component has remained relatively stable over the past 15 years and is not expected to grow substantially. Using the linear regression analysis for demands, the system is adding approximately 400 gpd of public water-use per year. On this basis, an additional 7,200 gpd of public water-use is projected by year 2038 in the York system. The current public demand of 40,200 would increase to 47,400 gpd in year 2038.

3.5.5.4 Non-Revenue Demand Projections

Non-revenue water is water-use that is not metered and is generally the result of YWD operations, such as hydrant usage, leaks in the distribution system, errors in meter accuracy. Lost or unaccounted-for water is also included in the non-revenue water. As discussed earlier in this report section, non-revenue water has averaged about 18.2% of the total system demands in the York system over the past 15 years. Of this amount, unaccounted-for water has averaged only 7.1%.

For projection purposes, the assumption has been made that this percentage of non-revenue water will continue through the planning period. Since unaccounted-for water has been managed well by the District and other known sources of non-revenue water are routinely managed and tracked each year, this assumption seems reasonable.

3.5.5.5 Projected Average-Day and Maximum-Day Demand Summary

The average-day and (MDD) projections are summarized on **Tables 3-9** and **Table 3-10** and graphically on **Figure 3-13**. The factor of 2.45 for the average ratio of ADD to MDD during the last 15-year period was used to project the future (MDD's) in years 2028 and 2038.

Table 3-9 Projected Average-Day Demands York Water District

Projected Water Demand	Year 2020* (gpd)	Year 2028 (gpd)	Year 2038 (gpd)
Residential Demand	637,000	607,400	642,800
Commercial Demand	236,600	250,900	268,800
Additional Governmental/Public	40,200	43,400	47,400
Non-Revenue Water	157,200	200,600	213,400
Projected Average-Day Demands	**1,071,000**	**1,102,300**	**1,172,400**

*2020 data represents actual observed data.

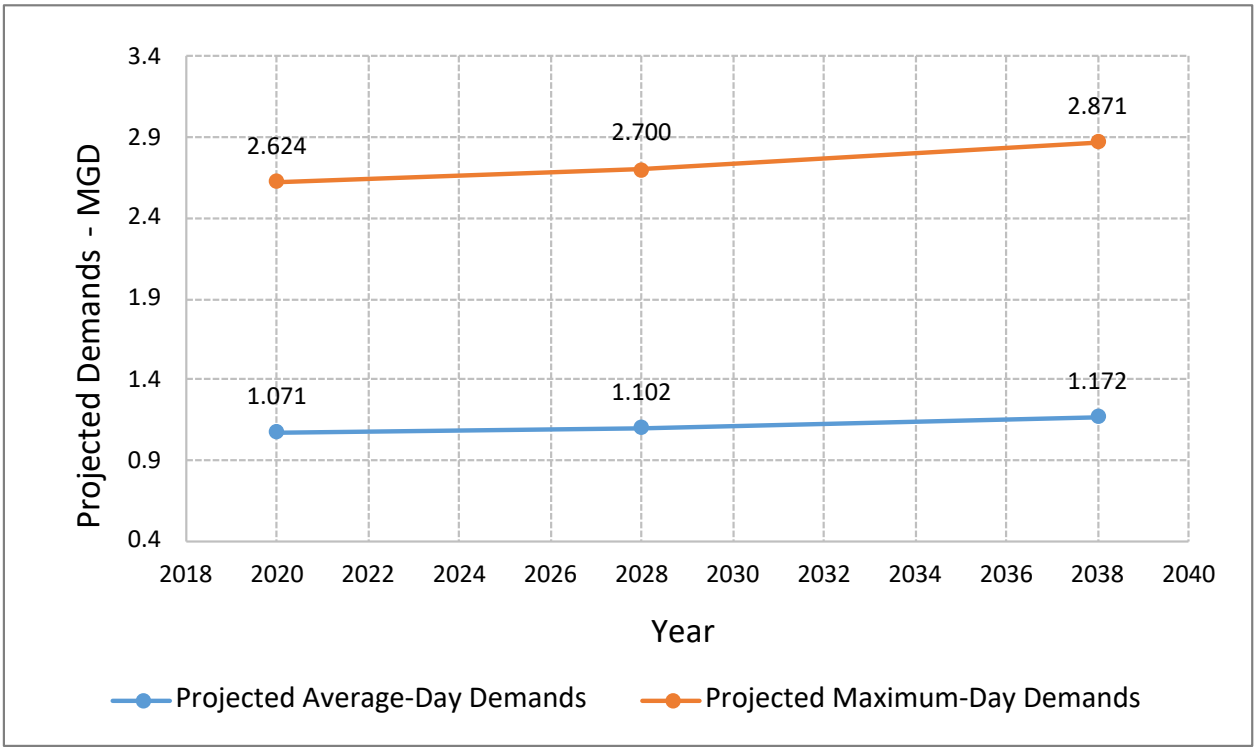
The projected average day demand (average annual demand) projected for 2038 is 1.17 MGD compared to the current estimated safe yield during the drought period of record (2.05 MGD) suggests that Chases Pond has ample capacity for slow to moderate growth in system water demand over the next 15 – 20 year period. Under average precipitation years, the available average day yield of Chase's Pond has been projected at about 2.97 MGD. However, the community and District should be mindful of the maximum day demands that occur during the summer months. The maximum day demand is projected to grow by 10% or about 250,000 gpd. The maximum day demand projection is approximately 0.9 MGD lower than the plant capacity of 3.7 MGD with both treatment units in service.

Table 3-10 Projected Demand Summary York Water District

Year	Average-Day Demand (MGD)	Maximum-Day Demand (MGD)
2020	1.071*	2.624
2028	1.102	2.700
2038	1.172	2.871

*2020 data represents actual observed data.

Figure 3-11 Projected Average-Day and Maximum-Day Demands York Water District



Maintaining the emergency interconnection is important in the event of disruption to the treatment operations or one treatment train during the summer months. YWD and neighboring utilities of KWD and KKW have water supply quantity limitations that will become more stressed in the future with continued land development and redevelopment projects that add new water demands to the system. The YWD must seek approval from KKW and KWD if water is needed for emergency use. During the dry summer months, these utilities also experience supply limitation, which may limit the availability of supplemental emergency water supply to York. It is recommended that the Town of York as part of the comprehensive plan process, consider development of a "build out" analysis of undeveloped parcels and potential redevelopment areas in growth areas to gauge the potential future water supply needs to support continued growth in York. Policies should be evaluated by the Town and the YWD to ensure that future desired development growth does not create water demands that exceed the safe yield from Chases Pond.

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Section 4 Regionalization

4.1 Introduction

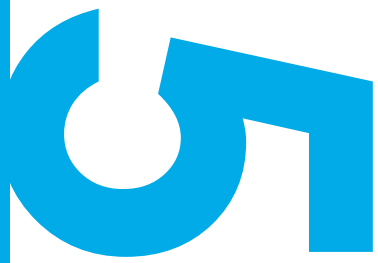
In 2005, the State of Maine passed water utility-sponsored legislation for the formation of regional water councils. These councils were formed to explore solutions to common water supply issues within regional areas of the state. The legislation (Maine Public Utilities Commission Rules and Regulations - Chapter 68: Regional Water Councils) authorized "two or more water utilities" to organize and form a non-profit corporation as a forum to address issues to the water suppliers within the region which the council is formed.

The Southern Maine Regional Water Council (SMRWC) was formed under the authorization of Chapter 68 in 2005 with the sole purpose of promoting regional cooperation in southern Maine. The York Water District joined this effort to help improve service and to deliver a better value to its customers. The SMRWC membership includes the following utilities:

- Kittery Water District
- Portland Water District
- Kennebunk-Kennebunkport-Wells Water District
- York Water District
- South Berwick Water District
- Maine Water Company Saco-Biddeford Division
- Sanford Water District

The overarching goal of the council is to improve service and to lower the cost of water for the customer base served by the water systems. Combined, the SMRWC members serve over 250,000 persons throughout 23 communities in York and Cumberland County. The membership extends from the Portland Water District to the north to the Kittery Water District at the southern end of the service area.

The primary motivation for forming the Southern Maine Regional Water Council (SMRWC) was to collectively seek ways to address common issues facing water suppliers in southern Maine and to improve customer service. Since its inception, the SMRWC has explored many opportunities and synergies between members.



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Section 5 Distribution System Overview

5.1 Fire Flow Requirements

The ability to provide fire protection is a valuable asset for a community. Guidelines for fire flow requirements are provided by the Insurance Services Office (ISO) and discussed in detail in **Section 2** of this report. As discussed previously, the ISO is an insurance service organization responsible for evaluating and classifying communities for insurance rating purposes.

Specific fire protection requirements at a given locale vary with the physical characteristics of a building. The required fire flows are based on the worst-case premise in a general location using the following factors: (1) materials of construction, (2) its occupancy use, (3) proximity to other structures, (4) height and size of building, (5) the existence of fire walls, (6) presence or absence of sprinklers, and other factors. Specific buildings may have required fire flows as high as 12,000 gpm. **Table 5-1** shows typical fire flow requirements for various building types and uses. This data will be used to assess the adequacy of the available fire flows at select locations throughout the distribution system. Actual fire flow requirements will be used at specific locations tested by ISO in 2012.

Table 5-1 Typical Fire Flow Requirements

Land-Use or Building Type	Range of Required Fire Flows
Single and Two-Family Dwellings	
Over 100 feet Building Separation	500 gpm
31 to 100 feet Building Separation	750 gpm
11 to 30 feet Building Separation	1,000 gpm
10 feet or less Building Separation	1,500 gpm
Multiple Family Residential Complexes	2,000 to 3,000 gpm
Average Density Commercial	1,500 to 2,500 gpm
High Value Commercial	2,500 to 3,500 gpm
Light Industrial	2,000 to 3,500 gpm
Heavy Industrial	2,500 to 3,500 gpm

Municipal fire insurance ratings are partially based on a water utility's ability to provide needed fire flows up to a maximum flow of 3,500 gpm. The ISO requirement of 3,500 gpm was the criteria used for all non-residential land uses. This is the largest fire flow that the ISO recognizes as necessary for any system to be required to provide. If a specific building has a required fire flow greater than 3,500 gpm, than the community's fire rating will only be based on the water system's ability to provide 3,500 gpm.

5.2 Available Water System Pressures

A water system should be designed to accommodate a range of pressures within minimum and maximum guidelines. Low pressures lead to customer complaints and restrict available flows for firefighting. Higher pressures can also lead to increased water loss from leakage.

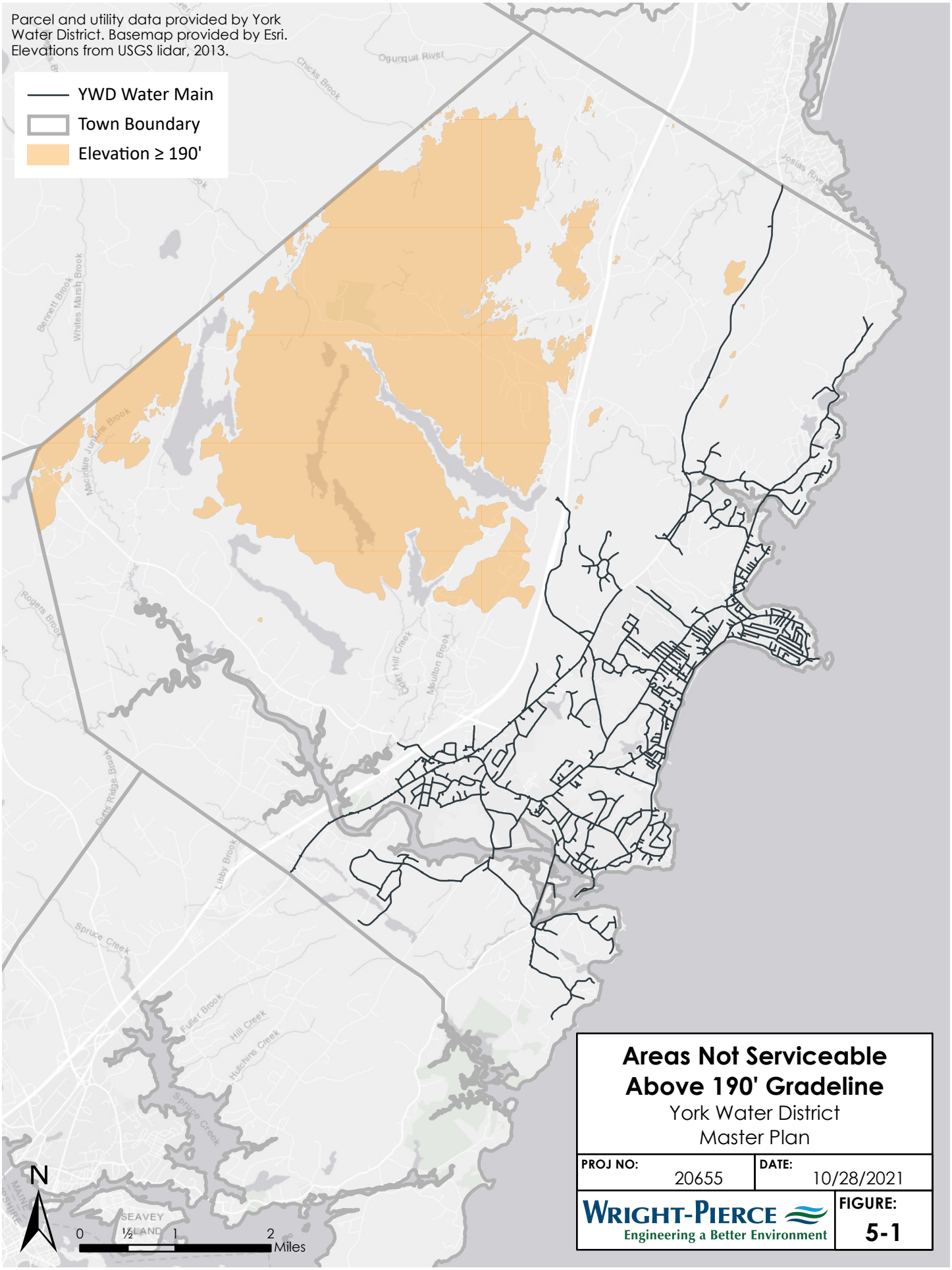
Water pressure will vary around the service area from variations in customer demand, changes in elevation and from proximity to pumping facilities and source of supply. In general, when customer demands increase, pressure will decrease. Areas with higher elevations typically have lower pressures.

The hydraulic gradeline in the York system is EL. 190 feet. This water elevation equates to a pressure of about 83 psi at sea level. The York Water District standard for new developments is a minimum pressure of 35 psi under normal operating conditions at all second story fixtures. Pressures during fire flow conditions should be maintained above 20 psi at all locations in the system in accordance with the Maine Public Utilities Commission and Maine Drinking Water Program guidelines. Homes with pressures below 20 psi should have limited-service agreements. Normal high pressures should not exceed 80 psi without pressure reduction at service connections, as required by the State of Maine Plumbing Code. The York water system does not exceed this pressure under most circumstances and pressure reduction at the customers service connection is not needed.

The York distribution system has been developed to accommodate the needed pressures. The first stressed condition tested with the model was peak hour demand in 2038. This condition resulted in all areas of the year-round distribution system having minimum pressures of 32 psi except high elevation areas around the base of the Simpson Hill and York Heights standpipes. During peak hour the seasonal water mains in the Godfrey Cove Rd area is 10-20 psi. In general, pressures should meet the Maine Public Utilities Commission's (MPUC's) minimum standard of 20 psi at the point of the service connection. Maximum static pressures are generally below 80 psi in all areas of the system.

The second stress condition was a test of the system's ability to refill the storage facilities during the nighttime hours of 10 PM to 6 AM on the maximum-day in 2038. This condition was tested using extended time simulations with a standard diurnal water use curve developed by the American Waterworks Association (AWWA). The diurnal curve distributes water use using average patterns over a 24-hour period. This distribution system met this condition under projected demand conditions.

Expansion of the York distribution system will be greatly limited by high elevation terrain north of the Interstate 95 corridor, along northerly portions of US Route 1 and along Pine Hill Road without booster pumping and creation of a new pressure zone. The Whippoorwill and White Pines service areas were created using booster pumps in this general area of town. High elevation areas not serviceable from the current hydraulic gradeline are shown in **Figure 5-1**. Land-use zoning and the large swath of protected lands within the source water protection area will continue to be disincentives to concentrated development in this area of York. Any new development in this area, will require creation of new pressure zones and main extensions funded by the development entity in accordance with Maine PUC regulations.



Areas Not Serviceable Above 190' Gradeline

York Water District
Master Plan

PROJ NO:	DATE:
20655	10/28/2021

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FIGURE: 5-1

JMN H:\GISTest_JMN\York\20655-WDMasterPlanUpdate\MXDs\MasterPlanFigs.aprx - High Elevs

5.3 Storage Tank Capacity

The York Water District owns and operates two distribution storage facilities. System storage is necessary for the following reasons:

- Storage should be designed to provide all demands which exceed the maximum-day average flow rate. The volume of storage, which is depleted during the daytime, peak flow periods is refilled during the lower demand, early morning hours.
- Storage is provided for fire protection. If a fire occurred during the maximum-day demand, all the water used to fight the fire would be drawn from storage volume.
- Storage provides water during emergency situations such as power failures, transmission main breaks, etc.
- To provide additional volume for pumping during off-peak electrical periods.
- Operating storage is used for cycling pumps during normal daily operation.

All storage components described above should be available while still providing at least 20 psi of pressure in the system. This pressure is equivalent to the volume of water stored 46 feet above the highest service. This storage volume is referred to as the available or active storage.

The existing available active storage must be sized and located at the proper elevation to provide the required pressures in the service area during a fire condition. These requirements are presented in **Table 5-2**.

Table 5-2 Existing Available Active Storage Volume

Storage Component	York Heights Tank	Simpson's Hill Tank
Total Capacity (gallons)	2,000,000	3,000,000
Overflow Elevation (feet-USGS)	El. 190	El. 190
Base Elevation (feet – USGS)	El. 125	El. 77
Unit Volume (gallons/foot)	30,800	26,500
Highest Elevation Served (feet- USGS)	El 120	El. 120*
Minimum Storage Elevation for Minimum 20 psi Residual System Pressure (feet – USGS)	El. 166	El. 166
Active Storage Volume (gallons)[1]	739,000	636,000
Total Active Storage Volume (gallons)	**1,542,000**	

1 Volume stored above El. 166 in each storage tank.
* Residences at the base of York Heights Tank - El. 120 feet USGS

Three approaches were evaluated to assess the adequacy of the existing storage system in York:

- Condition 1 - Storage for 3-hour fire storage for ISO's highest rated flow plus 20% Maximum-Day Demand for Peak-hour Demand Fluctuations.
- Condition 2 - Storage for Average-Summer Day Demand
- Condition 3 - Storage for 3-hour Fire @ 3,500 gpm plus maximum-day for 3-hours

Condition 1 Evaluation - For this condition, the adequacy of the existing storage volume considers a worst-case scenario when a fire occurs in the system during a maximum-day. During such an event, adequate storage must also be available to meet hourly demand fluctuation simultaneously. This analysis was made using projected demands through 2038.

The required storage in the service area for condition 1 can be calculated as follows:

1. Fire Protection Storage Volume - The volume which should be stored for fire protection should be capable of providing 3,500 gpm for 3 hours or 630,000 gallons. This is the Insurance Services Office (ISO) recommended maximum amount of fire protection necessary for a public water purveyor to supply for a test location in the York system. This flow is appropriate in the York service area where commercial land-use zoning exists. ISO flows above 3,500 gpm would be provided by the owner of the commercial structure.
2. Equalization Storage for Peak-Hour Storage Fluctuation - The storage volume necessary to provide the system hourly fluctuation demands was estimated to be 20 percent of the maximum day total demand in total for the entire water system. This flow equates to about twenty percent of the projected 2038 maximum-day demand or approximately 563,000 gallons for the entire water system.
3. Emergency Storage - Storage should be available to meet emergencies. Because the District is interconnected to the KKW and Kittery Water Districts and can supply water in an emergency from the high service area, no provisions for emergency storage are recommended for the low service area.

The total required active storage volume for the three components described above is 1,193,000 gallons in 2038. The existing active storage volume in the York service area is 1,542,000 gallons. Based on this analysis, the District has a storage surplus of approximately 349,000 gallons.

Condition 2 Evaluation - For this condition, the adequacy of the existing storage volume considers supplying one average-day of demand in the system using projected demands through 2038. The projected average-day demand in the system is projected to be 1,149,400 gal/day in 2038. The existing active storage volume in the York service area is 1,550,000 gallons, therefore the system meets this design condition.

Condition 3 Evaluation - For this condition, the adequacy of the existing storage volume would supply a projected maximum-day demand in the system coincident with a fire event. The maximum-day demand in the system is projected to be 2,815,000 gal/day in 2038. This demand over a 3-hour period would equate to a storage volume of 352,000 gallons. The coincident fire storage volume would be 630,000 gallons for a total required storage volume of 982,000 gallons. The existing active storage volume in the York service area is 1,550,000 gallons, therefore the system meets this design condition.

Table 5-3 Required Active Storage Volumes

Storage Requirements	Active Storage Volume (gallons)	Supply Deficit/Surplus in 2038 (gallons)	Adequate (Yes/No)
Condition 1 - Storage for 3-hour fire plus 20% of maximum-day demand for peak-hour demand fluctuations	1,550,000	1,193,000	Yes
Condition 2 - Storage for average-day demand	1,550,000	1,149,400	Yes
Condition 3 - Storage for 3-hour Fire @ 3,500 gpm plus Maximum-Day for 3-hours	1,550,000	982,000	Yes

5.4 Service Area Considerations and Expansion

5.4.1 Service Area Expansion West of Interstate 95

Opportunities for large scale expansion of the York Water District service area are limited. Much of the area west of Interstate 95 has ground surface elevations above EL. 135, the highest elevation the District can serve from its current gradeline without boosting pressure. Although much of this area is available for development and is zoned as a general development zone, the Kittery and York Water Districts own and protect about 5,000 acres of adjoining watershed lands restricted from development. Areas along the Route 91 corridor would likely be served by the Kittery Water District if within their chartered territory.

The topography north of US Route 1 in this area is generally too high to be served by the YWD's present hydraulic gradeline. This high elevation area extends north of Interstate 95. Most of this area is zoned for rural development and will not likely experience large or concentrated development. The watershed protection area encompasses much of the area west of Interstate 95.

5.4.2 Mountain Road Area and US Route 1 North Corridor

The US Route 1 corridor north of the District's Route 1 North Booster Pumping Station (BPS) has no elevated storage. The area is located north of the intersection of US Route 1 and Logging Road and includes Pine Hill Road. Presently, the BPS delivers approximately 35-40 psi to the highest elevation areas along US Route 1. Pine Hill Road is located in a valley which parallels US Route 1 to the Ogunquit town line. High elevation areas referred to as Gulf Hill and Pine Hill abut both roadways. Service to these areas is not likely from the present BPS.

One large residential development has been permitted at Gulf Hill. Wright-Pierce has collaborated with the YWD and developer to design the water main infrastructure and BPS to meet the Districts minimum service standards. The US Route 1 north area is also zoned by the Town of York for commercial development.

Presently, the booster pumps are adequately sized to supply the current demands in this area including projected demands from the completed Gulf Hill Subdivision. Additional demands and future buildout of the area could trigger the need for further reconsideration of the current pumping arrangement to either meet new pressure requirements or to supplement flows or possibly the addition of a storage tank.

The following is recommended for this service area:

- Any new development proposals should require a pump and storage analysis before the development is approved. The analysis should evaluate:
  - If the existing booster pumps are adequate to provide the flow and pressure needed to serve new development
  - If elevated storage is appropriate to avoid multiple pumping stations and service zones
  - A build out plan for the Pine Hill Corridor that may include elevated storage

A secondary boosted pump system drawing suction from the current US Route 1 North booster zone was previously analyzed and will be implemented to serve the Gulf Hill Subdivision. The new Gulf Hill BPS and Route 1 North BPS will be integrated with a control system to prevent pressure and pump operation issues for remaining customers in this service area. In addition, Route 1 North BPS has a pressure relief valve, and the proposed Gulf Hill BPS design includes a pressure relief valve.

A new storage tank in this area would have many benefits for the YWD. There are multiple areas adjacent to Pine Hill and US Route 1 with sufficient topography to site a new storage tank. The BPS would be reconfigured to be controlled off tank level in the new storage tank.

A practical approach would be to serve Logging Road and Pine Hill Road with local booster pumps drawing suction from the York distribution system if development occurs in these areas. Nonetheless, expansion of utilities to these roads should be studied further when water service is requested.

5.4.3 US Route 1 Gap

The large gap on US Route 1 is present between the end of Clark Road and the Whippoorwill BPS. However, a new 16-inch main is recommended along US Route 1 from the Whippoorwill BPS to Mountain Road to close this gap and create a second strong (large diameter) backbone in the system along US Route 1.

In 2018, the Maine Department of Transportation replaced the Cape Neddick Bridge on US Route 1. The YWD installed a 16-inch main with isolation valves to mesh with full replacement of the 12-inch main in the future.

This is an important, but costly project for the system. The YWD plans to design the 16-inch water main along US Route 1 from the Whippoorwill BPS to Cape Neddick Road in 2022. Construction is anticipated for 2024.

A 12-inch main exists along US Route 1 from Cape Neddick Road to Mountain Road but this main should be replaced to create a uniform 16-inch corridor along US Route 1 with no hydraulic pinch points.

5.4.4 Conversion of Seasonal Service Areas

The seasonal areas of the system are likely to see pressure from seasonal residents to convert summer housing into permanent year-round housing in the coming decades. The shallow seasonal mains would need to be replaced with appropriately sized water mains, designed to District standards, and buried permanently below the level of frost penetration. All of these seasonal service areas in York can be provided permanent service from the current gradeline and meet the YWD pressure requirements for adequate service.

5.5 Distribution System Maintenance

5.5.1 Hydrant Maintenance

The YWD routinely inspect and maintains all hydrants. These efforts include providing fire flow maps and data to all fire departments as well as training on hydrant operation. The ISO recommends that fire hydrants be inspected twice a year. The best time for these inspections is in the spring and in the fall during flushing. The fall inspection enables detection of problems before the freezing temperatures arrive. The spring inspection uncovers any problems which may have been caused by the previous winter (e.g., frost heaves). In addition to semi-annual inspections, hydrants should be pumped dry immediately after use and checked for:

- Loose or missing caps
- Missing gaskets
- Damaged operating nuts or nozzle threads
- Corroded breakaway bolts at ground level

During the winter months, the YWD crews inspect each fire hydrant weekly to confirm each barrel is dry. The YWD received a total of 2.55 of 3.0 allocated points for hydrant maintenance allowed by ISO when establishing the Towns Public Fire Protection Classification.

5.5.2 Water Main Maintenance

The condition of the water mains must be monitored periodically to identify when rehabilitation is required and to plan for the rehabilitation. Fire flow tests provide a general picture of localized flow capabilities but do not indicate the condition of specific water mains. Corrosion and the deposition of sediment and precipitates on the interior of unlined cast iron mains is the major cause of reduced hydraulic carrying capacity. Pipe corrosion, precipitation, and sedimentation create deposits called tubercles, which can contribute to the growth of filamentous bacteria. As a result, pipe flow is influenced in two basic ways. Under certain conditions, tuberculation can build up in thickness to a point where the cross-sectional area and carrying capacity of a pipe are seriously diminished. However, even without a significant "buildup", corrosion and tuberculation greatly increase the roughness of the pipe's interior wall; the result is increased friction or resistance to flow. In either case, the available flow and/or pressure is significantly reduced.

In general, the velocity of water steadily decreases as it leaves the source of supply and approaches the consumer. This decreasing velocity permits the formation of precipitates and allows them to settle out inside the pipe. To remove most of these deposits, a high velocity flushing (Unidirectional Flushing) program is recommended. The objective of a unidirectional flushing program is simply to create a high velocity in the pipeline to re-suspend the deposits and to scour the interior surface of the pipe. The water is then flushed out of a hydrant. The optimum times of year for flushing are in the spring and in the fall.

The YWD maintains an annual high velocity flushing program to improve distribution water quality and reduce water age in the distribution system. Flushing must be done from the supply and storage facilities out towards the extremities. In some locations, it may be necessary to isolate some of the system which is well looped in the distribution network. Alternatively, computerized unidirectional flushing programs can assist in sequencing the flushing program for maximum water-use and cleaning efficiency. These programs easily interface with the modeling software used for this study.

The accumulation of precipitates not only results in reduced flow capacity but also increases normal pumping costs and/or reduces normal system pressure. A flushing program will also reduce color and taste complaints from the customers, improve water quality overall and decrease the age of the water in the distribution system.

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