

ROLLINSFORD WATER AND SEWER DISTRICT

AUG 2024

# Water System Asset Management

# Water System Asset Management

## Rollinsford Water and Sewer District

**August 2024**

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## Section 1 Introduction

### 1.1 Background

The Rollinsford Water and Sewer District (RWSD) provides public water service to a large portion of the Town of Rollinsford, New Hampshire. RWSD provides water service to most of the populated areas of Rollinsford from General Sullivan Way in the South, to Front Street in the North.

Wright-Pierce has been retained by RWSD to prepare a Water System Asset Management Plan as part of the Drinking Water Asset Management Grant Program. The New Hampshire Drinking Water and Groundwater Bureau is supporting this project through a matching grant.

### 1.2 History of The District

On August 23, 1951, Town of Rollinsford voters moved to establish the Salmon Falls Village Water District, thereby establishing the first arm of what would later become the Rollinsford Water District. The Rollinsford Sewer District (RSD) was established via a special meeting on February 17, 1969. A vote to merge the two utilities was held on March 26, 1991. Following unanimous agreement, the Rollinsford Water and Sewer District was created in 1992.

The Town of Rollinsford currently maintains and operates water and wastewater services in a portion of the Town through the Rollinsford Water and Sewer District (RWSD). The Rollinsford water system has one service area and serves an approximate population of 1,688, with 639 service connections.

### 1.3 Purpose and Scope of Study

As noted in NHDES Asset management guidelines documents, “Asset Management is a systematic process of operating, maintaining, upgrading and disposing of assets cost effectively while maintaining a level of service that is acceptable to the customers”. This Water System Asset Management Plan includes recommendations for a Capital Improvement Program (CIP) and a water rate evaluation, which will guide RWSD’s drinking water investment decisions over the next 10 years.

In summary, the primary focus areas of the study are as follows:

- **Water Supply Infrastructure** - Inventory and document condition of the system's existing distribution and supply assets.
- **Distribution System** - Evaluate the distribution system using the district’s hydraulic model to identify mains for replacement or renewal.
- **Storage** - Conduct an analysis of the system's storage facilities regarding capacity and condition.
- **Level of Service** – Develop a Level of Service document outlining the needed Level of Service for the water system in Rollinsford.

Based on the findings in each study area, recommendations for system improvements were developed and prioritized. The recommendations are summarized and included in a capital improvement program.

## **1.4 Goals and Asset Evaluation Procedures**

This report summarizes the asset management work completed for the Rollinsford Water and Sewer District's Water System. The purpose of this evaluation is to meet the following objectives:

- Create an asset hierarchy for the Rollinsford Water and Sewer District (RWSD) assets.
- Conduct condition assessment of assets at the two well sites.
- Perform criticality/risk analysis of significant water assets.
- Identify best practices and management strategies for implementing RWSD's asset management program.
- Develop a 10-year Capital Improvement Plan.

Asset condition assessments are based on information provided by RWSD, interviews with operations staff, and field observations by Wright-Pierce personnel. During the site visits:

- Basic testing was performed with commonly available software tools. The results were used to identify assets performing outside the expected range.
- The Wright-Pierce team spoke with RWSD personnel to verify performance history and learn about the reliability of each asset.
- The condition assessment was limited to readily accessible areas. No confined space entry was performed.
- No destructive testing of construction materials (concrete, paint, metal, insulation, etc.) was performed to determine the condition of assets.

The detailed evaluation forms for each asset are in [Appendix A](#).

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## Section 2 Existing Water System Review

### 2.1 General

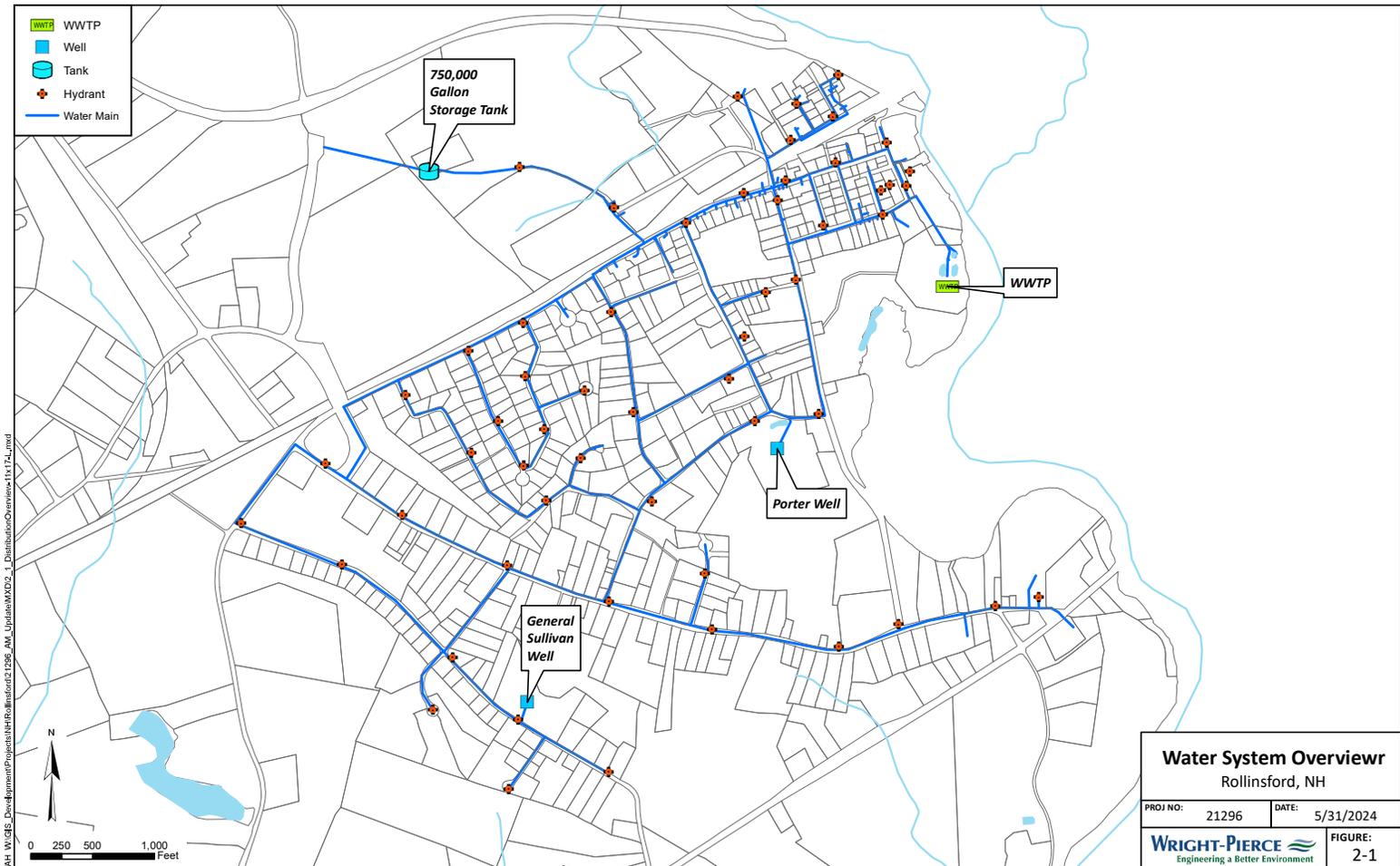
The purpose of this section is to provide a general overview of the water system infrastructure. This includes the well facilities, distribution piping, and storage facilities.

Included within this section are observations and findings from inspections that were conducted at each of the well stations and the water storage tank. Internal inspection of the water storage tank was conducted outside of this report. Recommendations for improvements are included in the Capital Improvement Program presented in [Section 7](#).

### 2.2 System Overview

#### 2.2.1 Source Water and Service Area

The water system has one service area. The system operates on a maximum hydraulic grade line elevation of 229 feet. Three wells feed the system, two on Foundry Street (Porter Wells), and one on General Sullivan Way (Sullivan Well). Water is pumped through approximately 6 miles of distribution piping to meet demands. Water that is pumped in excess of demand, fills the District's 750,000-gallon water storage tank located near the Rollinsford transfer station. The tank was constructed and placed online in 1996. This water tank stores approximately a one-week supply of treated water, based on current demand, for emergency purposes. The general extent of the water system, including the locations of the referenced water related facilities, is included in [Figure 2-1](#).



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### 2.2.2 Groundwater Supplies

The District meets its average daily demand of roughly 120,000 gallons of water per day using three ground water wells. Two bedrock wells (BRW #4 and BRW #6) are located at 573 Foundry Street site across from the Rollinsford boat launch. These wells are commonly referred to as the Porter Wells, water from the Porter Wells is treated for removal of arsenic and benzene, followed by disinfection prior to distribution. The third well, a gravel packed well, is located at 79 General Sullivan Way (Sullivan Well). Water from the Sullivan Well is treated for pH adjustment and disinfected prior to distribution.

The water quality from these two wells is very different and has caused water quality and corrosion control problems in the recent past. The cast iron section of the distribution system surrounding Wiley St where this water quality issue was most prevalent. To combat this, the District commissioned a corrosion control study in 2018 and implemented a program incorporating flushing this section of the distribution system and addition of a ortho/polyphosphate blend at both wells to reduce the potential for lead and copper corrosion in the system and sequester iron in solution. This program has improved water quality in the distribution system and has brought RWSD back into compliance with the Lead and Copper Rule.

#### 2.2.2.1 Porter Well Site

The Porter Wells are located at 573 Foundry Street, across from the Rollinsford boat launch, with access available just south of the American Legion. Water from the Porter Wells is treated for removal of arsenic and benzene, followed by disinfection prior to distribution.

The Porter Wells consist of two bedrock wells. BRW #4 is approximately 300 feet deep with a 50-gpm yield. BRW #6 is approximately 390 feet deep with a 52-gpm yield. Buildings on site consist of a small single-story building of concrete masonry unit construction with a peaked roof and a larger single-story building of wooden construction with vinyl siding and a peaked, shingled roof. The smaller building houses electrical and instrumentation equipment as well as a make-shift lab space. The larger building houses the arsenic and benzene treatment systems as well as chemical storage.

The well site's arsenic removal system is a co-precipitation process consisting of chemical addition followed by greensand filtration. Chemical addition and flow metering, of both well sources, occurs at the Porter Well Control/Treatment Station building. Ferric Chloride (38.25%) and Muriatic Acid (31%) are used in the arsenic removal process. Two chemical feed pumps are used to independently inject Ferric Chloride and Muriatic Acid directly from their bulk containers into the water main prior to filtration.

The filtration system consists of two fiberglass-reinforced plastic (FRP) pressure filtration/adsorption vessels measuring 36 inches in diameter and 72 inches tall, in a parallel configuration. Each vessel contained approximately 27 cubic feet of AD-33 adsorption media when originally installed, but this media has since been changed to Greensand adsorption media.

Water from both wells is disinfected using Sodium Hypochlorite (NaOCl) (12.5%). The NaOCl is stored in 55-gallon drums. A single chemical feed pump is used to pump the NaOCl into the water main directly from the drums.

Water from both wells is treated for corrosion control using a poly/orthophosphate blend. This chemical is stored in 55-gallon drums. A single chemical feed pump is used to pump the poly/orthophosphate blend into the water main directly from the drums.

Benzene treatment was added at the Porter well site in 2011, integrating a benzene removal system and Lowry air stripper to remove volatile contaminants. Benzene has not been detected in the Porter Wells since 2015. In 2018, RWSD received permission from the NHDES to take the aeration system offline and in 2023, the air stripper system was removed from the facility.

### 2.2.2.2 General Sullivan Well Site

The General Sullivan Well site is located on property the District owns at 79 General Sullivan Way, just north of Woodland Drive. The site consists of one gravel packed well which was upgraded on August 5, 2016.

The General Sullivan Well permitted yield is 150 gpm. The well has a total depth of 36 feet. The static water level in the well is recorded as 22.3 feet below the surface. The well has a 16-inch diameter, 33-foot long carbon steel casing. The well screen is a 304 stainless steel Johnson 8-wire with 0.06-inch slots. The screen is five feet long with a diameter of 16 inches. The top of screen is located 31 feet below ground. The current well replaced the original, in building well, and is located approximately 10 ft to the Northwest of the building.

There is a single story building onsite with a basement level. The building is constructed of concrete masonry units with a flat membrane roof. This above ground floor of the building houses chemicals, a small workbench and provides storage for materials. The basement level of the building electrical equipment, process piping and chemical addition area.

Water from this well is treated for disinfection using NaOCl (12.5%). A positive displacement chemical feed pump is used to pump the NaOCl directly into the water main inside the building.

Water from this well is treated for corrosion control using a poly/orthophosphate blend. This chemical is stored in 55-gallon drums. A single chemical feed pump is used to pump the poly/orthophosphate blend into the water main directly from the drums.

Sodium Hydroxide is used for pH adjustment. This chemical is injected directly from a bulk tank into the water main in the building. A positive displacement chemical feed pump is used to pump the NaOH into the water main.

Sodium Bicarbonate is used for alkalinity adjustment. This chemical is injected directly from a mixing tank into the water main in the building. A positive displacement chemical feed pump is used to pump this chemical into the water main.

### 2.2.3 Distribution Piping

The distribution system includes approximately 6 miles of piping ranging in size from 1.5-inch to 12-inch in diameter and 58 hydrants. A breakdown of piping by year, diameter, material type and age has been created using the updated mapping database developed for this study and presented in Tables 2-1, 2-2, and 2-3, as well as Figures 2-2, 2-3, and 2-4.

In general, most of the distribution system piping is believed to be in serviceable physical condition but significant and consistent investment in water main renewal is warranted. The oldest pipes in the system are cast iron and were installed in the late 1800s. A large portion of the system is cast iron, or the material is unknown, and the hydraulic capacity of the system does not support current industry fire flow requirements.

**Table 2-1 Distribution System Piping by Diameter**

Diameter (in)	Length (feet)
≤4	1,800
6	6,300
8**	26,600
12	8,200
Unknown	6,500
<b>TOTAL</b>	<b>49,400</b>

\*Some values may include service lengths

\*\*Includes lengths from planned 2024 projects, as seen in Figure 2-2

**Table 2-2 Distribution System Piping by Material**

Material	Length (feet)
Cast Iron	11,500
PVC**	4,600
PE	1,000
Asbestos Cement	17,200
Ductile Iron	8,900
Unknown	6,200
<b>TOTAL</b>	<b>49,400</b>

\* Some values may include service lengths

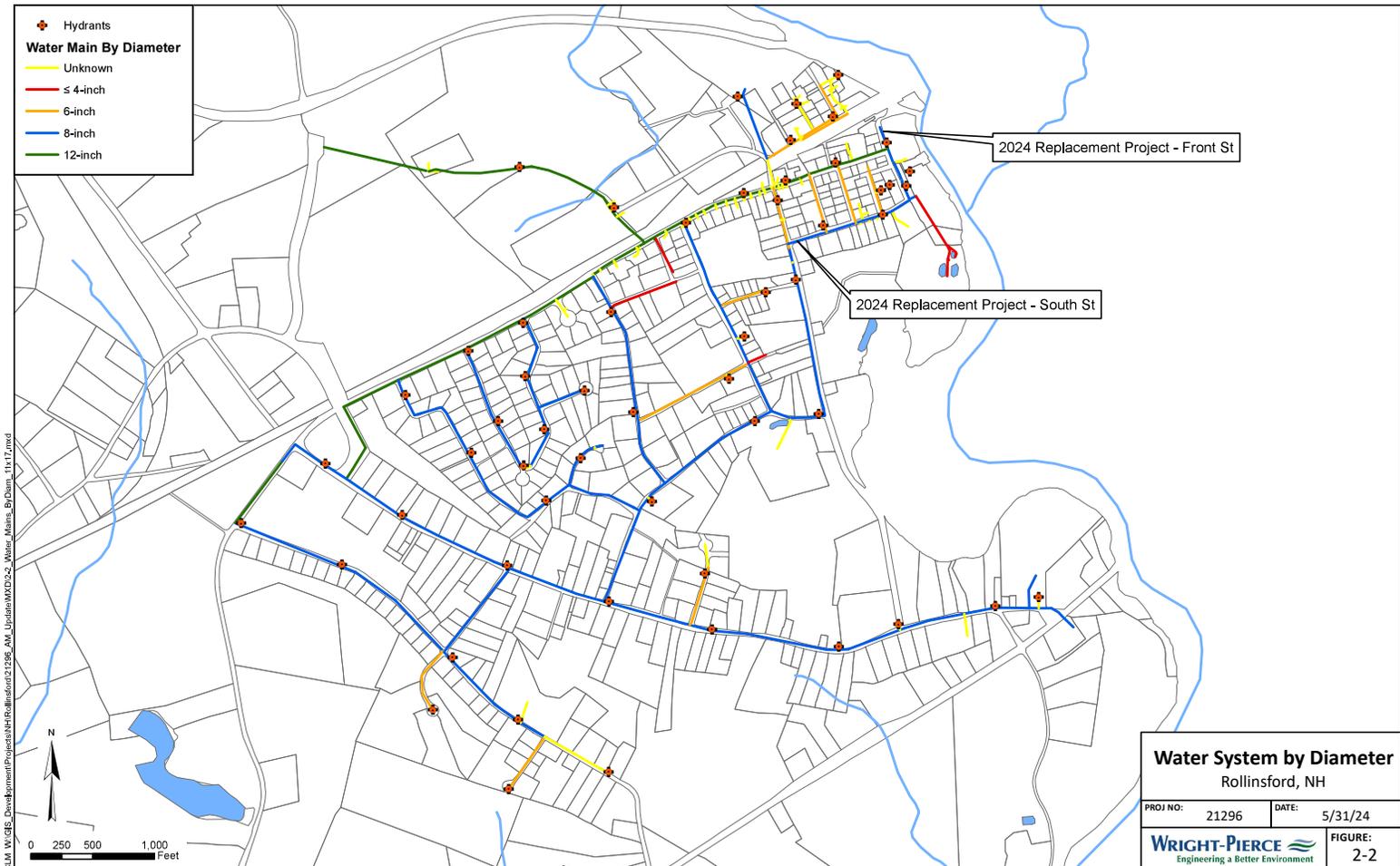
\*\* Includes lengths from planned 2024 projects, as seen in Figure 2-3

**Table 2-3 Distribution System Piping by Age**

Age (yrs)	Length (feet)
Unknown	5,300
0-4**	5,900
5-24	2,100
25-34	6,400
35-44	2,700
45-54	20,200
54-65	6,900
<b>TOTAL</b>	<b>49,400</b>

\* Some values may include service lengths

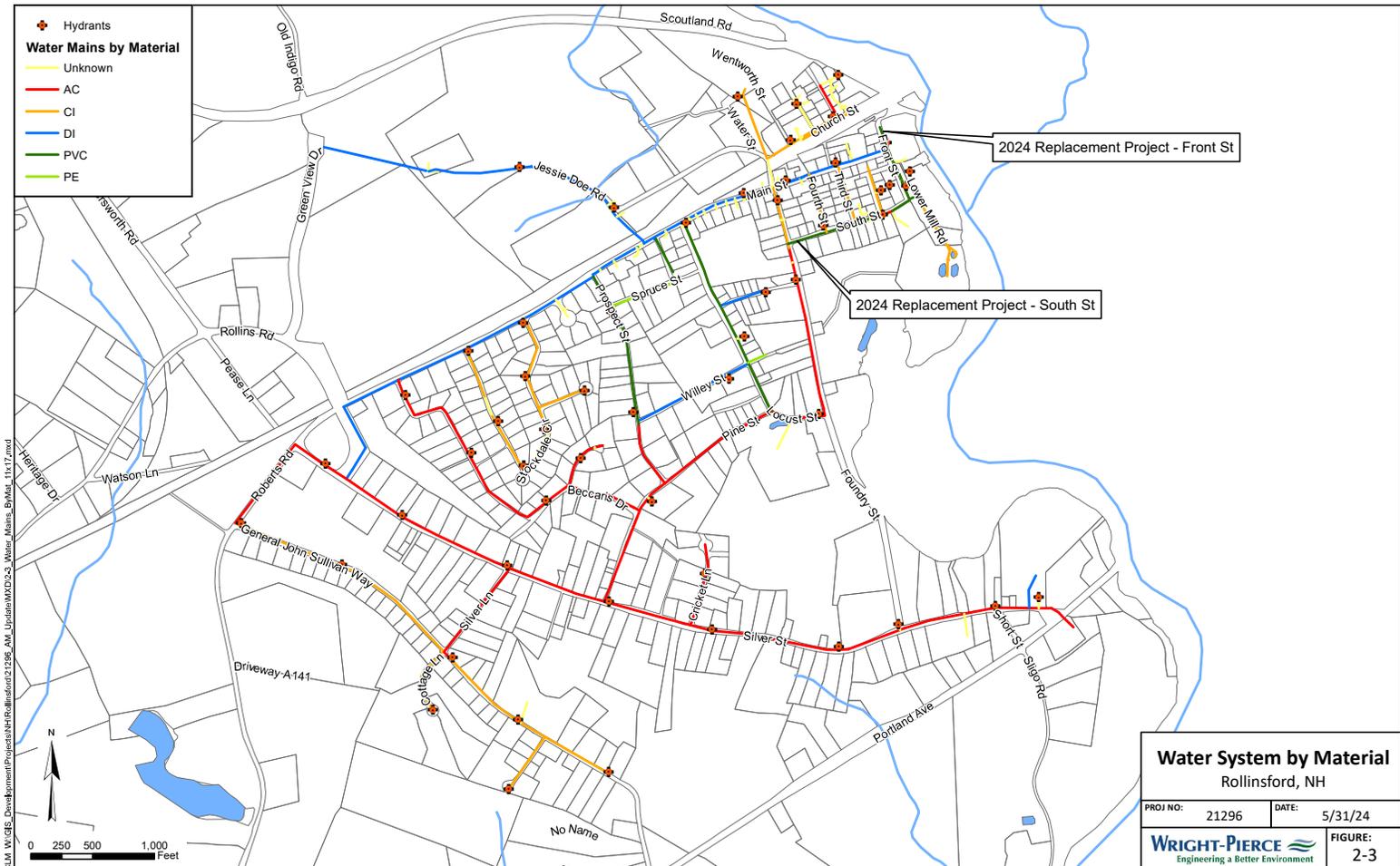
\*\*Includes lengths from planned 2024 projects, as seen in Figure 2-4



**Water System by Diameter**  
Rollinsford, NH

PROJ NO:	21296	DATE:	5/31/24
 WRIGHT-PIERCE Engineering a Better Environment		FIGURE:	2-2

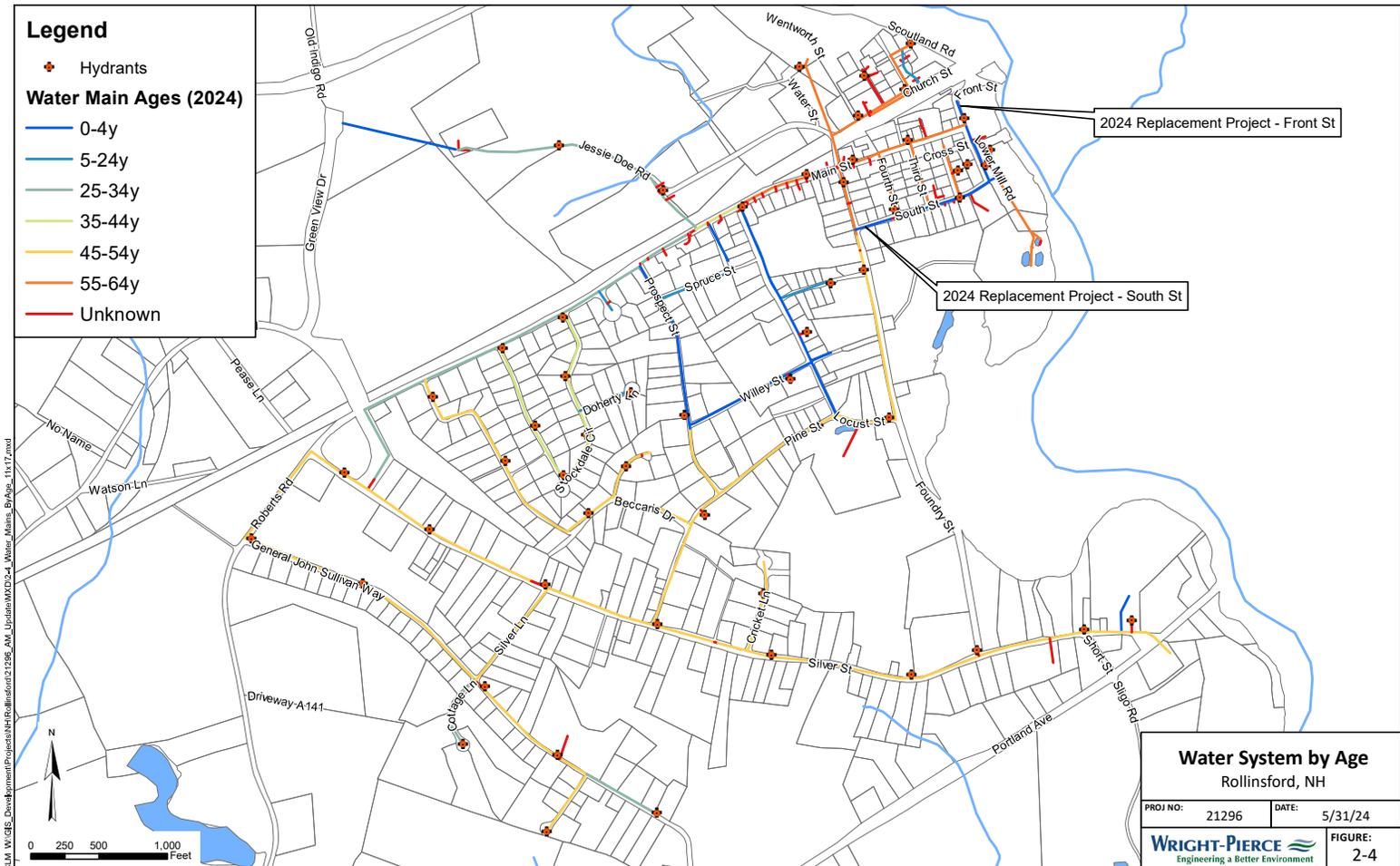
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**Legend**

- ◆ Hydrants
- Water Main Ages (2024)**
- 0-4y
- 5-24y
- 25-34y
- 35-44y
- 45-54y
- 55-64y
- Unknown



2024 Replacement Project - Front St

2024 Replacement Project - South St

**Water System by Age**  
Rollinsford, NH

PROJ NO: 21296      DATE: 5/31/24

**WRIGHT-PIERCE**      FIGURE: 2-4  
Engineering a Better Environment

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### 2.2.4 Storage

Storage of water within the distribution system is used to provide for equalization, peak hourly demands, firefighting needs, and emergencies. Adequate storage allows transmission and water treatment works to be sized for no more than the maximum daily flows. Storage volume is replenished daily during periods of low demand. Use of a water storage tank under a diurnal 24-hour water use pattern, typical of residential communities allows for peak day-time water use periods to be serviced using the storage tank, while water storage volume is replenished over night when demands are low.

The water system has one 750,000-gallon concrete storage tank, built in 1996. Physical properties for the tank is presented in [Table 2-4](#).

**Table 2-4 Storage Facilities**

Storage Facility	Total Storage Capacity (gal)	Tank Diameter (Feet)	Tank Height (Feet)	Base Elevation (Feet-USGS)	Overflow Elevation (Feet - USGS)
750,000 Gallon Storage Tank	750,000	50.5	50	179.0	229.0

The storage tank is further discussed in Section 4 of this report.

### 2.2.5 SCADA and Controls

The RWSD water system is controlled through a supervisory control and data acquisition (SCADA) system. Remote signals from the tank and well stations are remotely monitored through this system.

## 2.3 Unaccounted-for Water

Unaccounted-for water (UAW) is water use that is not billed or metered. Sources of UAW include hydrant usage and flushing, leaks in the distribution system, transcription errors and inaccuracy in meters. Other sources of UAW may include main breaks, unauthorized use, drainage of storage facilities for maintenance or repair, unmetered accounts or non-functioning meters.

Based on a review of the billing and production data for the fiscal year 2022, the unaccounted-for water in the Rollinsford system is approximately 15%. Industry standards suggest that total water loss volume should be no higher than 20% of the total production volume while real losses, by definition, true unaccounted-for water, should be 10-15% of the total production volume.

The State of New Hampshire has adopted rules under Env-Ws 390, which require applicants for development of new sources to demonstrate that unaccounted-for water is less than 15%.

If the District is considering the development of a replacement or new water source, we recommend the review and implementation of the NHDES Water Conservation Rules (Env-Ws 390). These rules provide the framework for making detailed determinations of water use, record keeping and water accounting procedures.

Two areas which are specifically recommended include the development of a water conservation plan and completion of a water audit.

The water conservation plan should include, as a minimum, the following primary components:

- Implementation of a water audit, leak detection and leak repair program.
- Development and implementation of response plans to reduce unaccounted-for water to less than 15% of production.
- Demand management through rate structure development that encourages conservation.
- Implementation of a conservation educational outreach initiative.
- Development of a Water Use Restriction Ordinance.
- Schedule for regular leak detection and water audits.
- Establishment of procedures to manage lost water.
- Public Education.
- Procedures for meter calibration and leak detection.
- Emergency Planning.

Similarly, we recommend that the District conduct a water audit of the water system. A water audit is a formal procedure to define sources of non-revenue water and determine if recoverable leakage within the distribution system can be cost-effectively remedied. The audit should be developed in accordance with the guidelines of the American Water Works Association Manual of Water Supply Practices entitled "Water Audits and Leak Detection, AWWA M36". A water audit will characterize a variety of sources of lost water and would include development of a plan to address and account for these sources of non-revenue water:

- Distribution System Bleeders
- Hydrant Use for Fire Fighting
- Water Main Flushing
- Unbilled Usage
- Unmetered Service Connections
- Control Valve Releases
- Sewer Flushing
- Street Sweeping
- Other Public Uses such as Schools, Public Pools, Etc.
- Tank Overflows
- Water Theft
- Other

### 2.4 Water Department Staff and Management

The RWSD is classified as a Grade II system for Distribution and a Grade I system for treatment. The department currently has two staff members that meet the operation license requirements.

The Rollinsford Water and Sewer Department staff performs all the functions described herein with a management and operations staff consisting of three full time workers and two part time workers that manage and maintain both the water and wastewater systems. Currently, the water department is under the direction of Ray McNeil, Superintendent.

The Superintendent is supported by a full-time administrative employee, an additional staff of two maintenance and operations workers, and one part-time mechanic. The management and support staff offices are located at the WWTP facility. The RWSD staff is responsible for both water and wastewater systems. As the system ages, it is anticipated that the workload of the RWSD staff will continue to increase as maintenance becomes more frequent. Long term, the current staffing level of three full time employees safely and effectively managing both the water and wastewater may be unable to reasonably manage the workload for a system of Rollinsford's size. We recommend reviewing employee workload and the ability to deliver an appropriate level of service on an annual basis to determine if changes in staffing are required to effectively operate the system.

### 2.5 Regulatory Review

The Safe Drinking Water Act (SDWA) of 1974 (amended in 1984 and 1996) is the legal foundation of most United States Environmental Protection Agency (EPA) water regulations. The purpose of the SDWA is to ensure that public water systems (PWSs) are protected from contaminants that have been known to, or have the potential to, cause adverse health effects to the consumer by regulating contaminant concentrations that may be distributed to the general public. For each regulated contaminant, EPA sets a legal limit on the amount allowed in drinking water. Limits set by States must be at least as strict as those established by EPA.

In recent years, the EPA has continued to progress regulations that affect the operation of water systems. Notable regulatory changes include the update to the Lead and Copper Rule and Per and Polyfluoroalkyl Substances (PFAS) regulation development. These two regulatory changes have had a large impact on the water industry and public water suppliers have had to pivot and re-think priorities. Additionally, new contaminants are routinely under review or in the planning stages for future regulation by the EPA.

In New Hampshire, the NHDES are responsible for enforcing National Primary Drinking Water Regulations (NPDWR) along with state-based treatment initiatives that are more stringent than the national standard. This report section will review water quality regulations (current and future) which have the potential to impact the District. Regulations that pertain to the District or have the potential for impact in the future include:

- National Primary Drinking Water Regulations:
  - Groundwater Rule
  - Revised Total Coliform Rule
  - Filter Backwash Recycling Rule
  - Stage 1 & 2 Disinfectants and Disinfection Byproducts Rule
  - Chemical Contaminant Rules
  - Arsenic Rule
  - Lead and Copper Rule
  - PFAS Rule
  - Radionuclides Rule
- Unregulated Contaminant Monitoring Rule:
  - Contaminant Candidate Lists
  - Unregulated Contaminant Monitoring Rules (1-5)
  - Regulatory Determination
- National Secondary Drinking Water Regulations
- Regulatory Assessments
  - Source Water Protection

- Horizon Issues
  - Radon Rule
  - Manganese Rule
  - Other horizon issues

### 2.5.1 Classification of the Water System

The classification of a water system is typically based upon the population served and the characteristics of the water source (e.g., surface water vs. groundwater), the volume of water furnished, and complexity of treatment provided. A water system's classification is used to establish which state and federal rules apply to the water system and the requirements for compliance.

The RWSD is considered a small community water system (CWS) (<10,000 people) that serves a portion of the Town of Rollinsford residents (approximately 1,688 people). The RWSD supplies drinking water to the customers from the two groundwater sources. Over the past few years, the (EPA) has undertaken significant rule-making activity which affects the operation of the system, including updates to the Lead and Copper Rule and recently finalized PFAS Regulations. Furthermore, the State of New Hampshire has lowered the MCL for detectable arsenic and will be establishing state specific PFAS regulations.

The District conducts a regular program of source and distribution water quality sampling and testing. A compilation and summary of sampling results from both sources and distribution system are published in the yearly Consumer Confidence Report (CCR), which is distributed to all customers, as required by the EPA.

Currently, the District meets all State and Federal Drinking Water Standards but has had violations for lead and copper as well as arsenic as recently as 2018.

### 2.5.2 New Hampshire Drinking Water Standards

In accordance with the SDWA, a State may be granted primacy for implementing the provisions of the SDWA provided that the regulations are as stringent as the EPA regulations, at a minimum. The NHDES is the primacy agency which regulates water systems under the New Hampshire Code of Administrative Rules, Env-Dw. Applicable rules include:

- Env-Dw 100 – Public Water Systems: Purpose and Applicability; Use of Federal Terms; Special Provisions for Political Subdivisions; Definitions.
- Env-Dw 200 – Rule Waivers; Confidential Business Information; Hearing Procedures.
- Env-Dw 300 – Sources of Water.
- Env-Dw 400 – Public Water System Classification and Design.
- Env-Dw 500 – Operation and Maintenance.
- Env-Dw 600 – Capacity Assurance.
- Env-Dw 700 – Water Quality: Standards, Monitoring, Treatment, Compliance, and Reporting.
- Env-Dw 800 – Public Notification by Public Water Systems.
- Env-Dw 900 – Protection of Water Sources.
- Env-Dw 1000 – Grants for Public Water System.
- Env-Dw 1100 – Drinking Water State Revolving Loan Fund Program.
- Env-Dw 1300 – Administrative Procedures for Grants and Loans from the Drinking Water and Groundwater Trust Fund.

- Env-Dw 1400 – PFAS Remediation Grant and Loan Fund Programs for Certain Public Water Systems

### 2.5.3 National Primary Drinking Water Regulations

(NPDWR or primary standards) are legally enforceable contaminant concentration limits and treatment techniques that apply to PWSs. The concentration limits for the primary contaminants are quantified with a maximum contaminant level (MCL) because either chronic or acute exposure to primary contaminants can compromise public health. The EPA is required to review and, if appropriate, revise existing NPDWRs every six years with the last review occurring in 2022. A complete listing of the NPDWRs may be found on the EPA website at <http://water.epa.gov/drink/contaminants>.

Currently, the NPDWRs are divided into the following six categories. Each category is comprised of a specific group of contaminants, each regulated by rules developed to effectively control their concentrations in drinking water. The rules associated with the six NPDWR categories are outlined below:

- Microorganisms
  - Groundwater Rule
  - Revised Total Coliform Rule
  - Filter Backwash Recycling Rule
- Disinfectants and Disinfection Byproducts
  - Stage 1 & 2 Disinfectants and Disinfection Byproducts Rule
- Inorganic Chemicals
  - Chemical Contaminant Rules
  - Arsenic Rule
  - Lead and Copper Rule
  - PFAS Rule
- Organic Chemicals
  - Chemical Contaminant Rules
- Radionuclides
  - Radionuclides Rule

The following subsections detail the applicable rules and outline the treatment and sampling requirements for the District.

### 2.5.4 Groundwater Rule

The GWR which pertains to groundwater sources not under the influence of surface water was finalized on November 8, 2006. Compliance requirements of the GWR began in 2010. The purpose of the GWR is to better identify systems at risk for fecal contamination, and to provide the primacy agency with a flexible range of tools to better protect public health. The GWR has the following four major components:

- A. Periodic sanitary surveys of groundwater systems require the evaluation of eight critical elements and the identification of significant deficiencies (e.g., a well located near a leaking septic system). States had to complete the initial survey by December 31, 2012, for most CWSs and by December 31, 2014, for CWSs with outstanding performance and for all non-CWSs.
- B. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions:

1. Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99 percent (4-log) inactivation or removal of viruses and that have a total coliform-positive routine sample under Total Coliform Rule (TCR) sampling in the distribution system.
  2. Assessment monitoring - As a complement to triggered monitoring, a State has the option to require systems with sources that seem susceptible to fecal contamination, to conduct source water assessment monitoring to help identify high risk systems.
- C. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following correction action options:
1. correct all significant deficiencies,
  2. eliminate the source of contamination,
  3. provide an alternate source of water, or
  4. provide treatment which reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.
- D. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99 percent (4-log) inactivation or removal of viruses. A sanitary survey by the State primacy agency would be required every 3 years, and would review eight critical components to the extent that they apply to the individual water system being surveyed:
1. Source
  2. Treatment
  3. Distribution System
  4. Finished Water Storage
  5. Pumps, Pump Facilities and Controls
  6. Monitoring, Reporting, and Data Verification
  7. System Management and Operation
  8. Operator Compliance with State Requirements

The survey frequency may be reduced to five years if the system either treats to 4-log inactivation of viruses or has an outstanding performance record in the eight performance elements documented in previous inspections and has no history of TCR, MCL or monitoring violations since the last sanitary survey. Significant deficiencies in groundwater systems include, but are not limited to, the following types:

- Unsafe source (e.g., septic systems, sewer lines, feed lots nearby),
- Improper well construction,
- Fecal indicators present,
- Lack of proper cross-connection control for treatment chemicals,
- Lack of redundant mechanical components where chlorination is required for disinfection,
- Improper venting of chemical storage tanks,
- Overflow and drainpipes not properly screened,
- Holes in storage tank roof, improper hatch construction, improper clearwell hatch construction,
- Inadequate internal cleaning and maintenance of storage tank,
- Unprotected cross connection (e.g., hose bib without vacuum breaker),
- System leakage that could result in the introduction of contaminants,
- Inadequate monitoring of disinfectant residuals and TCR, MCL or monitoring violations.

The GWR uses the existing TCR monitoring as one trigger for identifying whether a system should be defined as high risk and requiring source monitoring. A groundwater system that does not disinfect to 4-log virus inactivation and has a distribution system TCR sample that tests positive for total coliform is required to conduct "triggered source water monitoring" to evaluate whether the total coliform presence in the distribution system is due to fecal contamination in the groundwater source. Within 24-hours of receiving the total coliform positive notice, the system must collect at least one groundwater sample from each groundwater source and test it for fecal indicators.

If any monitoring sample is fecal indicator-positive, the system must notify the State immediately, and then take corrective action. Corrective action is required to correct the significant deficiency, provide an alternate source of water, or provide treatment which reliably achieves at least 99.99 percent (4-log) inactivation or removal of viruses before or at the first customer. The 4-log virus inactivation can be achieved through treatment technique. One available treatment technique is to maintain a disinfectant residual for a prescribed length of contact time. The required contact time is dependent upon the type of disinfectant used and the water pH and temperature.

RWD is currently in compliance with the Groundwater Rule.

### 2.5.4.1 Revised Total Coliform Rule

The Revised Total Coliform Rule (RTCR) was promulgated in 2013 and required PWS to comply with the requirements of the RTCR by April 1, 2016. The RTCR was intended to reduce the implementation burden of the original Total Coliform Rule (TCR) while, at the same time, better ensuring the integrity of the distribution system.

The objectives of the RTCR are as follows: (1) to evaluate the effectiveness of treatment, (2) to determine the integrity of the distribution system, and (3) to signal the possible presence of fecal contamination. It did not change the monitoring required, but it did change the actions a PWS must take for compliance.

The RTCR set a MCLG and MCL for E. coli and Total Coliforms to protect water supplies against possible fecal contamination. A PWS that exceeds a specified frequency of total coliform occurrence must conduct either a Level 1 or Level 2 Assessment to determine if any sanitary defects exist. Sanitary defects are defined by the RTCR as a "defect that could provide a pathway of entry for microbial contamination into the distribution system or that is indicative of a failure or imminent failure of a barrier that is already in place". If any sanitary defects are found, the system must correct them.

- **Level 1 Assessment** – Is triggered when a system that collects less than 40 samples per month has two or more total coliform positive samples in the same month (5%), or if a PWS fails to take all required repeat samples after any total coliform positive sample. The Level 1 Assessment is performed by the PWS. The Level 1 Assessment form must be submitted to the state within 30 days of the infraction.
- **Level 2 Assessment** – Is triggered if a PWS sample exceeds the E. Coli MCL, there is the need for a second Level 1 Assessment within a year of the first assessment, or if a PWS has a Level 1 Assessment triggered in two consecutive years. The Level 2 Assessment is performed by the state or state-approved entity. The Level 2 Assessment form must be submitted to the state within 30 days of the infraction.

For every regulation, the EPA is required to identify a Best Available Technology (BAT), which is defined as treatment technique, or other means available for achieving compliance with the rule's requirements. In the case of the RTCR, the following BAT are recommended to ensure levels below the MCL for total coliform:

1. Disinfectant residual is maintained throughout the distribution system,
2. Proper maintenance of the distribution system including appropriate pipe replacement and repair procedures, main flushing programs, proper operation and maintenance of storage tanks and reservoirs, and continual maintenance of positive water pressure in all parts of the distribution system,
3. Filtration and/or disinfection of surface water using strong oxidants such as chlorine, chlorine dioxide, or ozone.

NHDES published guidance on addressing bacterial contamination in small transient water systems in 2020 "DWGB-7-8" which is intended to assist small water systems in the evaluation and correction of bacteria contamination for compliance with the RTCR.

The District is required to take two routine samples per month. If a sample is positive for total coliform, the rule prescribes that three repeat samples be taken within 24 hours for each positive sample to ensure a false positive sample did not occur. Any positive repeat sample constitutes a violation of the MCL for total coliform. A water system would also be required to take two routine samples the month following a positive routine sample. For purposes of the public notification requirements in 310 CMR 22.16, this is a violation that may pose an acute risk to health. RWSD is in compliance with this rule.

### 2.5.4.2 Filter Backwash Recycling Rule

The Filter Backwash Recycling Rule (FBRR) was introduced in 2001 to regulate the recycling of filter backwash water within the treatment process of PWS. The FBRR affects systems that meet all the following criteria:

- uses surface water or GWUDI,
- uses conventional or direct filtration to treat water,
- recycles at least one of the following: spent filter backwash water, thickener supernatant, or liquids from dewatering processes.

Recycled spent filter backwash water, thick supernatant, and/or liquid from the dewatering process often have very high concentrations of microbial contaminants and they can reintroduce microbes and other contaminants to the treatment systems. Additionally, large volumes of these recycled streams can interrupt the treatment processes and allow these contaminants to pass through the system. The goal of the FBRR is to reduce the contamination of drinking water in PWS from these microbes.

The FBRR requires that all recycle streams be reintroduced to the plant at a point that incorporates all treatment processes of a conventional or direct filtration system. The FBRR also requires that all affected PWS must collect and maintain the following information to remain in compliance:

1. A copy of all information submitted to the State,
2. A list of recycle streams and the frequency with which they are returned to the system,
3. Average and maximum backwash flow rates through the filters and the average and maximum durations of the filter backwash process in minutes,
4. Typical filter run length and a written summary of how filter run length is determined,

5. The type of treatment provided for the recycle stream before it re-enters the conventional or direct filtration process,
6. Data about the physical dimensions of the equalization or treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used, average dose of chemicals, frequency of chemical addition, and frequency of solids removal.

RWSD discharges its backwash water at the Porter Well WTP to the sewer and does not recycle.

### 2.5.4.3 Stage 1 Disinfectants and Disinfection Byproducts Rule

The Stage 1 & 2 Disinfectants and Disinfection Byproduct Rules (DDBR) regulate all CWSs that deliver water disinfected by any means other than UV light. While non-UV disinfectants are important and effective for controlling microorganisms, they react with naturally occurring organic matter (NOM) in the finished water to form potentially dangerous by-products. The DDBR protects the public against the excessive presence of ozone or chlorine-based disinfectants and DBPs such as Trihalomethanes (TTHM), HAA5, Bromate, and Chlorite in drinking water by introducing an MCL on the running annual average concentration of each group of compounds. The MCLs established under the DDBR are as follows: TTHM < 80ppb, HAA5 < 60ppb, Chlorate < 1.0 mg/L, Bromate < 0.010 mg/L, and the maximum residual disinfectant level must be less than 4.0 mg/L for chlorine or chloramines as Cl<sub>2</sub>.

Stage 1 DDBR required DBP sampling to occur at the location of maximum residence time during the month of the warmest weather and the entire system is averaged for compliance purposes. These sampling requirements were soon increased by the Stage 2 DDBR. The Stage 2 DDBR requires a distribution system evaluation to be completed in order to determine the sampling locations in the system which are most likely to form DBPs. Each Stage 2 DDBR sampling location is assessed separately with its own running annual average which must meet the MCLs. If the running annual average for an individual sampling location exceeds the MCLs for one or more DBP compound, then the system must increase monitoring to a quarterly frequency until the system returns to compliance.

Water systems at higher risk of DBP formation typically have areas in the water distribution system with high residence times, tanks with low turnover or mixing, high dosage and residual concentrations of disinfectant, and increased presence of organic matter. Reducing the formation of DBPs within the treatment plant can be achieved by one of three primary practices: Reducing the concentration of NOM precursor (measured as TOC and color) before the addition of disinfectant, reducing the concentration of disinfectant used to achieve the required CT with the disinfectant during the primary disinfection process, and switching to a disinfectant that forms lower levels of regulated DBPs.

A system the size of RWSD must complete quarterly sampling of TTHM and HAA5 at two locations within the distribution system in accordance with the Stage 2 DDBR. RWSD is in compliance with the Stage 2 DDBR.

### 2.5.4.4 Chemical Contaminant Rules

The Phase I, II, IIA, and V Chemical Contaminant Rules were promulgated between 1987 and 1992 and apply to all PWS. The Chemical Contaminant Rules regulate over 65 compounds that have been scientifically proven to have a negative impact on human health. Regulation of these contaminants reduces the risk associated with developing cancer, organ damage, and circulatory/nervous/reproductive system disorders in PWS customers.

Compounds regulated under this rule may generally be classified as Inorganic Contaminants (IOCs), Volatile Organic Contaminants (VOCs), or Synthetic Organic Contaminants (SOCs). Standard sampling practices require annual sampling of IOCs and quarterly sampling for VOCs and SOCs. Water systems with routinely low concentrations may request a sampling waiver to reduce sampling frequency to once every 3 years for SOCs, every 6 years for VOCs, or every 9 years for IOCs. Water systems that have been granted reduced sampling frequencies for SOCs and/or VOCs must complete a vulnerability assessment (VA) every three years to prove that the source water is not susceptible to contamination. Sampling waivers for IOCs are renewed at each 9-year sampling interval pending results. Waiver extensions should be filed 1-2 months prior to expiration to allow for review and approval by the State.

The EPA is currently considering additional regulations under this ruling for a group of compounds designated as Carcinogenic Volatile Organic Compounds (cVOCs) which include eight currently regulated VOCs and eight unregulated VOCs. The EPA is also considering lowering the MCL for Trichloroethylene (TCE) and Tetrachloroethylene (PCE). These potential changes are not expected to impact RWSD.

RWSD is currently in compliance with this regulation.

### 2.5.4.5 Arsenic Rule

Arsenic is common to New England states as it is an element that naturally occurs in bedrock. Ingesting water with elevated levels of arsenic for prolonged periods of time can increase the risk of cancer (bladder, lung, and skin) and cardiovascular disease. Studies have also shown arsenic in drinking water can increase the risk birth defects and reduced IQ in children.

In January 2001, the EPA lowered the previous MCL for arsenic from 50 ppb to 10 ppb. Arsenic was added to the Phase II/V Chemical Contaminant Rules described above and PWSs were required to comply with the revised concentration limit by February 2006.

In 2018, New Hampshire State Legislature directed NHDES to review the EPA's recommended MCL of 0.010 mg/L for arsenic in drinking water and groundwater. The NHDES evaluation considered, "the prevalence of arsenic in New Hampshire water supplies, the adverse health impacts that could be avoided by lowering the limit, the cost of water treatment to remove arsenic, and other factors all of which are explained in the report" (NHDES). Based on the findings of their evaluation, NHDES recommended that the MCL for arsenic in drinking water be reduced from 0.010 mg/L to 0.005 mg/L, effective July 1, 2021.

Arsenic concentrations in the raw water from the Porter Wells exceed the Arsenic Rule MCL. The Porter Well WTP treats the water from these wells using an iron coprecipitation process to remove Arsenic and maintain compliance with the Arsenic Rule.

### 2.5.4.6 Lead & Copper Rule

The (LCR) was promulgated in June 1991 and has been revised several times including in 1998, 2000, 2004, 2007, 2021, and 2023 when the Lead and Copper Rule Improvements (LCRI) was proposed. The LCRI is anticipated to be finalized in October 2024, until then the Lead and Copper Rule Revisions (LCRR) is the current rule that must be followed. The purpose of the LCRI is to protect public health by minimizing lead and copper levels in drinking water, primarily by reducing water corrosivity. The LCRI proposes that 90% (P90) of lead and copper samples tested fall below the respective action levels (AL) of 0.010 mg/L for lead and 1.3 mg/L for copper. The lead AL is to be reduced from the 0.015 mg/L that is currently in place. Recent revisions require all water systems to develop a publicly

available Lead Service Line Inventory (LSLI) and LSL Replacement Plan (LSLR Plan) by October 2024 with annual updates beyond the initial deadline. Any changes to source water or treatment techniques must be accompanied by primacy agency approval and followed by biannual monitoring.

### Sampling and Monitoring

Lead and copper sampling must be conducted in wide-mouthed bottles of the first liter of at least 6-hour-old stagnant water (fifth liter for homes with lead service lines). Aerator cleaning or removal and pre-stagnation flushing prior to sample collection is prohibited. Sampling occurs every six months at a number of sites depending on system size.

- Systems serving  $\leq 3,000$  people may apply for a water quality monitoring waiver to sample every 9 years.
- Systems serving  $\leq 50,000$  people that test below the AL for both lead and copper for two consecutive 6-month monitoring periods may begin sampling annually. After three years of annual sampling the system qualifies for triennial sampling. Water quality monitoring must be conducted for systems with 6-month sampling intervals.
- Systems serving  $> 50,000$  people must meet above requirements and have optimal source water quality parameters to qualify for annual or triennial sampling. Regular water quality monitoring must be conducted.
- Systems with lead  $\leq 0.005$  mg/L and copper  $\leq 0.65$  mg/L for two consecutive 6-month periods may qualify for accelerated reduced monitoring and triennial sampling.
- Lead sampling may be required more frequently in systems with higher lead concentrations, but this does not impact copper sampling frequency.
- 20% of elementary schools and childcare facilities must be sampled for lead annually on a rotating basis so that all facilities are sampled in a five-year period. Secondary school sampling should be conducted upon request. All applicable lead sampling results must be shared with the respective schools, health departments, and primacy agencies. Facilities constructed or have had a complete plumbing renovation after January 2014 are exempt from lead sampling requirements. Under the proposed LCRI, site specific waivers may be obtained which relieve the school or childcare from the first five-year testing cycle given lead samples were collected between January 2021 and the LCRI compliance date.
- Source water monitoring is required in all systems with source water treatment and/or lead levels exceeding the AL. Primacy agencies may waive continued source water monitoring requirements for untreated systems if no new water sources are added and previous continuous monitoring has been conducted.
- New lead sample location tiering criteria was introduced in 2021 under the LCRR which requires all samples to be taken from locations with known LSLs when possible. The proposed LCRI revises this location tiering criteria to include galvanized services and lead connectors. The EPA website should be consulted when determining sample site selection.

### Trigger Level (TL) Requirements

The LCRR introduced the concept of “Trigger Levels” to aid systems in strengthening their corrosion control plans. The LCRR defined a lead TL of P90  $> 0.010$  mg/L and introduced requirements based the water system size. When the TL is exceeded, annual lead sampling is the new minimum frequency and systems must conduct testing to develop or re-optimize corrosion control plans.

- Systems serving  $> 3,300$  people must implement their LSLR program in consultation with their primacy agency for at least 2 consecutive years.

- Systems serving > 10,000 people must address the implementation or effectiveness of corrosion control treatment (CCT) within the system. The first TL exceedance requires the system to develop a treatment plan which would be installed upon the second TL exceedance.
- Systems serving  $\leq$  10,000 people may choose to reduce lead levels below the TL from four options CCT, LSL replacement, replacement of all lead-bearing plumbing materials, or providing and maintaining point-of-use treatment devices (such as pitcher filters) to customers. All options are subject to primacy agency approval.

The EPA is proposing to eliminate lead TL requirements with the upcoming LCRI to simplify the rule and require water systems to act sooner. As a result, the AL, described below, would be lowered to  $P90 \geq 0.010$  mg/L to cover the full range of what is currently the TL.

### AL Requirements

The LCRR strengthened requirements for systems exceeding the lead AL of  $P90 \geq 0.015$  mg/L and now mandates several actions dependent on system size. Upon exceeding the lead AL, systems must install or re-optimize CCT immediately, begin acting on their lead service line replacement plan, and increase lead sampling frequency to 6-month intervals.

- Systems serving > 3,300 people must begin replacing  $\geq 3\%$  of LSLs within their system annually based on a two-year rolling average.
- Systems serving > 10,000 people must immediately implement CCT regardless of historical lead levels.
- Systems serving  $\leq$  10,000 people must reduce lead levels by CCT or LSL replacement within 15 years.
- All systems must notify customers within 24 hours of receiving test results and provide public education materials discussing lead sources, health effects, measures to reduce lead exposure, and sources for additional information. All public education materials must be available in multiple languages upon request.
- All systems without source water treatment that exceed the AL must undergo continued source water monitoring.

The proposed LCRI lowers the lead AL further  $P90 \geq 0.010$  mg/L to encompass the removal of the lead TL. Upon exceeding the reduced AL under the proposed LCRI systems would be required to provide public notification within 24-hours and public education opportunities. Systems with  $P90 > 0.010$  mg/L must implement CCT regardless of historical lead levels, systems with CCT must re-optimize, and systems with optimal CCT (OCCT) meeting optimal water quality parameters (OWQPs) need only re-optimize OCCT once, unless otherwise required by the State.

### Individual Samples Exceeding AL

All customers with individual samples exceeding the AL must be provided with a lead notice within 3 days and effected sample locations must be re-sampled within 30 days. Systems with CCT must conduct water quality parameter monitoring at or near the site and perform corrective actions. If the customer does not respond or refuses, contact after two attempts the water system must document interactions and inform local public health officials. The proposed LCRI would increase the number of required customer contact attempts from two to four.

### Public Education and Outreach

The LCRR updated CCR lead health effect language and requires the CCR to include access information for the system's LSLI and tap sampling results. Annual notice to customers supplied by LSLs or service lines of unknown material is now required and any water-related work that may disturb LSLs must be accompanied by prior notice and educational materials. Targeted outreach to LSL customers encouraging LSLR must be completed in systems utilizing a goal based LSLR program, otherwise additional outreach activities may be required. The system must provide educational materials to local health authorities and healthcare providers. Educational materials must also be included with advanced notices of water-related work that could disturb LSLs.

The proposed LCRI eliminates the goal-based public outreach activities and requires systems failing to meet the mandatory service line replacement rate to conduct targeted outreach to LSL customers encouraging LSLR. Large systems with a significant population of consumers with limited written English proficiency must provide a translated statement with all educational materials describing the importance of the materials and instructions on how to contact the system to get the materials translated into other languages.

In the event that a water system has multiple lead AL exceedances, under the LCRI the system would be required to conduct additional public outreach activities and make filters available. The LCRI also requires that all water systems offer lead tap sampling be available upon request for customers with lead, galvanized, and unknown service lines.

### Lead Service Line Inventory

A fully developed LSLI is required by October 2024. The LSLI must include information on both the public and private sides of each service line that is connected to the PWS, including street address with each service line and connector. The LSLI requires that each service line be classified as one of four options: lead, galvanized requiring replacement (GRR), non-lead (or the actual material), or lead status unknown. It is recommended that each service line also includes other details of the service line such as pipe diameter, and installation date. All systems serving > 50,000 people must make the LSLI publicly accessible and available online.

The proposed LCRI introduces requirements that water systems must respond to customer inquiries about incorrectly identified service line materials within 60 days. Existing LSLIs must be updated annually and systems must validate the accuracy of non-lead services lines in their inventory within seven years of the October 2024 compliance date unless subject to shortened or deferred deadlines. Furthermore, all unknown service lines must be identified by the mandatory lead and GRR service line replacement deadline.

### LSL Replacement Program

Under the current LCRR all water systems with at least one lead or GRR service line must develop LSLR plan that includes: strategies for identifying unknown service line materials, procedures for a full-service line replacement, a customer communication strategy, service line flushing instructions, and a service line replacement prioritization strategy. In addition to the requirements of the LCRR, the proposed LCRI requires LSL replacement plans to include strategies to inform customers of proposed service line replacements and to identify any legal requirements such as water tariffs that may affect the system's ability to complete a service line replacement.

Currently, the annual LSL replacement rate is dependent on the number of service pipes that have unknown, galvanized, or lead material present at the time of AL exceedance. See the AL and TL sections for required replacement rates. Both private and public sides of the service line must be replaced to count towards the completion of annual rates and qualify for some funding programs. If a customer decides to replace their private side lead or GRR service line, the system must replace the public side within 45 days of notification. The state may authorize a replacement period extension for up to 180 days from the date of notification. Within 24 hours of LSLR completion, systems must provide consumers with a 6-month supply of pitcher filters and replacement cartridges and a new lead test must be conducted in 3 to 6 months. All lead connectors must be replaced when encountered.

The proposed LCRI mandates the complete replacement of all lead and GRR service lines within 10 years with late 2034 being the earliest likely deadline. The majority of water systems will be required to replace at least 10% of lead and GRR service lines annually. The number of service lines requiring replacement will be calculated on a rolling 3-year period. Very large systems with over 10,000 lead or GRR service lines may be granted extended deadlines. Systems with a high percentage of lead or GRR service lines may also be granted extended deadlines. The LSL replacement plan does not need to be made publicly available unless the water system serves >50,000 people in which case the replacement plan must be made available online.

NHDES currently requires RWSD to have a minimum of 20 sample sites and collect 10 samples across the distribution system triennially. RWSD complies with all the provisions of the LCR and are in the process of completing the LSLI in compliance with the October 2024 submission deadline.

### 2.5.4.7 PFAS Rule

Per- and polyfluoralkyl substances (PFAS) are a group of man-made chemicals that are resistant to heat, water, and oil, and have been used in a wide range of consumer products and industrial applications such as food packaging, clothing, fire-fighting foams, and upholstery since the 1940s. Often referred to as “forever chemicals”, PFAS are resistant to typical degradation processes due to their highly stable chemical structure, and thus persist in the environment and have been found in surface and groundwater as well as finished drinking water across the country.

Because of their widespread use and endurance in the environment, most people have been exposed to some level of PFAS. It has been reported that exposure to certain PFAS can be linked to health problems in the liver, kidneys, immune system, and nervous system and may also cause developmental and reproductive issues such as low birth weight, accelerated puberty, and skeletal changes. Research has also suggested links to cancer, thyroid disease, and endocrine disruption. Due to these impacts, both state and federal agencies have begun taking action to protect public health and the environment.

In June 2016, the EPA issued a non-enforceable interim health advisory level for the sum of PFOS and PFOA of 70 ppt, which was revised in June 2022, based on best available science and occurrence data, to 0.004 ppt and 0.02 ppt for PFOS and PFOA, respectively. Along with this revision, the EPA also issued final health advisories for hexafluoropropylene oxide dimer acid (HPFO-DA, commonly referred to as GenX Chemicals) of 10 ppt and for perfluorobutane sulfonic acid (PFBS) of 2,000 ppt. These interim health advisory levels were intended to remain in place until the EPA established a NPDWR. A draft NPDWR was issued in March 2023, and finalized by the EPA on April 10, 2024, establishing the first enforceable federal regulatory limits for PFAS ([Table 2-5](#)).

**Table 2-5 PFAS Regulatory Summary**

Chemical	Maximum Contaminant Level Goal (MCLG)*	Maximum Contaminant Level (MCL)
PFOA	0	4.0 ppt
PFOS	0	4.0 ppt
PFNA	10 ppt	10 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA (GenX chemicals)	10 ppt	10 ppt
Mixture of two or more: PFNA, PFHxS, HFPO-DA, and PFBS	Hazard Index of 1	Hazard Index of 1

**\*Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

The NPDWR establishes an individual MCL of 4.0 ppt for both PFOA and PFOS and an individual MCL of 10 ppt for PFNA, PFHxS, and HFPO-DA. Additionally, PFNA, PFHxS, HFPO-DA, and PFBS will be regulated as a mixture, with an MCL established at a Hazard Index of 1. The Hazard Index is a calculated value based on a combination of health-based ratios developed for each of the four PFAS, as follows:

$$\text{Hazard Index (HI) Value} = \frac{\text{PFNA}}{10} + \frac{\text{PFHxS}}{10} + \frac{\text{PFBS}}{2,000} + \frac{\text{HFPO-DA}}{10}$$

PWSs will be required to monitor for these PFAS and notify the public and take action to reduce PFAS concentrations if they exceed the proposed MCLs. Initial monitoring is required to be completed within three years following rule promulgation (between 2024 – 2027), and results will determine a system’s required initial compliance monitoring schedule for each individual entry point within the system. Depending on the size and type of water system, two or four samples collected at each entry point to the system over a one-year period is required for initial monitoring data.

As discussed, PWSs are required to collect sampling data for 29 PFAS (and lithium) under Unregulated Contaminant Monitoring Rule (UCMR) 5. Consistent with the goals of the PFAS Strategic Roadmap published by the EPA in 2021, which outlines their whole-of-agency approach to addressing PFAS, this monitoring data is used in conjunction with best available science as the EPA makes determinations regarding future PFAS regulatory actions. monitoring requirements. As part of the final NPDWR, UCMR 5 or state-level drinking water occurrence data can be used to satisfy initial monitoring requirements.

Beginning three years following rule promulgation (2027 – 2029), initial monitoring results are required to be included in a system’s CCRs, and regular compliance monitoring begins.

Compliance monitoring data will be required to be included in CCRs moving forward, and public notification for monitoring and testing violations will also be required. Beginning five years following rule promulgation (2029), systems will be required to comply with all MCLs and notify the public of any MCL violations.

Currently, the State of New Hampshire regulates four PFAS, with enforceable MCLs, as established by House Bill-1264 in July 2020:

- PFOA – 12 ppt
- PFOS – 15 ppt
- PFHxS – 18 ppt
- PFNA – 11 ppt

Now that the new federal NPDWR has been established, state-level regulations will be required to be at least as stringent as the federal MCLs moving forward.

In December 2023, as part of routine sampling, both the Porter Well and the General Sullivan Well sites were tested for Per- and polyfluoroalkyl substances (PFAS), the results of which can be seen in [Table 2-6](#) below reported in parts per trillion (ppt).

**Table 2-6 Recent PFAS Sampling Results**

	General Sullivan – 12/22/23	Porter – 12/15/23
Perfluorohexane Sulfonic Acid (PFHXS) - ppt	ND	1.84*
Perfluorononanoic Acid (PFOA) - ppt	ND	ND
Perfluorooctane Sulfonic Acid (PFOS) - ppt	<b>4.08</b>	1.07*
Perfluorooctanoic Acid (PFOA) – ppt	<b>6.39</b>	0.754*

\*Concentrations lower than 4 ppt are considered estimated values

**Potential PFAS Treatment Options**

PWSs may be able to reduce PFAS concentrations by discontinuing the use of contaminated wells or by blending water sources, if allowed. Conventional water treatment technologies are typically ineffective for removing PFAS. To date, the most common treatment methods for PFAS have been granular activated carbon (GAC) and ion exchange (IX). The EPA has also identified high-pressure membranes such as nanofiltration (NF) and reverse osmosis (RO) as effective technologies. Novel adsorbents, such as surface-modified clays, are another group of emerging technologies that are being piloted and considered for PFAS removal. When selecting a PFAS treatment option, is important for PWSs to understand the type of PFAS requiring removal (e.g., short-chain, long-chain, carboxylate, sulfonate), compatibility with any existing treatment processes, resulting waste stream characteristics, as well as more typical design considerations such as footprint and energy requirements.

RWSD should conduct an alternatives analysis to determine a cost-effective solution to comply with the PFAS regulations. Alternatives to consider include treatment options, interconnections with neighboring water systems, and additional source investigation. An exploration of interconnections with neighboring water systems is included in Section 4.

#### 2.5.4.8 Radionuclides Final Rule

The Radionuclides Final Rule was published on December 7, 2000, by the EPA, revising the existing regulation that was introduced in 1977. This revision of the rule introduced the regulation of uranium and maintained the existing MCLs for combined radium-226 and radium-228, gross alpha particle activity, man-made beta particles and photon emitters. In 2004, minor corrections were issued by the EPA identifying the detection limit for uranium.

CWSs of all sizes are expected to meet these MCLs. Initial monitoring consisted of four consecutive quarters of monitoring for gross alpha activity, combined radium-226/228, and uranium, with samples collected from the entry point to the distribution system. Initial monitoring for beta particle and photon radioactivity was not required of most PWS, only those that were considered vulnerable such as waters contaminated by effluents from nuclear facilities. All systems were required to complete initial monitoring of these contaminants by December 31, 2007, using EPA approved methods, which are specified in 40 CFR 141.25.

PWS are eligible for reduced monitoring if the initial monitoring results for each contaminant were below the detection limit, below half of the MCL, or greater than one-half the MCL but less than or equal to the MCL. The reduced sampling rates are one sample every nine years, one sample every six years, or one sample every three years respectively.

Table 2-7 describes the MCLs and best available treatment techniques for radionuclides in drinking water. RWSD is in compliance with this regulation.

**Table 2-7 MCLs For Radionuclides in Drinking Water (other than radon)**

Parameter	MCL and BAT
Gross Alpha (excluding radon and uranium)	15 pCi/L; RO
Beta Particle and Photon Emitters	4 mrem/year, IX and RO
Uranium	30 µg/L; IX, Lime Softening, RO, Enhanced Coagulation/Filtration
Combined Radium-226 and Radium-228	5 pCi/L; IX, Lime Softening, RO

#### 2.5.5 Unregulated Contaminant Monitoring rule

The 1996 SDWA Amendments created a new method of prioritizing new contaminants to be regulated. As a result, EPA promulgated the UCMR and Contaminant Candidate List (CCL), which were developed as coordinating processes. The UCMR process is used to generate occurrence data of selected contaminants from the CCL.

The regulatory determinations (RDs) are made based on the results of CCL/UCMR and the EPA's 6-year reviews. This section describes the regulatory process followed by the EPA and provides a view of the regulatory horizon.

### 2.5.5.1 Contaminant Candidate Lists

The CCL is used to define unregulated contaminants for which EPA needs to obtain occurrence data, develop analytical methods, ascertain potential health effects, and evaluate treatment techniques. Every five years the EPA is required to publish a CCL of currently unregulated contaminants in drinking water that may pose risks, and to make determinations on whether or not to regulate at least five contaminants on a five-year cycle, or 3½ years after each CCL is published, if EPA finds that such regulation would present a meaningful opportunity for health risk reduction. The CCL includes contaminants that are (1) not currently regulated by the NPDWR (2) are known or anticipated to occur at PWS, and (3) that may warrant regulation under the SDWA. The number of contaminants on the CCL lists are therefore much greater than those monitored under each UCMR.

The CCL process builds on evaluations used for previous CCLs and is based on substantial expert input and recommendations from the National Academy of Science’s National Research Council (NRC) and the National Drinking Water Advisory Council (NDWAC). EPA re-issues the CCL based on reviewed contaminants that had been targeted through existing prioritization processes, including previous UCMR contaminants and previous CCLs. Many contaminants may be carried over into succeeding CCLs. Additional contaminants are identified based on current research on occurrence and health effect risk factors. Contaminants are prioritized on the CCL according to whether they have analytical methods that are ready for use, have an analytical reference standard, or whether they are registered for use and are likely to be found in the US (in the case of certain pesticides).

EPA further prioritizes contaminants based on more extensive health effects evaluations by the Office of Water’s Office of Science and Technology.

The previous CCL, CCL5, was finalized in November 2022, and contained 69 chemicals or chemical groups and 12 microbiological contaminants which are known or anticipated to occur in PWS. The list included chemicals used in commerce, pesticides, biological toxins, DBPs, cyanotoxins, and waterborne pathogens. Cyanotoxins are naturally produced or released from naturally occurring cyanobacteria, a type of blue-green algae, which have been identified in some lakes and surface water bodies in New England. Contaminants from CCL5 were included in UCMR 5.

CCL 6 is currently under development. On February 17, 2023, the EPA requested nominations of chemicals, microbes, and other contaminants to be nominated by April 2023. The EPA is currently in the process of reviewing those nominations and will issue a draft CCL 6 for public comment.

### 2.5.5.2 Unregulated Contaminant Monitoring Rules (1-5) Summary

The UCMR process is used to generate occurrence data required by selected contaminants on the CCL. Once every five years the EPA issues a list of no more than 30 unregulated contaminants selected from the CCL for monitoring by PWS under the UCMR. There have been five UCMR rounds to date:

- UCMR 1 – published on September 17, 1999,
- UCMR 2 – published on January 4, 2007,
- UCMR 3 – published on May 2, 2012,
- UCMR 4 – published on December 20, 2016,
- UCMR 5 – published on December 27, 2021.

Data collected through the UCMR process is stored in the National Contaminant Occurrence Database (NCOD) and may be viewed by the public. The data is used to support analysis and review of contaminant occurrence, to guide the CCL selection process, and to support the Administrator's determination of whether to regulate a contaminant in the interest of protecting public health.

The SDWA was amended in 2018 with Section 2021 of America’s Water Infrastructure Act (AWIA). All CWSs and non-transient non-CWSs serving more than 3,300 persons (small/large systems) that use surface water, GWUDI of or groundwater systems are required to monitor for the full 30 contaminants. A representative sample of 800 randomly selected small SW and GWUDI systems (serving < 3,300 persons) must monitor for all 30 contaminants.

PWS are required to report contact information to the EPAs Safe Drinking Water Accession and Review System (SDWARS) and review or revise their sampling locations and monitoring schedule in SDWARS. Laboratory results must be posted to SDWARS withing 90 days of the sample collection date.

The SDWA was also amended by Section 7311 of the National Defense Authorization Act (NDAA) in 2020. The amendment specified that, “EPA shall include all PFAS in UCMR 5 for which a drinking water method has been validated, and that are not subject to a NPDWR.” (EPA)

UCMR 5 consists of 29 PFAS substances (within the scope of EPA Methods 533 and 537.1) and lithium. PWS are to monitor all 30 contaminants during a 12-consecutive month period from January 2023 through December 2025. The UCMR 5 contaminants are presented in [Table 2-8](#).

Because the District serves less than 3,300 persons, it is not required to participate in UCMR 5 as it is considered a small system. EPA will collect a national representative sample for this category of system.

**Table 2-8 Contaminants for UCMR 5**

Contaminant	Minimum Reporting Level	Analytical Methods
11-chloroeicosafuoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.005 µg/L	EPA Method 533
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	0.002 µg/L	EPA Method 533
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.003 µg/L	EPA Method 533
hexafluoropropylene oxide dimer acid (HFPO-DA)	0.005 µg/L	EPA Method 533
nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.02 µg/L	EPA Method 533
perfluorobutanoic acid (PFBA)	0.005 µg/L	EPA Method 533
perfluorobutanesulfonic acid (PFBS)	0.003 µg/L	EPA Method 533
1H,1H, 2H, 2H-perfluorodecane sulfonic acid (8:2FTS)	0.005 µg/L	EPA Method 533
perfluorodecanoic acid (PFDA)	0.003 µg/L	EPA Method 533
perfluorododecanoic acid (PFDoA)	0.003 µg/L	EPA Method 533
perfluoro(2-ethoxyethane)sulfonic acid (PFEEESA)	0.003 µg/L	EPA Method 533
perfluoroheptanesulfonic acid (PFHpS)	0.003 µg/L	EPA Method 533
perfluoroheptanoic acid (PFHpA)	0.003 µg/L	EPA Method 533
1H,1H, 2H, 2H-perfluorohexane sulfonic acid (4:2FTS)	0.003 µg/L	EPA Method 533

Contaminant	Minimum Reporting Level	Analytical Methods
perfluorohexanesulfonic acid (PFHxS)	0.003 µg/L	EPA Method 533
perfluorohexanoic acid (PFHxA)	0.003 µg/L	EPA Method 533
perfluoro-3-methoxypropanoic acid (PFMPA)	0.004 µg/L	EPA Method 533
perfluoro-4-methoxybutanoic acid (PFMBA)	0.003 µg/L	EPA Method 533
perfluorononanoic acid (PFNA)	0.004 µg/L	EPA Method 533
1H,1H, 2H, 2H-perfluorooctane sulfonic acid (6:2FTS)	0.005 µg/L	EPA Method 533
perfluorooctanesulfonic acid (PFOS)	0.004 µg/L	EPA Method 533
perfluorooctanoic acid (PFOA)	0.004 µg/L	EPA Method 533
perfluoropentanoic acid (PFPeA)	0.003 µg/L	EPA Method 533
perfluoropentanesulfonic acid (PFPeS)	0.004 µg/L	EPA Method 533
Perfluoroundecanoic acid (PFUnA)	0.002 µg/L	EPA Method 533
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.005 µg/L	EPA Method 537.1
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.006 µg/L	EPA Method 537.1
perfluorotetradecanoic acid (PFTA)	0.008 µg/L	EPA Method 537.1
perfluorotridecanoic acid (PFTrDA)	0.007 µg/L	EPA Method 537.1
Lithium	9 µg/L	EPA Method 200.7; SM 3120 B (2017); SM 3120 B-99 (1999); ASTM D1976-20

### 2.5.5.3 Regulatory Determination

The EPA evaluates the UCMR sampling results and compiles a “short list” of those contaminants with sufficient data to make a regulatory determination. A preliminary “determination” is published in the Federal Register for public comment. The EPA considers the following criteria when making a Regulatory Determination for a particular contaminant:

1. The contaminant may have adverse health effects,
2. The contaminant is known to occur or there is a substantial likelihood that the contaminant will occur in PWS with a frequency and at levels of concern,
3. In the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction through a national drinking water regulation.

#### Regulatory Determination 1

In June 2002, the EPA published preliminary determinations associated with nine contaminants from CCL 1 to the Federal Register. Based on comments received during the public comment period, the EPA announced (July 2003) that no regulatory action was appropriate for the following contaminants: acanthamoeba, aldrin, dieldrin, hexachlorobutadiene, manganese, metribuzin, naphthalene, sodium, and sulfate.

## **Regulatory Determination 2**

In May 2007, the EPA published preliminary determinations associated with 11 contaminants from CCL 2 to the Federal Register. Based on comments received during the public comment period, the EPA announced (July 2008) that no regulatory action was appropriate for the following contaminants: boron, dacthal mono-acid (MTP) degradate, dacthal di-acid (TPA) degradate, 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethylene (DDE), 1,3-Dichloropropene (Telone), 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, s-Ethyl propylthiocarbamate (EPTC), fonofos, terbacil, and 1,1,2,2-Tetrachloroethane.

Methyl-tertiary dibromoethylene (MTBE) and perchlorate were included on CCL 2, but regulatory determinations were not made for these contaminants in 2008. However, on February 11, 2011, an off-cycle Final RD was published in the Federal Register for perchlorate. This means that the EPA intended to propose a NPDWR for perchlorate, but more research was required. However, in July 2020 the EPA made a determination not to regulate perchlorate in drinking water citing “best available peer reviewed science” for their decision. Subsequently, EPA published a plan to address perchlorate contamination in March 2022. The plan includes the following items:

1. Continue ongoing cleanup activities at perchlorate contaminated sites.
2. Propose revisions to Resource Conservation and Recovery Act (RCRA) standards for the open burning and open detonation of waste explosives and bulk propellants to reduce impacts of perchlorate to human health and the environment.
3. Strengthening labeling requirements for hypochlorite solutions that include storage and handling information to minimize perchlorate formation.
4. Providing resources and recommendations for water systems to address perchlorate contamination.
5. Conduct Studies to Characterize Perchlorate Occurrence in Ambient Waters.
6. Develop a Web-Based Toolkit about Perchlorate.

MTBE was not regulated in 2008 because EPA's health risk assessment had not been finalized. To date, EPA has not regulated MTBE, but EPA Archives note that “there is little likelihood that MTBE in drinking water will cause adverse health effects at concentrations between 20 and 40 ppb or below.”

## **Regulatory Determination 3**

In October 2014, the EPA published preliminary determinations associated with five contaminants from CCL 3 to the Federal Register. Based on comments received during the public comment period, the EPA announced (January 2016) that no regulatory action was appropriate for the following contaminants: dimethoate, 1,3-dinitrobenzene, terbufos, and terbufos sulfone. At that time, the EPA chose to delay the final determination for strontium to “consider additional data and decide whether there is meaningful opportunity for health risk reduction by regulating strontium in drinking water.”

## **Regulatory Determination 4**

In February 2020, the EPA published preliminary determinations associated with eight contaminants from CCL 4 to the Federal Register. Based on comments received during the public comment period, the EPA announced (February 2021) that regulation is appropriate for PFOS and PFOA and no regulatory action was appropriate for the

following contaminants: 1,1-dichloroethane, acetochlor, methyl bromide (bromomethane), metolachlor, nitrobenzene, and RDX).

### 2.5.6 National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations (or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as color, taste, or odor) or even technical effects (such as corrosivity, scale, or sedimentation) in drinking water. The EPA recommends secondary contaminant standards to water systems but does not require systems to comply. However, individual states may choose to adopt them as enforceable standards.

Although secondary standards are considered as aesthetic issues that are non-compulsory to water systems, they can nevertheless be problematic. Some secondary contaminants are also regulated as MCLs when they occur at higher concentrations. For example, fluoride is listed with an MCL of 4.0 mg/L and a Secondary MCL (SMCL) of 2.0 mg/L. Copper is regulated under the LCR to an AL of 1.3 mg/L for health reasons, yet it is also included as an SMCL for aesthetic reasons. **Table 2-9** lists the EPA SMCLs.

A complete listing of the national secondary drinking water standards is published by the EPA on its website: <https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals>.

**Table 2-9 Secondary Drinking Water Regulations**

Contaminant	General Sullivan Well (mg/L)	Porter Wells (mg/L)	Secondary MCL (SMCL) (mg/L)	Noticeable Effects above the SMCL
Aluminum	N/A	N/A	0.05 to 0.2 mg/L	Colored Water
Chloride	2.9 mg/L	2.9 mg/L	250 mg/L	Salty Taste
Color	N/A	N/A	15 (color units)	Visible Tint
Copper	0.16 mg/L	0.16 mg/L	1.0 mg/L	Metallic Taste, Blue-Green Staining
Corrosivity	N/A	N/A	Non-corrosive	Metallic Taste, Corroded Pipes, Fixtures Staining
Fluoride	ND	ND	2.0 mg/L	Tooth Discoloration
Foaming Agents	N/A	N/A	0.5 mg/L	Frothy, Cloudy, Bitter Taste, Odor
Iron	0.054 mg/L	0.054 mg/L	0.3 mg/L	Rusty Color, Sediment, Metallic Taste, Reddish/Orange Staining
Manganese	0.0052 mg/L	0.0052 mg/L	0.05 mg/L	Black/Brown Color, Black Staining, Bitter Metallic Taste
Odor	N/A	N/A	3 threshold odor number (TON)	"Rotten-Egg", Musty/Chemical Smell
pH	6.64	6.64	6.5-8.5	Low Ph: Bitter Metallic Taste, Corrosion High Ph: Slippery Feel, Soda Taste, Deposits

Contaminant	General Sullivan Well (mg/L)	Porter Wells (mg/L)	Secondary MCL (SMCL) (mg/L)	Noticeable Effects above the SMCL
Silver	N/A	N/A	0.10 mg/L	Skin Discoloration, Graying of the White Part of the Eye
Sulfate	2.2 mg/	2.2 mg/	250 mg/L	Salty Taste
TDS	N/A	N/A	500 mg/L	Hardness, Deposits, Colored Water, Staining, Salty Taste
Zinc	ND	ND	5 mg/L	Metallic Taste

RWSD treated water sampling results indicate compliance with the Secondary Drinking Water Regulations and associated MCLs.

## 2.5.7 Regulatory Horizon

This section of the report serves to provide updates to policies and rules currently in development or that have the potential for development in the future by regulatory agencies such as EPA and NHDES.

### 2.5.7.1 Radon Rule

Radon-222 is a naturally occurring volatile gas which forms from the radioactive decay of uranium-238 in the ground. Radon is colorless, odorless, tasteless, chemically inert, and radioactive. Radon can move through air or dissolve into water. It commonly enters homes through basements and crawl spaces when gases escape the soil, or when water containing radon is used for cooking or cleaning and is released into the air of the house where it can be inhaled.

The Radon Rule was proposed on November 2, 1999, but never reached regulation. The rule was unique in that for the first time, the EPA sought to address a health risk caused by an air and water-borne contaminant with one rulemaking. The EPA originally proposed an MCL of 300 picocuries per liter (pCi/L) and an alternative MCL (AMCL) of 4,000 pCi/L for governments or utilities that have implemented a "multi-media mitigation (MMM) program" to lower indoor air radon from all sources. This means that treatment would not be required for supplies with radon levels between 300 and 4,000 pCi/L if the State were to develop and implement a MMM program. With or without a MMM program, sources with radon levels above 4,000 pCi/L would be required to provide treatment. The volatile nature of radon makes it easy to remove with exposure to the atmosphere, usually during aeration, which EPA has designated as the BAT for radon removal.

Despite the Radon Rule never reaching regulatory status, NHDES issued recommended health advisories for radon concentrations in private wells as follows:

- > 10,000 pCi/L – water treatment recommended along with indoor air mitigation.
- 2,000 – 10,000 pCi/L – water treatment recommended if indoor air concentrations exceed 4 pCi/L.
- < 4,000 pCi/L – no water treatment, retest air and water every 3-5 years.

The RWSD has no treatment obligations regarding radon as there are no Federal or State regulatory standards in place at this time. However, since this contaminant is common across New England, RWSD should continue to keep monitor for future regulatory developments as it may impact treatment requirements.

### 2.5.7.2 Manganese Rule

In July 2021, NHDES announced that they were in the process of developing a rule to enforce a maximum manganese concentration of 0.3 mg/L in drinking water. The proposed rule was based on, “the adoption of a 0.3 mg/L ambient groundwater quality standard (AGQS) pursuant to Env-Or 603.03(c), Table 600-1, that took effect on January 1, 2021.” The rule was anticipated to take effect by July 2022 and would include mandatory notification for any manganese concentrations above 0.1 mg/L as studies have shown developmental impacts for infants exposed to concentrations exceeding this value.

However, in January 2023 NHDES announced that the development of the Manganese Rule has been suspended indefinitely due to several policy and legal issues that arose following the adoption of the AGQS described above. Despite this announcement, NHDES encouraged water systems to “install and maintain treatment when manganese exceeds 0.3 mg/L and to notify the public of the health risks when manganese exceeds 0.1 mg/L.” NHDES also noted that funding opportunities will be available through the EPA over the next few years for the installation and treatment of manganese.

We recommend that RWSD continue to monitor developments on this rule in the future.

### 2.5.7.3 Other Horizon Issues

Below is a summary of the research that is continuing on other aspects of water treatment and may become the foundation upon which future regulation is based:

- EPA has released the results of a nationwide sampling in which certain new "high priority" DBPs have been identified as a product of alternative disinfectants including ozone, chlorine dioxide and chloramines. Alternative disinfectants have found favor with water systems because they minimize the concentration of the regulated DBPs (TTHM and HAA5) which are formed during chlorination. However, researchers have identified unregulated DBPs that are formed with alternative disinfectants in concentrations greater than the TTHM and HAA5 that would be created by conventional chlorination of the same water. RWSD should not be impacted by this regulation based on historic TTHM and HAA5 levels.
- In 2015, the CDC published the results of their most recent surveillance of waterborne disease outbreaks associated with drinking water. The report shows that in the 2013-2014 surveillance period, Legionella was responsible for 78% of the 23 outbreaks associated with drinking water and was responsible for 100% of the 25 resulting deaths. Legionella is currently regulated under the SWTR and Groundwater Rule. However, the EPA has included Legionella on CCL 5 citing that “these contaminants have limitations as a class under these rules, and therefore lack contaminant-specific monitoring and filtration or treatment requirements.” It is possible new Legionella regulations will be introduced to drinking water legislation in the future.
- In April 2015, the US Department of Health and Human Services changed its recommended level of fluoride in drinking water for the prevention of dental cavities to be set at 0.7 mg/L, at the lower end of the optimal range of 0.7-1.0 mg/L. In 2016, the EPA reviewed the current Fluoride MCL (4.0 mg/L) during the third 6-year NPDWR review and determined that a revision was not a priority at that time due to other higher priority rulemakings being pursued by the agency. The EPA noted that they would continue to monitor studies and new information as they are developed to determine if a revision to the current fluoride MCL is warranted in the future.

- Endocrine disruptors are a new family of contaminants under consideration for regulation in drinking water. These are man-made chemicals that act like hormones in the bodies of people, animals, and fish, which interfere with the natural development of fetuses, causing birth defects and health issues. The problem is caused by many classes of chemicals including pesticides, herbicides, pharmaceuticals, and personal health care products (PPCPs), and other compounds that find their way into both groundwater and surface water. These substances enter the water supply through human activity such as swimming, and through groundwater from disposal of these products in landfills, septic systems, and through waste discharges. PPCPs are any product used by individuals for personal health or cosmetic purposes or used by agribusiness to enhance growth or health of livestock. PPCPs include thousands of substances including prescription drugs, cosmetics, fragrances, lotions, and veterinary drugs.

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## Section 3 Level of Service

### 3.1 Introduction

A Level of Service Agreement (LOS) defines the way in which the utility owners, managers, and operators want the system to perform over the long term. Establishing the level of service in a utility is a critical first step in creating an asset management plan. The LOS can include any technical, managerial, or financial components the District wishes, as long as all regulatory requirements are met. The LOS will become a fundamental part of how the system is operated and how assets are replaced and renewed. The LOS is intended not only to be a tool for measuring the success and deficiencies of the system for individuals working for the utility, but also for conveying these metrics to customers.

For the Rollinsford system, a workshop was conducted to refine the existing level of service plan previously developed for the 2018 Asset Management Plan. A public survey was developed for customers to be able to provide feedback necessary for refining and creating LOS goals. Both District Commissioner's and water operators were involved with the creation of the survey. A public presentation was held to present survey results and to inform the public of how customer feedback would be incorporated into the District's new LOS. Once the LOS goals and objectives were defined, an asset management plan described later in this document was developed to meet this vision for the water system.

### 3.2 Level of Service Overview

There are two key facets to asset management; defining the LOS the system will strive to provide its customers over the long term and determining the most efficient and economical way to deliver that service. Therefore, determining and detailing the LOS that the system is going to provide is a key step in the overall process.

Recent updates to the NHDES Asset Management Handbook & Toolkit provide important building blocks to creating and maintaining a sustainable LOS. NHDES suggests using the acronym SMART(ER) when defining LOS goals.

- Specific – Definitive and capable of being understood.
- Measurable – Will the District be able to track progress towards the goal?
- Attainable – Is the utility able to achieve the goals being set?
- Relevant – Are specific goals in line with the vision of the District?
- Time Bound – Time frame for achieving goals
- Evaluate – Continually assess the reality of goals
- Re-Do – update or re-do goals in need of adjustment based on evaluation

The LOS Agreement, the document that will spell out the services the utility wishes to provide, is a multi-faceted tool that can be used to:

- Improve Customer Communication
- Determine critical assets
- Provide a means of assessing overall system performance
- Provide a direct link between costs and service
- Serve as an internal guide for system management and operations staff
- Provide information for system annual report or annual meeting presentations

### **3.2.1 Customer Communication**

It is important for a water utility to communicate with its customers to avoid confusion, bad feelings, accusations of improper operation, and to make clear what the customer's expectations should be. Effective communication aligns the utilities and customers' expectations on issues such as water quality, water rates, service responses and other issues related to how a water utility operates and is managed.

### **3.2.2 Determine Critical Assets**

The LOS can be one factor in determining critical assets. An example of how the LOS can impact criticality is where a system's LOS includes the factor "Minimize the time customers can expect to be without water." If the system has only one water source, the source will be a critical asset for the system. It must keep the source operational at all times in order to meet this criteria.

### **3.2.3 Provide a Means for Assessing Overall System Performance**

If at least some of the LOS factors include measurable items, the system can keep information regarding how well they are meeting these criteria and use the criteria as a benchmark in assessing the overall operation. For example, consider a system that includes the following measures in its LOS:

- Breaks will be repaired within 6 hours of initiation of repair 95% of the time.
- Customer complaints will be responded to within 24 hours, Monday through Friday.
- Losses will be kept to less than 15% as measured by gallons pumped each month – gallons sold each month.
- System will meet all state and federal regulations.

All of these items in this example are measurable if the system collects the appropriate data. Assume the system has the following data from its first year of operation.

- 25 breaks occurred, 23 were fixed in less than 6 hours
- 30 complaints were received, all 30 responded to within 24 hours
- Losses over the year as follows: January - 12%, February - 10%, March - 19%, April - 14%, May - 9%, June - 13%, July - 9%, August - 10%, September - 12%, October - 9%, November - 10%, December - 12%
- System met all regulations, no violations

Based on this data, the system met some, but not all of its LOS factors. The following items were met: The customer complaints were responded to on time and the system met all the state and federal regulations. The following items were not met: breaks were not repaired within 6 hours and the losses were not kept to less than 15% in all months. The system can look at these results and determine the items that it needs to work harder on in order to meet the LOS requirements.

It is important to note that data collected on LOS items must be consistently collected and recorded at given intervals (daily, weekly, monthly, or quarterly) to be able to assess and make changes in the system as necessary.

### **3.2.4 Provide a Direct Link between Costs and Service**

There is a direct link between the LOS provided and the cost to the customer. When a higher LOS is provided, the costs to the customers will likely increase. This relationship provides an opportunity for the water system to have an open dialogue with its customers regarding the LOS desired and the amount the customers are willing to pay for this LOS or increased services.

For example, customers may complain about the aesthetic condition of the water citing concerns such as taste, odor, or color. While such conditions do not pose a direct health concern, the customers may still request to have the contaminants removed. The water system can install treatment to remove these contaminants, but it will cost each customer more for their water each month. The water system can have a dialogue with the customers to explain what the treatment would entail, what the finished water quality would be, and how much it would cost the customers. Following the discussions, the customers could decide whether or not they were willing to pay for the additional treatment. In this way, the LOS sets desired services and provides information to the customers regarding what the costs of their LOS will be.

### **3.2.5 Serve as an Internal Guide to System Operation and Management**

It is much easier to operate or manage a system when the operations and maintenance staff as well as the management staff understand the goals of the operation. Defining the LOS sets these goals for the system. These goals ensure the operations staff have a better understanding of what is desired from them, and the management has a better understanding of how to use staff and other resources more efficiently and effectively. Checking how well the system is meeting LOS also allows the management to shift resources, if need be, from one task to another to meet all the goals more effectively.

### **3.2.6 Provide Information for Annual Report or Meeting**

If the system tracks information regarding how well it is meeting the LOS criteria on a weekly or monthly basis, it can use this information to prepare an annual report regarding how well the system met these criteria over the course of a year. This information can be presented to the Board of Selectmen or customers at an annual meeting so that customers are aware of how well the system met the overall goals for the operations of the system.

This meeting would also be an opportunity to discuss any changes needed in the LOS, based on the operations data. Perhaps some of the LOS conditions are not possible to be met given the current staff or resources. If that is the case, the system will either have to reduce the LOS provided or increase staff or other resources in order to meet the current LOS. The decision to increase staff or other resources or decrease LOS will directly impact customers, so it is important to use the opportunity of the annual meeting to discuss the potential options with them.

Alternatively, the system may decide that some criteria are very easily met and may not be stringent enough. The system may find that it can increase the LOS for particular criteria without impacting costs and may wish to discuss the changes with the customers at the annual meeting.

## **3.3 Level of Service Goals**

LOS goals are a combination of both external and internal set goals. Goals have been separated into these categories to be easily communicated to the public.

Generally external goals relate to keeping the public informed. These goals are easy for the public to understand and encourage conversation between the District and its customers. When setting external goals, it is recommended to involve customers in the decision-making process.

Internal LOS goals relate to defining the operations of a utility that are not easily understood by the public. These goals generally involve key performance indicators that are more granular and process specific, created from professional standards, and technical experience.

The proposed internal and external LOS goals can be organized into the following categories:

- Customer Service
- Operations and Maintenance
- Regulatory Compliance
- Business
- Workplace Environment

### 3.3.1 Customer Service Goals

Customer service goals are generally always external goals as these goals focus on communication.

#### 3.3.1.1 External Goals:

1. **Respond to a customer by within 48 business hours of receiving business related inquiry** – The District has set a goal of 100% compliance for responding within 48 hours to business related inquiries. This goal will be measured annually by reviewing work records. Compliance with this goal will increase customer satisfaction.
2. **Respond to a customer within 48 business hours of receiving field inquires/service requests** – The District has set a goal of 100% compliance for responding within 48 hours to service requests/field related inquiries. This goal will be measured annually by reviewing work records. Compliance with this goal will increase customer satisfaction.
3. **Address water billing complaints within same business day** – This is an ambitious goal for the District, but important as the public survey identified billing inaccuracies as a point of concern. This goal will be tracked quarterly after billing is sent to customers.
4. **Contact affected customers 48 hours prior to a scheduled water main shutdown** – Set to a target of greater than 100% compliance. This goal is measured annually through work records. Compliance with this goal reduces customer complaints and increases customer satisfaction.
5. **Conduct public survey biennially** – This is a District driven goal that will be measured every other year to gain a better understanding of the public’s perception of drinking water. The District will track survey data over time to better meet the needs of customers.

### 3.3.2 Operations Goals

Operations goals are a combination of internal and external objectives. Compliance with drinking water standards and inspection of visible system components are easily comprehended by District customers.

#### 3.3.2.1 External Goals

1. **Compliance with Safe Drinking Water Act (SDWA) rules and regulations** – Set to a target goal of 100% compliance. This goal is driven by the United States Environmental Protection Agency (USEPA) SDWA and will be measured using annual compliance reports. This goal is important because its compliance is federally mandated to ensure safe public drinking water supplies nationwide.
2. **Compliance with USEPA secondary drinking water standards** – Set to a target goal of 100% compliance. The goal is driven by the USEPA SDWA and will be measured using samples taken annually. This goal is important because, although compliance is not mandatory due to secondary drinking water standards being comprised of non-life-threatening water qualities, it does measure aesthetic qualities such as taste and odor. Customers value such aesthetic qualities and compliance.
3. **Compliance with NHDES Regulations** – Set to a target goal of 100% compliance. This goal is driven by NHDES policy and will be measured in NHDES sanitary surveys.

4. **LCRR/I Water Service Asset Inventory Update** – Set to a target goal of 100% compliance. This goal is driven by the USEPA Lead and Copper Rule Revision (LCRR) and Lead and Copper Rule Improvement (LCRI) and will be measured annually by GIS updates. This goal is important because its compliance is federally mandated to ensure safe public drinking water supplies nationwide.
5. **Inspect and maintain all hydrants in the distribution system** – This goal is driven by American Water Works Association (AWWA) G200/M-17 and is set to a target goal of flushing biannually. This goal will be measured annually using work order records. Compliance with this goal helps to improve hydrant life and distribution system function as well as contribute to a high ISO rating in the District. The District will utilize its unidirectional flushing program for every flushing cycle.
6. **Inspect and maintain all valves in the distribution system** – This goal is driven by AWWA G200/M-17 and is set to a target goal of inspecting critical valves once a year and non-critical every other year. This goal will be measured annually using work order records. Compliance with this goal helps to improve valve life and distribution system function.
7. **Maintain a normal working system pressure of 35 psi, and a minimum pressure of 20 psi under all flows** - This goal is driven by NHDES and is set at a target goal of a normal working system pressure of 35 psi, and a minimum pressure of 20 psi under all flows. It will be measured annually through field pressure measurements.
8. **Maintain an unaccounted-for water value of less than 15%** - This goal is driven by NHDES and is set at a target goal of unaccounted-for water values of less than 15%. This goal will help the water system appropriately account for water used and ensure revenue is not lost through main leakage or underreporting meters. It will be measured annually using an internal water audit spreadsheet.
9. **No adverse event, unless related to electrical failure or severe weather condition, will cause customers to be without water** - This goal is self-imposed and set to a target of 100% compliance. This goal is measured annually through work records. Compliance with this goal satisfies DES policy and will increase customer satisfaction.

### 3.3.2.2 Internal Goals

1. **Maintain compliance with water conservation plan (WCP)** – This goal is set to a target of 100% compliance and is driven by the NHDES. This goal will be measured through annual water audits.
2. **Maintain a LOS where there is less than 1 break per 25 miles of distribution water main** – This goal is self-imposed and set to less than one incidences annually for the water distribution main. This goal will be measured annually using work order records. This goal is important because excessive breaks may indicate an area of distribution main where an underlying problem is present. Breaks in distribution mains are also costly to repair in terms of time, labor, parts, and an inconvenience to customers.
3. **Maintain a full inventory of distribution system parts required for emergency repair** – Set to a target of 100% compliance. Inventory shall be monitored and recorded annually. This goal is driven by the NHDES. Work order records and purchase order invoices will be used to track changes in inventory. This goal is important because compliance will avoid intervention by the NHDES, minimize service disruptions to customers and businesses, and reduce response time for repairs.
4. **Maintain water system facilities power and communications capacity** – Set to a target of greater than 100% compliance and is driven by the NHDES. This will be measured annually using the District’s supervisory control and data acquisitions (SCADA) system. Compliance with this goal is required by the NHDES and helps ensure that the water infrastructure will be operational during an emergency.
5. **Maintain infrastructure that allows for fire flows that exceed ISO needed fire flows in the community** - Set to a target of 100% compliance. This goal is driven by ISO insurance ratings measured biennially by performing

flow tests. Compliance with this goal is important for ensuring that adequate flows are available in case of a fire and is required to maintain a good insurance rating.

6. **Eliminate unprotected cross connections** – This goal is driven by NHDES and has been set for a target goal of 0 cross connections. This goal will be measured annually using work order records. Compliance with this goal will avoid intervention by the NHDES as well as ensure the quality and safety of the potable water supply.
7. **Meet compliance with backflow inspections** – This goal set at 100% compliance, is driven by NHDES, and is measured annually by percent complete. The District aims to inspect 50% of its devices annually, rotating inspections so every device is inspected biennially.

### 3.3.3 Business Goals

Business can be a combination of external and internal goals. RWSD has set external goals at this time.

#### 3.3.3.1 External Goals

1. **Rates will be reviewed on annual basis and raised as needed to ensure full cost recovery** - This is a self-imposed goal which ensures the viability of the water system infrastructure and water rates. This goal will be measured annually by way of a budget review. Meeting this goal avoids complaints from customers due to sharp, unexpected rate increases some years and relatively low rate increases other years.

### 3.3.4 Workplace Environment Goals

1. **Maintain a safety committee and deliver service in the safest possible manner** – This goal is driven by Department of Labor (DOL) and OSHA regulations. The target for this goal has been set at 0 accidents per year as measured by accident reports. Compliance with this goal not only helps meet DOL and OSHA standards but should also always be the number one priority of any workplace.
2. **Treatment system operator training level** – This goal is driven by State Regulations and has been set at 75% of the treatment system operators being Grade 1 or better. This goal will be measured annually using certification records. Compliance with this goal is required by the state and helps increase the depth of knowledge among treatment operators.
3. **Distribution system operator training level** – This goal is driven by State Regulations and has been set at 100% of the distribution system operators being Grade 2 or better. This goal will be measured annually using certification records. Compliance with this goal is required by the state and helps increase the depth of knowledge among distribution operators.

## 3.4 Level of Service Agreement

The LOS goals described above provides the basis for the proposed updated RWSD LOS agreement. This agreement defines the way in which the water commissioners, managers, operators, and customers want the system to perform over the long term and by what means this performance is measured. The LOS agreement is consolidated [Tables 3-1](#) and [3-2](#) below.

### **3.5 Recommendations**

The RWSD should review and report on the Level of Service Agreement annually to evaluate its effectiveness for delineating the necessary effort required by the RWSD to provide clean safe drinking water to the public in the most efficient, economical, and sustainable way. By continuing to send out the survey created as part of this effort, the District will be able to track its progress in meeting customers' expectations. This is a very useful data set most other public drinking water utilities are not yet tracking. The Level of Service Agreement in its entirety, or in excerpts, is an excellent tool to communicate how the District is operating and how well the community is being served.

If the RWSD finds that an alternative method for measurement better fits a level of service goal or a level of service goal target should be modified. Changes to the document should be recommended to the Board and discussed annually.

Table 3-1 External Level of Service Agreement

Asset Category	Specific Objective	Measure	Units	2024 Goal	2024 Attainment	Corrective Measures/Comments
Customer Service	Respond to customer within 48 business day hours of receiving business related inquiry	Quarterly Complaint Log Review	hours/call	100%		
	Respond to customer within 48 business hours of receiving field inquires/service requests	Quarterly Complaint Log Review	hours/call	100%		
	Address water billing complaints within same business day	Quarterly Complaint Log Review	hours/call	100%		
	Contact affected customers 48 hours prior to a scheduled water main shutdown	Work Records	% customers called before shutdown	100%		
	Conduct Public Survey every 2 years	Survey Results	Survey Completed	100%		
Operations	Compliance with Safe Drinking Water Rules and regulations	Compliance Reports	Violations	100% Compliance		
	Compliance with USEPA Secondary Drinking Water Standards	Water Sampling	Violations	100% Compliance		
	Compliance with NHDES Regulations	Sanitary Survey	Violations	100% Compliance		
	LCRR/I Water Service Asset Inventory Update	Annual Update	GIS Update	100% Compliance		
	Inspect and maintain all hydrants in the distribution system	Hydrants inspected/maintained	# of hydrants inspected/maintained	Unidirectional flushing biannually		
	Inspect and maintain all valves in the distribution system	Valves inspected/ maintained	# of valves inspected/ maintained	critical valves once a year, non-critical every other year		
	Maintain a normal working system pressure of 35 psi, and a minimum pressure of 20 psi under all flows	Monthly Pressure Reading Review	Normal Working Pressure, Minimum Pressure	100%		
	Unaccounted for Water Losses shall be less than 15%	Compare master meter with billing record	% Difference	<15%		
Business	No adverse event, unless related to electrical failure or severe weather condition, will cause customers to be without water	Yearly Work Record Review	% Compliance	100%		
	Review Rates Annually	Rate Review	% Reviewed	100%		

Table 3-2 Internal Level of Service Agreement

Asset Category	Specific Objective	Measure	Units	2024 Goal	2024 Attainment	Corrective Measures/Comments
Operations	Maintain compliance with WCP - Water audit annually	Compliance Reports	Violations	100% Compliance		
	Maintain a level of service where there are less than 1 break per 25 miles of distribution water main	Breaks/Mile	# Of Breaks/Mile	<1 / year		
	Maintain a full inventory of distribution system parts required for emergency repair	Work Records / Purchase Order Invoices	Each	100% Required Parts		
	Maintain water system facilities power and communications capacity	Work Records	% Compliance	100%		
	Maintain infrastructure that allows for fire flows that exceed ISO needed fire flows in the community	Biennial Flow Testing	Gallons Per Minute	100% Compliance		
	Eliminate unprotected cross connections	Cross Connection Inspections	# Of Cross Connections	0		
	Meet compliance with backflow inspections	Inspection Reports	% Of Inspections Completed/Year	50%		
Workplace Environment	Maintain a safety committee and deliver service in the safest possible manner	Accident Reports	yes / no	0		
	Treatment operator training level	Staff w/ Required Training	% of Staff with Grade I Level Training	75%		
	Distribution operator training level	Staff w/ Required Training	% of Staff with Grade II Level Training	100%		

# 4

## Section 4 Distribution System Evaluation

### 4.1 Distribution System Evaluation

The purpose of the distribution system evaluation is to assess the hydraulic adequacy of the Rollinsford Water and Sewer District's (District) water system and infrastructure and its ability to satisfy both existing and projected demand conditions. The scope of the evaluation will be focused on the following:

- Maximum and minimum system pressures
- Adequate fire flows
- Reliable pipe looping
- Reliability, redundancy and criticality
- Pipe velocities
- Water age

Water systems are analyzed, planned and designed primarily through the application of basic hydraulic principles. A computer hydraulic model was developed and used as the hydraulic tool to assess the condition and hydraulics of current infrastructure under existing and projected demands and to guide future improvement recommendations. The evaluation was based on compliance with State of New Hampshire code requirements and standard water works engineering practice. Alternatives and recommendations are presented at the end of this section.

### 4.2 Distribution System Hydraulic Model Update

One of the primary goals of this study was to provide an updated analysis of the District's water distribution system using the hydraulic computer model that was developed as part of the previous asset management plan.

WaterGems, a hydraulic modeling platform developed by Bentley Systems, was used for the analysis. Existing water system data incorporated into the model includes pipe diameter, pipe geometry, pipe roughness as C-value, ground elevation at pipe intersections, hydraulic grade line elevations, pump data, and total system demand. As part of this analysis, the model was updated with all distribution piping changes implemented by the District since the previous Asset Management Plan.

The hydraulic model was calibrated in 2019 and was used to evaluate the adequacy of the system under existing and future demands and various stress conditions by assessing a variety of operating criteria such as pressures, hydraulic grade line, available fire flows, and velocities and head losses within each pipe. Where deficiencies were identified, improvements were simulated to assess the benefit of the proposed improvement.

#### 4.2.1 Distribution System Mapping

Prior to developing the hydraulic model, RWSD reviewed the existing mapping to verify and validate pipe diameters and material. It is critical that actual details of the piping network be clearly understood in order to validate the necessity of improvements. As more accurate data is identified, and when updates to the system are made, the model network and Geographic Information Systems (GIS) database should be updated as well.

The model represents pipes as lines, and pipe intersections are represented as nodes. Each pipe is assigned specific physical information including diameter, length between nodes, material of construction and C-value. Nodes are assigned elevation and demands. Supply sources and storage facilities are represented as pipes connected to a single node.

### 4.2.2 Water System Demand

To develop the demand to be used in the hydraulic model, the 2022 Well Production Reports for both General Sullivan Well and Porter Well were used. Based off these reports, the 2022 Average Day Demand (ADD) was observed to be 0.09 MGD and the Maximum Day Demand (MDD) was observed to be 0.23 MGD.

Additionally, no known commercial or residential developments are anticipated to be constructed within the service territory within the planning period. With no new significant source of commercial, residential, or industrial demand, this analysis assumes that projected demands will not exceed the current demand during the planning period. If significant development occurs and demand projections change this should be revisited.

### 4.2.3 Fire Flow Field Testing Program

Fire flow testing was previously performed to gather actual system data used to calibrate the hydraulic computer model. In addition, the fire flow testing provides an estimate of the flow rate available for fire protection at specific locations within the system and provides a direct indication of the relative strengths and weaknesses of the system in the vicinity of the test.

Fire flow tests were performed by Wright-Pierce and RWSD personnel on April 29, 2019. The results of these tests are summarized in [Table 4-1](#). The two Porter site wells and treatment plant pumps were shut down during the flow testing to ensure consistent boundary conditions during the flow testing. Operating conditions for the Sullivan Well and the tank were obtained from the RWSD for the duration of the field testing. The locations of the tests are presented in [Figure 4-1](#).

Test locations were selected based on system hydraulics, zoning, and prior locations tested. Fire flow test locations were performed to provide data in order to calibrate the hydraulic model, fill in data gaps, or to test known weak points in the distribution system. Insurance Service Office (ISO) is an insurance organization responsible for evaluating and classifying communities for insurance rating purposes. It is our understanding that an ISO test may have been performed in the District in the past, but the exact hydrants used by ISO were not known and, therefore, the resulting data collected as part of this study may not coincide exactly with prior ISO data. Further details on the role of the ISO as it pertains to a community's water system are discussed later in this Section.

A typical fire flow test utilizes a minimum of two and in some cases, three or more hydrants. One hydrant is used to monitor pressure while one or more hydrants are used and monitored for flow. The purpose of the test is to stress the system by simulating an actual fire flow condition in order to measure the drop in pressure at a specific hydrant flow rate.

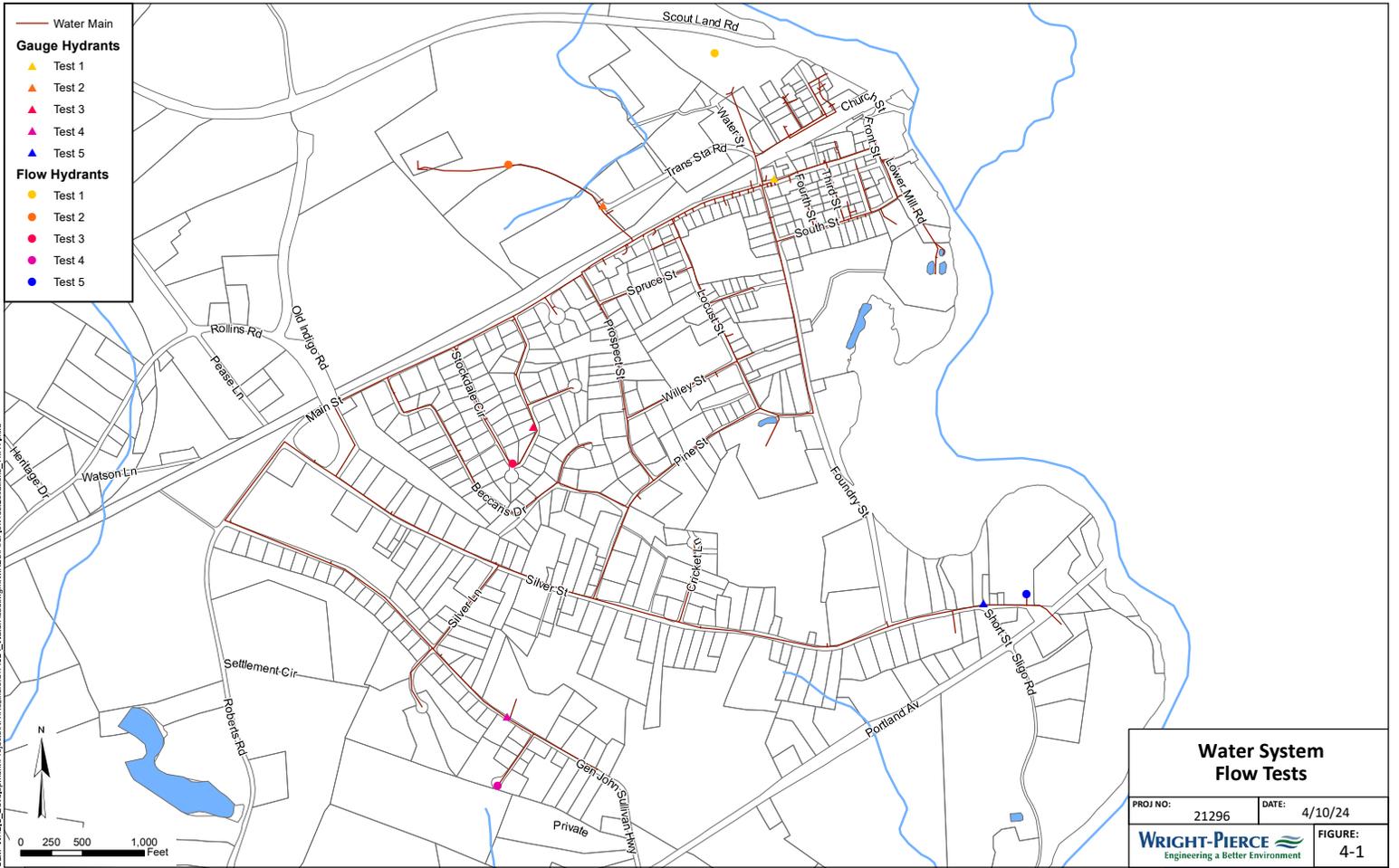
Static pressure is measured prior to conducting the test and represents the system pressure at the test location. Once a hydrant is opened, residual pressure is measured at a gauge hydrant and flow is measured from the flowing hydrant. The result represents the system pressure at a measured discharge rate. The goal is to obtain a pressure drop of at least 10 psi (the greater the pressure drop, the higher the level of the accuracy). Where a drop cannot be attained through one hydrant, two or more may be flowed.

Table 4-1 Wright-Pierce Fire Flow Test Locations April 2019

Test No.	Location	Gauge Hydrant		Flow Hydrant						Boundary Conditions				
		Static (psi)	Residual (psi)	Location	Static (psi)	Adjusted Residual (psi)	Pitot Reading (psi)	Field Flow (gpm)	Flow (gpm) 20 psi	0.75 MG Tank Level (ft)	HGL (ft)	Porter Well 1 Flow (gpm)	Porter Well 2 Flow (gpm)	Sullivan Well Flow (gpm)
1	Wentworth Street	37	0	End of Wentworth Street	45	8	10	531	429	47.0	226.0	0.0	0.0	80.0
2	Transfer Station Road	50	50	TS Road	50	50	48	1,163	-	47.0	226.0	0.0	0.0	80.0
3	Stockdale Circle	48	45	Stockdale Circle	49	46	37	1,021	3,475	47.0	226.0	0.0	0.0	80.0
4	Gen John Sullivan Highway	52	44	Gen John Sullivan Highway	55	47	30	919	2,039	47.0	226.0	0.0	0.0	80.0
5	Silver Street	64	40	Silver Street	50	26	22	787	888	47.0	226.0	0.0	0.0	80.0

Tank Base Elevation = 179 feet

Water Demand used for Calibration = 120,000 GPD



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<b>Water System Flow Tests</b>	
PROJ NO: 21296	DATE: 4/10/24
 <b>WRIGHT-PIERCE</b> Engineering a Better Environment	
FIGURE: 4-1	

The test results were used to calculate the available flow rate at the test location while maintaining a residual system pressure of 20 psi. The "Recommended Standards for Water Works", also known as the "Ten States Standards" specifies that water systems should be "designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow". Maintaining a minimum residual pressure assures uninterrupted service to customers, protects the system from possible vacuum conditions, which could damage infrastructure or contaminate the system water, and provides adequate suction pressure for firefighting pump equipment.

The fire flow testing program results will be difficult to compare to ISO test results unless boundary conditions were recorded during the ISO testing program. In addition, modeling allows a specific available flow at a given location to be limited by low pressures elsewhere in the distribution system, not just at the residual hydrant where pressure is measured during a test.

No additional fire flow testing was conducted as part of this update.

### 4.2.4 C-Value Determination

The Hazen-Williams C-value is a relative measure of the hydraulic capacity of a water main. New pipe C-values are established by the piping and engineering industry. However, the C-value of existing pipe must be estimated (see below for discussion of field testing for C-value). Pipes having a C-value less than that for new pipe of the same diameter have less carrying capacity than the new pipe. For example, a 12-inch pipe having a C-value of 50 will transmit half the water, with the same pressure drop, as a 12-inch pipe of the same length with a C-value of 100.

The C-values of some pipe materials such as cement and bituminous lined ductile iron (DI) pipes and asbestos cement (AC) pipe generally change very little from when they were originally placed into service. Other materials such as unlined cast iron (CI), however, may change significantly over time. The piping materials are not completely known in the District's distribution system, but are believed to include unlined CI, lined CI, cement lined DI, and AC.

Typically, unlined cast iron water mains are the most problematic for water utilities, because cast iron is relatively brittle and being an unprotected ferrous metal, tend to develop corrosion deposits on the interior surface of the pipe after years of service. These deposits are called tubercles. Tubercles have two detrimental effects on the flow carrying capacity: (1) they reduce the inside diameter of the pipe and, (2) they result in increased frictional head losses. For that matter, any obstruction, such as a partially closed valve will reduce the carrying capacity of the pipe. Corrosion tubercles are more prevalent in unlined mains with low flow velocities. This explains why older unlined piping has relatively low C-values. Typical C-values for new pipes are 120 for cement lined ductile iron pipe and 140 for PVC or HDPE pipe.

C-values for existing pipe can be estimated in the field by selecting a straight section of pipe that contains a minimum of at least three fire hydrants in series (one flow and two residual hydrants). Once the test location has been selected, the test pipe segment is isolated by closing branch lines, and the flow and differential pressure are measured and recorded at the hydrants. Additional information, such as the diameter and length of the test pipe segment between the gauge hydrants is determined from existing records and mapping.

Pipe roughness is then calculated by using the Hazen-Williams equation:

$$C = \frac{3.54Q}{D^{2.63} \left(\frac{h}{L}\right)^{0.54}} \quad \text{where,}$$

C = Hazen-Williams C-factor

Q = Flow in gallons per minute

D = Pipe diameter in inches

h = Head loss in feet

L = Length of test section in feet

#### 4.2.5 Model Calibration

Calibration involves simulating each field fire flow test and making adjustments or corrections to the C-values of pipes, so that the model closely approximates the data collected in the field. The interior roughness of pipes can and does change over time and, therefore, the C-value is the primary variable which is adjusted during calibration. Physical characteristics such as pipe diameter, length, age, and material type are fixed and, therefore, cannot be manipulated.

Initially, average-day demand was simulated to validate static pressures against those measured during the fire flow test program. This is done to calibrate the ground surface elevations at the test locations. Next, each fire flow was simulated and C-values were adjusted until the model results replicated the field results within 5% or less. For the majority of the fire flow simulations, the model closely replicated actual field conditions ([Table 4-2](#)).

The accuracy of the estimates of total system demand and the apportionment to the nodes is not critical during calibration because demands are distributed so widely throughout the system. The low system demands result in minimal pipe flow velocities and virtually static conditions. For this reason, fire flow, which stresses the system at a single location, tends to govern the hydraulic requirements of the system.

The calibration performed as part of the 2019 Asset Management report was used in this analysis, as the District's Distribution System has not undergone any significant changes to its configuration or operation. The model was updated to reflect any piping projects that have occurred since 2019, and the new pipes were given a C-Value of 120 for cement lined ductile iron pipe and 140 for PVC or HDPE pipe.

**Table 4-2 Calibration**

Test No.	Location	Field Results <sup>1</sup>			Model Results	
		Static Gage Hyd. (psi)	Residual Gage Hyd. (psi)	Observed Flow (gpm)	Static Gage Hyd. (psi)	Residual Gage Hyd. (psi)
1	WWTP Wentworth St <sup>2</sup>	37	0	531	37	30
2	Transfer Station Road	50	50	1,163	50	49
3	Stockdale Circle	48	45	1,021	48	43
4	General John Sullivan Highway	52	44	919	52	41
5	Silver Street	64	40	787	64	40

<sup>1</sup>Field Conditions during testing were replicated in model during calibration. Model assumed Porter site wells and treatment plant pumps were offline, Sullivan Well was operating at 80 gpm and a Tank Water Elevation of 226 ft.

<sup>2</sup>Partially closed valve on Wentworth Street is assumed to be the cause of the results of the field testing.

### 4.3 Water System Evaluation

The approach used to evaluate the District's distribution system was first to establish the existing and projected hydraulic requirements of the system. The second approach was to evaluate the adequacy and limitations of the system under the existing and projected demand conditions. The system was evaluated against a number of key operating and engineering principles and industry standards. These include:

- System pressure
- Velocity of water in the pipelines
- Headloss
- Pipe looping
- Piping redundancy, reliability and adequacy
- Fire flow
- Water age

Several stress conditions were simulated in order to evaluate the adequacy of the system under existing and projected demand conditions. Stress conditions used for this analysis include:

#### Peak Hour on Maximum Day in the year 2030

Under peak-hour conditions, a water system is considered adequate if a minimum pressure of 35 psi can be provided at ground level to the entire service area. Where it can be provided, we recommend that systems be designed to provide 35 psi to the second story of a building (i.e., 15 feet above ground elevation). We recognize that this is not always practical or possible. For the purposes of this study, our evaluation will consider pressure at ground level.

### Maximum Day in the year 2040 Plus Fire Flow Requirements

Under maximum-day plus fire flow demand conditions, a system must be capable of providing the needed fire flow during maximum-day demands, while maintaining a minimum residual pressure of 20 psi coincidental throughout the distribution system.

Each of these conditions is evaluated under varying demands, and where the system does not meet the criteria set forth, alternative improvements are modeled, and recommendations are made based on the hydraulic and cost-effectiveness of the improvements.

#### 4.3.1 Water System Pressure

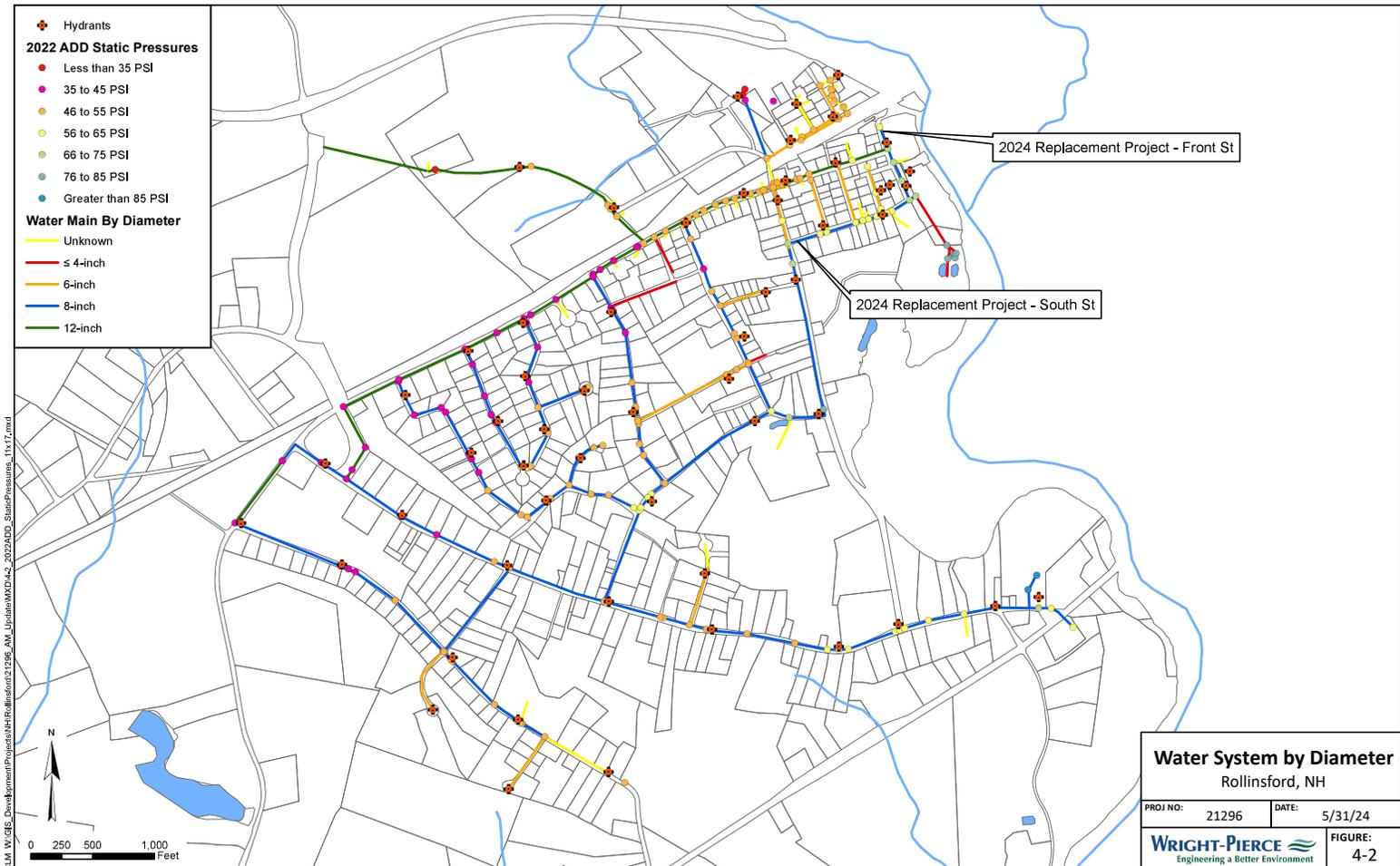
A water system should be designed to accommodate a range of pressures within minimum and maximum guidelines. Low system pressures result in customer complaints, may affect the accuracy of meters, and restrict available flows for firefighting. Higher pressures can contribute to increased water loss from leakage, can increase maintenance on equipment, lead to higher energy costs, and tend to increase consumption.

Variations in customer demand, changes in elevation and proximity to pumping facilities and sources of supply will affect water pressure. In general, when customer demands increase, pressure will decrease. Areas with higher elevations typically have lower pressures.

Standard water works practice and NHDES standards require that municipal water systems be designed with a normal operating pressure range of 60-80 psi and no less than 35 psi at all locations in the distribution system. Pressures throughout the system during fire flow events should be maintained above 20 psi at all locations. Where pressures exceed 80 psi, pressure reducing valves should be considered on service connections at the service meter horn. [Table 4-3](#) presents an overview of areas where pressures were found to be below 35 psi. [Figure 4-2](#) presents pressures across the system under average day demands.

Pressures throughout Rollinsford are generally adequate. Pressures were observed during modeling three conditions: average day conditions, maximum day conditions, and peak hour conditions. One area was found to have pressures below 35 psi under Average Day Demand (ADD) and Maximum Day Demand (MDD). This area is near the base of the tank on Jessie Doe Road, where ground elevations are highest in the system and is unlikely to affect service to customers within the Rollinsford service territory. The observed pressures were 20 psi in all three modeling scenarios.

Under projected ADD conditions pressures between 80 psi and 83 psi were observed at the intersection of Locust and Foundry Street and at the end of Lower Mill Road. Additionally, pressures above 90 psi were observed off Silver Street at the new development on Scarlett Lane. No action is recommended for high pressure locations.



**Water System by Diameter**  
Rollinsford, NH

PROJ NO:	21296	DATE:	5/31/24
		FIGURE:	4-2
<small>Engineering a Better Environment</small>			

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**Table 4-3 Low Pressure Areas of Distribution System**

Scenario	(< 35 psi)
Average Day	Top of Bunker Street Prospect St Pearl Lane Mount Vernon Street Upper Charles Street North Main Street near tank Jessie Doe Road at Tank
Max Day	Top of Bunker Street Pearl Lane Mount Vernon Street Upper Charles Street North Main Street near tank Prospect St Jessie Doe Road at Tank

### 4.3.2 Pipe Velocities and Head Loss

Optimally, pipe velocities should be maintained below 2 feet per second (fps) to prevent resuspension of accumulated sediments in the pipeline, which can cause aesthetic problems. Velocities of 2 - 5 feet per second (fps) are accepted during stressed circumstances such as a fire condition. Velocities greater than 5 fps contribute to increased head loss which in turn requires pumps to work harder and results in higher energy costs. Higher velocities can also scour the interior of the pipe, reducing its useful life.

All of the pipes in the system were found to have velocities 2 fps or less when evaluated under projected MDD conditions.

### 4.3.3 Dead-End Mains and Pipe Looping

Dead-end mains in a water system present a number of operational issues because water velocities in these pipes tend to be very low. This condition can cause sediment build-up and contribute to poor water quality. In winter months, pipes having low velocities can be prone to freezing. Generally, the only way to improve this condition is to regularly flush the ends of these pipes, add bleeders or loop the pipe into another location in the distribution system.

Flushing is labor intensive and, if not done on a regular basis, will have little effect in improving conditions. Bleeders can be effective in improving water quality and help prevent freezing, but this method increases unbilled water and electrical pumping costs. RWSD currently has no active bleeds in the system. Looping requires capital investment in new piping and, in some cases, it may not be practical to loop pipes because of physical or environmental impediments or simply the cost of investment exceeds the benefit.

The RWSD distribution system is generally well looped, although there are numerous dead-end mains spread throughout the system. The District should take advantage of future opportunities to eliminate dead-end mains.

Not only does pipe looping improve hydraulics, it also provides redundancy in the system. Future looping opportunities may occur as a result of new residential or commercial development.

### Looping opportunities:

- Extend the main on Foundry St to connect to the main on Silver Street, approximately 1,900 LF of 8-inch water main.
- Connect the mains on Church St and Front Street, approximately 550 LF of 12-inch main. This extension includes a railroad crossing.
- Connect the 8-inch main on Water Street to the 12-inch main on Wentworth Street, approximately 200 LF of 12-inch main installed cross-country.
- Connect dead end main on 2nd Street to Front Street via Cross Street, approximately 200 LF of 8-inch main.

### 4.3.4 Piping Reliability and Redundancy

Piping reliability is defined as the ability of the piping network to supply service to an area of the system in the event of isolated or catastrophic disruptions. Isolated disruptions include shutdowns required to repair main breaks, replace valves or services, flush hydrants, etc. In some cases, the measure of reliability is a function of the redundancy of piping. Adequacy relates to the ability of the network piping to convey the required demands under all conditions.

In general, ferrous metal water main, such as cast iron or ductile iron, has a useful life of approximately 75-100 years. The useful life of an unlined metal pipe can be extended by cement lining the pipe, a practice commonly employed by many municipalities, and by adding polyethylene encasement to the exterior on the pipe during installation. This assumes that the materials of construction were proper for the application, that the size is adequate for the flows, that the pipes were properly installed and protected and that water quality and pipe bedding materials are not aggressive to the interior and exterior of the pipe respectively.

The majority of the mains in the District's system are either cast iron, asbestos cement or ductile iron.

In most cases, older pipe, 6-inch in diameter and less, should be replaced with a minimum of 8-inch diameter piping as opportunities arise (i.e. local road projects, new developments etc.). However, it may be acceptable to maintain a limited network of 2 to 6-inch pipe, depending on the number of services on each segment and the proximity of fire hydrants to the homes. The water distribution system hydraulic model should be used to verify the pipe size required.

The RWSD distribution system includes approximately 75% of water mains that have CI, AC or unknown material types. The majority of unknown material water mains can effectively be considered cast iron. General water works practice is to maintain an on-going replacement program where 1-2% of the total system pipe length is replaced each year. This ensures that the distribution system is fully replaced every 50-100 years.

Many utilities, including Rollinsford's, are limited in the amount of investment that can be made in a rehabilitation and replacement program. However, even in the face of limited funding resources, establishment of a routine replacement/rehabilitation program will pay dividends in the long term.

### 4.3.5 Pipe Criticality

In addition to considering adequacy and reliability, the analysis evaluated the distribution network to identify those mains considered "critical" to maintaining continuous service. An analysis was conducted using the criticality tool included in the hydraulic modeling software. The criticality tool simulates a failure of each pipe in the system and measures the redundancy and vulnerability of the pipe in question.

Not unexpectedly, the criticality tool identified dead-end mains as being critical to maintaining service. However, many smaller dead-ends were eliminated from the results, because the impact to customers was minimal and in many cases, dead-ends simply cannot be eliminated. The most critical mains identified in Rollinsford's water system include the following:

- Foundry Street between Church Street and Main Street – This section of 8-inch main is the only connection between the rest of the distribution system and the residential areas on Water Street, Wentworth Street, Church Street, and Washington Street. Loss of this main would impede service and fire protection to these residential customers
- General Sullivan Way between General Sullivan Well and Silver Lane – loss of this main isolates the primary source well from the distribution system and would result in disruptions to the entire system.
- Dead end main on Silver Street from Pine Street to Portland Ave – loss of this main would disrupt service and fire protection to residential customers along Silver Street and on Cricket Lane.
- Jessie Doe Road from the 0.75 MG tank to Main Street - Loss of this 12-inch main isolates the tank from the distribution system and would result in disruptions to the entire system.

### 4.3.6 Fire Flow

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). ISO is an organization responsible for evaluating and classifying communities for insurance rating purposes. Periodically, the ISO will visit a community, perform fire flow tests and develop a fire insurance rate for that community. The rate assigned ranges from 1 to 10 with 1 being the best rating. The rating is based on the total firefighting capability of the community, including such factors as water supply, fire department structure and available communication systems.

Specific fire protection requirements at a given locale vary with the physical characteristics of a building. ISO assigns a required fire flow based on the worst case premise in a general location using the following factors: (1) materials of construction, (2) 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, as well as other factors. Some special use buildings may have required fire flow as high as 12,000 gallons per minute (gpm). [Table 4-4](#) presents typical fire flow requirements for various building types and uses.

**Table 4-4** Typical Fire Flow Requirements

Land-Use or Building Type	Range of Required Fire Flows and Flow Duration
Single and Two-Family Dwellings	
<i>Over 100 feet Building Separation</i>	500 gpm for 2 hours
<i>31 - 100 feet Building Separation</i>	700 gpm for 2 hours
<i>11 - 30 feet Building Separation</i>	1,000 gpm for 2 hours
<i>10 feet or less Building Separation</i>	1,500 gpm for 2 hours
Multiple Family Residential Complexes	2,000 to 3,000 gpm for 2-3 hours
Average Density Commercial	1,500 to 2,500 gpm for 2-3 hours
High Value Commercial	2,500 to 3,500 gpm for 2-3 hours
Light Industrial	2,000 to 3,500 gpm for 2-3 hours
Heavy Industrial	2,500 to 3,500 gpm for 2-3 hours

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 for all non-residential land uses. This is the largest fire flow that the ISO recognizes as necessary for a system to provide even if a specific building within the community requires a greater fire flow.

As discussed earlier, it is unknown when the last ISO fire flow test was performed, and without known testing locations and boundary conditions, it will be difficult to compare the results of our fire flow testing to ISO information. If RWSD is approached by ISO to perform fire flow testing in the future, it is encouraged to have this testing performed and obtain locations and boundary conditions for future use.

**Figure 4-3** shows the estimated available fire flows at each node within the distribution system. The fire flow analysis was run under projected MDD conditions, with the tank set at its lower operating level, and well pumps off to determine the capabilities of the system under worst case conditions.

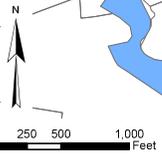
 Hydrants  
**Estimated Available Fire Flow**  
 501 - 1000 gpm  
 1001 - 1500 gpm  
 1501 - 2000 gpm  
 2001 - 2500 gpm  
 2501 - 3500 gpm  
**Water Main By Diameter**  
 Unknown  
 ≤ 4-inch  
 6-inch  
 8-inch  
 12-inch

Fire flows based on minimum tank operating level (El. 225 Ft), pumps at WTP, Porters Wells, and Sullivan Well off-line, and an assumed projected maximum day demand of 0.70 MGD

2024 Replacement Project - Front St

2024 Replacement Project - South St

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**2030 MDD Est. Avail. Fire Flows**  
Rollinsford, NH

PROJ NO:	21296	DATE:	5/31/24
		FIGURE: 4-3	

*Engineering a Better Environment*

## 4.4 Conclusions and Recommendations

The purpose of this evaluation was to assess the strengths and weakness of the distribution system under existing and projected future demand conditions. Based on the evaluations presented, the following conclusions and recommendations are offered.

### 4.4.1 Operations and Maintenance Recommendations

#### Valve and Hydrant Exercise Program

A routine valve and hydrant exercise program is recommended. Main transmission valves should be exercised yearly. Smaller distribution valves should be operated at a minimum every three (3) years.

#### Hydrant and Valve Replacement Program

The RWSD currently replaces hydrants as they fail and has been proactive in replacing older hydrants in the system. The same has been done for valves in the system. We recommend the District continue with a hydrant and valve replacement program. This should consist of budgeting to replace a small number of known problem valves and hydrants each year. Additional location and condition assessment data can be collected during the flushing and exercise programs on the hydrants and valves to target replacements of assets that are most critical or not functional.

#### Uni-directional Flushing

Pipe velocities were evaluated under MDD conditions. The analysis found that a majority of the mains throughout the system have velocities below 1 fps. Low velocities are generally desired in distribution piping to reduce headloss and to avoid the possibility of resuspending sediment in pipes during typical operations. The collection of deposits can become problematic if not flushed on a regular basis. The District currently flushes the distribution system in the spring using a modified uni-directional flushing (UDF). We recommend that the District continue this practice. UDF is designed to routinely and systematically flush water from the supplies and storage to remove sediments and should be combined with hydrant and pipe maintenance.

### 4.4.2 Distribution System Improvements

In general, the distribution system (piping, pumping and storage) requires short term hydraulic improvements as well as short term and long-term renewal. While the age of the majority of the system is ~50 years or less, this infrastructure will continue to age and possibly further reduce in hydraulic capacity, especially in the case of unlined CI water mains. Reduced hydraulic capacity may eventually decline to a point where the ability to deliver appropriate fire flows throughout the system is less than ISO required fire flows. A number of potential improvements were modeled to resolve the deficiencies identified from the analysis. In many cases, an improvement was found to resolve more than one deficiency. For this reason, the improvements were considered from a holistic perspective to maximize the benefit while minimizing the amount of infrastructure investment needed. Recommended improvements are prioritized in the Capital Improvement Program section ([Section 6](#)).

### System Pressure

As previously discussed, under ADD and MDD conditions only one instance of pressure below 30 psi was observed within the distribution system at the base of the storage tank, pressures between 80 psi and 83 psi were observed at the intersection of Locust and Foundry Street, as well as at the end of Lower Mill Road.

### High Velocity, Excessive Headloss

All pipes were observed to have velocities below 2 fps and no upgrades to improve system velocities are required.

### Pipe Looping Opportunities

- Connect the main on Foundry to the main on Silver Street, 1900 LF of 8-inch water main.
- Connect the 8-inch main on Water Street to the 12-inch main on Wentworth Street, 200 LF of 12-inch main installed cross-country.
- Connect the mains on Church St and Front Street, approximately 550 LF of 12-inch main. Includes a railroad crossing.
- Connect dead end main on 2nd Street to Front Street via Cross Street, approximately 200 LF of 8-inch main.

### Piping Redundancy, Reliability and Adequacy

- Foundry Street between Church Street and Main Street – This section of 8-inch main is the only connection between the rest of the distribution system and the residential areas on Water Street, Wentworth Street, Church Street, and Washington Street. Loss of this main would impede service and fire protection to these residential customers
- General Sullivan Way between General Sullivan Well and Silver Lane – loss of this main isolates the primary source well from the distribution system and would result in disruptions to the entire system.
- Dead end main on Silver Street from Pine Street to Portland Ave – loss of this main would disrupt service and fire protection to residential customers along Silver Street and on Cricket Lane.
- Jessie Doe Road from the 0.75 MG tank to Main Street - Loss of this 12-inch main isolates the tank from the distribution system and would result in disruptions to the entire system.

### Fire Flow Improvements

- Pipe looping opportunities on Wentworth and Silver Street will improve fire flow in these locations.
- Other options for improved fire flow are increasing main size on Wentworth and Silver Street. The main diameter is unknown at the flow location used off Silver Street, this should be determined before assuming this improvement will be effective.
- Mains near locations of low fire flow may be hydraulically restricted. As water main is replaced at various locations in the system, a record of pipe condition should be kept. Replacement vs. renewal options should be considered for areas where unlined CI is of suitable diameter and condition to allow for cement lining rather than replacement. Pipe coupons may be performed to assess water main condition.

## 4.5 Prioritization of Distribution System Pipe Replacements

WP compiled available data and developed a condition assessment of the distribution system. Not all system pipes are equally important to the system operations; some pipes are highly critical to operations, and others are much less so. To assist the RWSD in determining the level of risk associated with the loss of any one asset, we developed a rating and level of risk model for the water system pipes using guidance from the (EPA) Sustainable Water Infrastructure – Asset Management for Water and Wastewater Utilities guidance program.

The EPA guidance uses the probability of failure (PoF) and the consequence of failure (CoF) to calculate Business Risk Exposure (BRE) of the asset (business refers to the RWSD). Analyzing the existing distribution system to determine the PoF and the CoF provides valuable information about locations in the distribution system that have the greatest risk of failure. This evaluation methodology is additionally beneficial to the development of a cost-effective CIP.

The distribution system BRE assessment was developed utilizing specific available GIS attributes to assign risk for each pipe segment in the water system network.

### 4.5.1 Probability of Failure

A water main may have a high PoF if it is old and past its useful life expectancy, has a history of failure, is made of less reliable pipe materials, or has a poor condition rating. A main may be much less likely to fail if it is newer, is made of modern materials, has little to no history of failure, and has a good to excellent condition rating.

### 4.5.2 Consequence of Failure

A water main may have a high CoF if it feeds important facilities or businesses, is located on a major roadway, or is large in diameter. Should a water main break occur and one of these factors be true, it is likely to draw more attention from the public and regulatory agencies. A main may have a low CoF score if the main is located on a road-less-traveled, has a small diameter, or is in a residential area.

### 4.5.3 Business Risk Exposure

The BRE score combines PoF and CoF scores into one number that can be used to sort and rank assets for further analysis.

$$\text{BRE} = \text{PoF} \times \text{CoF}$$

With regard to water mains, risk can be reduced by decreasing either the PoF (through replacement or refurbishment) or decreasing the CoF (through redundancy or relocation). In most cases it is not cost effective to install redundant infrastructure and sometimes, in the case of distribution systems, too much redundancy can often be detrimental to water quality in the system.

In most cases a significant amount of risk can be mitigated through replacement or by updating unknown information. For example, the BRE score for an existing 12-inch DI pipe with an unknown installation year will go from 38.6 to 24.8 if the installation year was discovered to be 2008 (Table 4-6). The replacement of an existing pipe with a new pipe reduces the PoF thus reducing the BRE score.

**Table 4-5 Impact of Replacement on BRE Scores**

Description	12" DI Pipe (Unknown Install Year) Score	2008 12" DI Pipe Score
<i>Probability of Failure Score</i>	5.6	3.6
<i>Consequence of Failure Score</i>	6.9	6.9
<b>Business Risk Exposure Score</b>	<b>38.6</b>	<b>24.8</b>

#### 4.6 Distribution System Risk Analysis Scoring

The distribution system BRE assessment was developed to utilize specific available GIS attributes to assign risk for each pipe segment in the water system network. [Table 4-6](#) contains PoF and CoF factors used to determine BRE scores for system assets.

**Table 4-6 BRE Categories For Distribution System Analysis**

Probability of Failure	Consequence of Failure
Asset Life Consumed	Business Interruption
Material	Traffic Interruption
Static Pressure	Fire Protection Disruption

##### 4.6.1 Probability of Failure

As a first step in determining risk, a system needs to look at what it knows about the likelihood that a given water main is going to fail. An asset may be highly likely to fail if it is old, has a long history of failure, has a known failure record in other locations, and has a poor condition rating. An asset may be much less likely to fail if it is newer, is highly reliable, has little to no history of failure and has a good to excellent condition rating. The PoF score is a sum of the factors listed below normalized to a 1-10 scale by weighting the factors per [Table 4-7](#). These weighting factors have been selected by the RSWD to appropriately reflect the potential risk for each factor in Rollinsford.

**Table 4-7 Probability of Failure Factor Weighting**

Factor	Weighting
Asset Life Consumed	0.40
Material	0.30
Static Pressure	0.30

Asset Life Consumed – This factor gives weight to the age of a pipe. This factor assumes a useful lifespan of 100 years for all types of pipe. The scoring is a ratio of current time in service for each pipe by the expected lifespan. This ratio is multiplied by 10 to adjust the ratio to the 1-10 scoring mechanism as shown below. All pipes with unknown ages were assigned a score of 5. [Figure 2-4](#) shows the distribution system by age.

$$\text{Score} = (\text{Current Year} - \text{Installation Year}) / \text{useful lifespan} * 10$$

- Material Type – This factor gives weight to the different types of pipe material. Some types of pipe are more susceptible to failure than others. In this instance a portion of the distribution system material type is unknown but is either AC, CI or DI as those are the only types of pipe ever known to be installed in the distribution system. All pipes with unknown material type were assigned a score of 5. [Figure 2-3](#) shows the distribution system by material type.

**Table 4-8 Pipe Material Scoring**

Material	Score
Ductile Iron	1
PVC	1
Asbestos Cement	2
Unlined Cast Iron	10
Unknown	5

- Static Pressure – This factor gives weight to areas where higher static pressures are present. High pressure adds additional stress on a pipe and can lead to failure. [Figure 4-2](#) shows the normal distribution system pressure.

**Table 4-9 Static Pressure Scoring**

Static Pressure (psi)	Score
0-40	1
40-60	3
60-80	5
80-100	7
>100	0

#### 4.6.2 Consequence of Failure

In terms of the consequence of failure, it is important to consider various possible costs of failure. The costs potentially include: loss of fire protection, social cost associated with the loss of the asset, repair/replacement costs related to collateral damage caused by the failure, legal costs related to additional damage caused by the failure, environmental costs created by the failure, and any other associated costs or asset losses. The consequence of failure can be high if any of these costs are significant or if there are several of these costs that will occur with a failure. The CoF score is a sum of the factors listed below normalized to a 1-10 scale. These weighting factors have been selected by the RSWD to appropriately reflect the potential risk for each factor in Rollinsford.

**Table 4-10 Consequence of Failure Factor Weighting**

Factor	Weighting
Business Interruption	0.25
Traffic Disruption	0.25
Fire Protection Disruption	0.5

- Business Interruption – This factor gives weight to sections of the distribution system that are necessary to supply water to large water users and facilities where water is of high importance such as school buildings and medical facilities. [Figure 4-4](#) delineates the areas where business interruption was considered.

**Table 4-11 Business Interruption Scoring**

Business Interruption (Y/N)	Score
No	1
Yes	10

- Traffic Disruption – This factor gives weight to traffic issues that would occur if a given pipe were to fail. Disruptions were divided into three types (Major, Moderate and Minor). [Figure 4-5](#) delineates the three traffic disruption classifications.

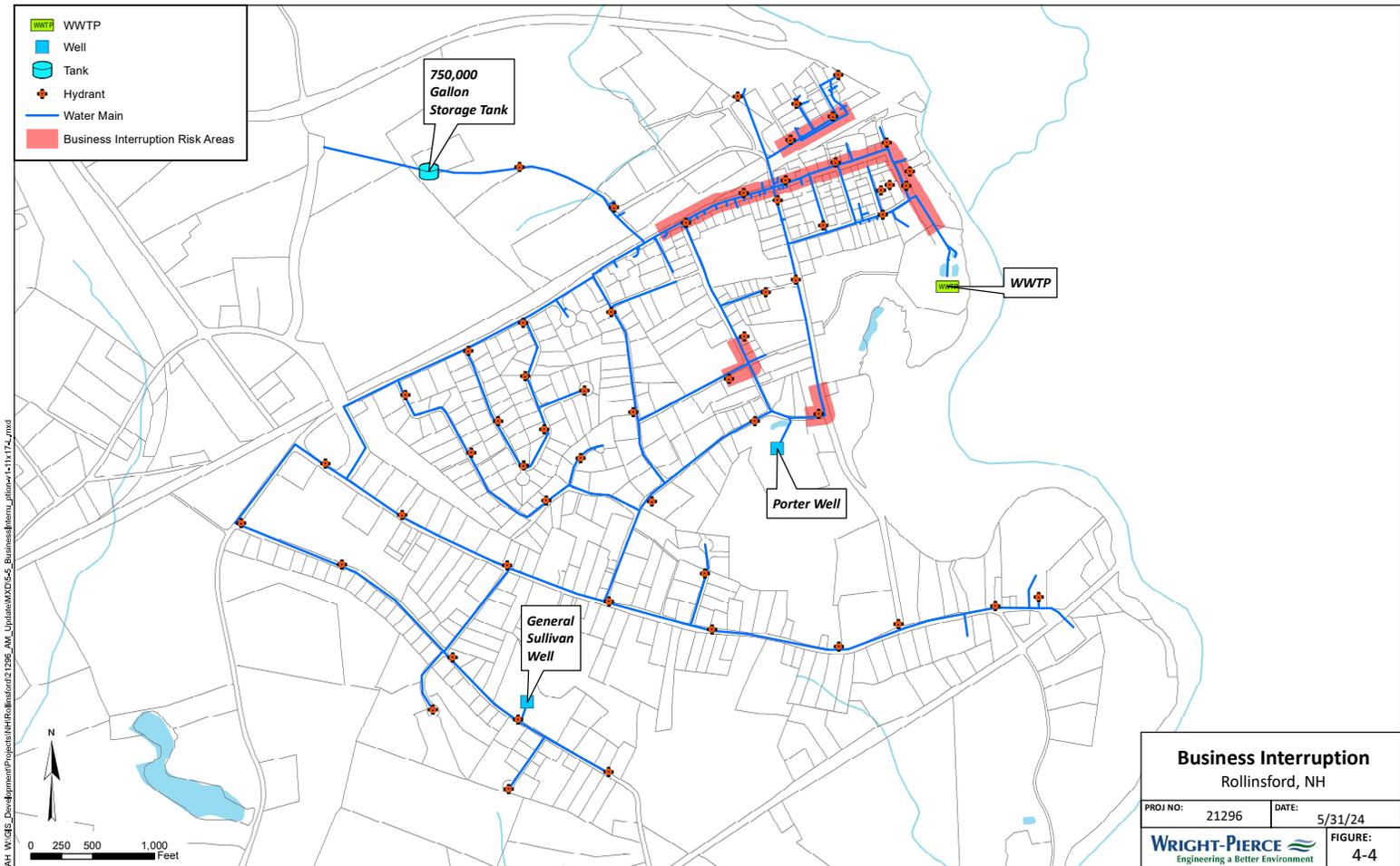
**Table 4-12 Traffic Disruption Scoring**

Soil Type	Score
Minor	1
Moderate	5
Major	10

- Fire Protection Disruption – Larger diameter water mains provide the backbone of the fire protection and water transmission for the system. Larger diameter pipes are also more difficult to repair in the event of a main break. This factor provides weight to the consequence of failure of the water mains based on the pipe diameter. [Figure 2-2](#) shows the distribution system by pipe diameter.

Table 4-13 Fire Protection Disruption Scoring

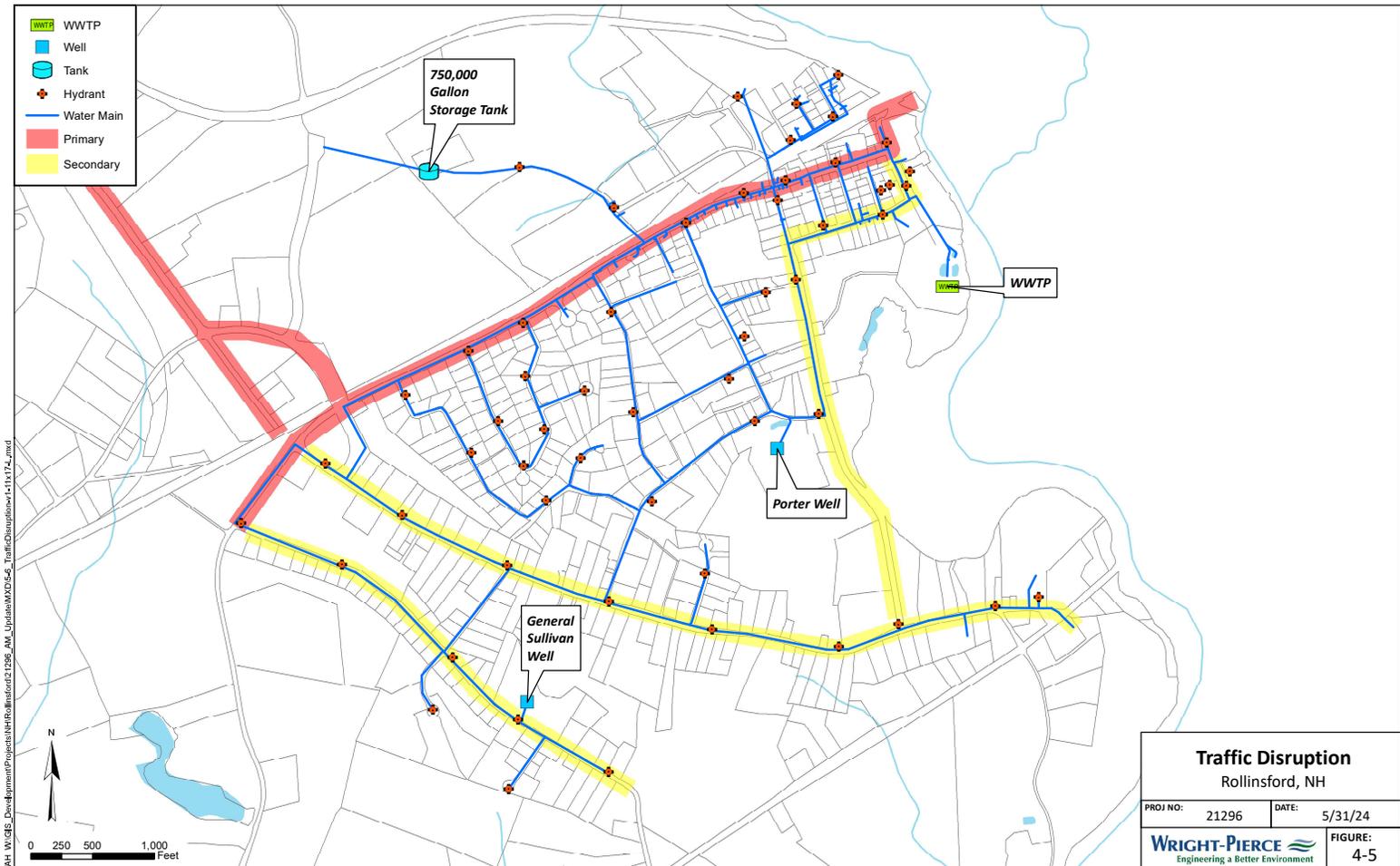
Diameter (inch)	Score
2	1
4	3
6	5
8	7
10	8
12	10



**Business Interruption**  
Rollinsford, NH

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 Engineering a Better Environment		FIGURE:	4-4

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<b>Traffic Disruption</b>	
Rollinsford, NH	
PROJ NO: 21296	DATE: 5/31/24
<b>WRIGHT-PIERCE</b> Engineering a Better Environment	
FIGURE:	4-5

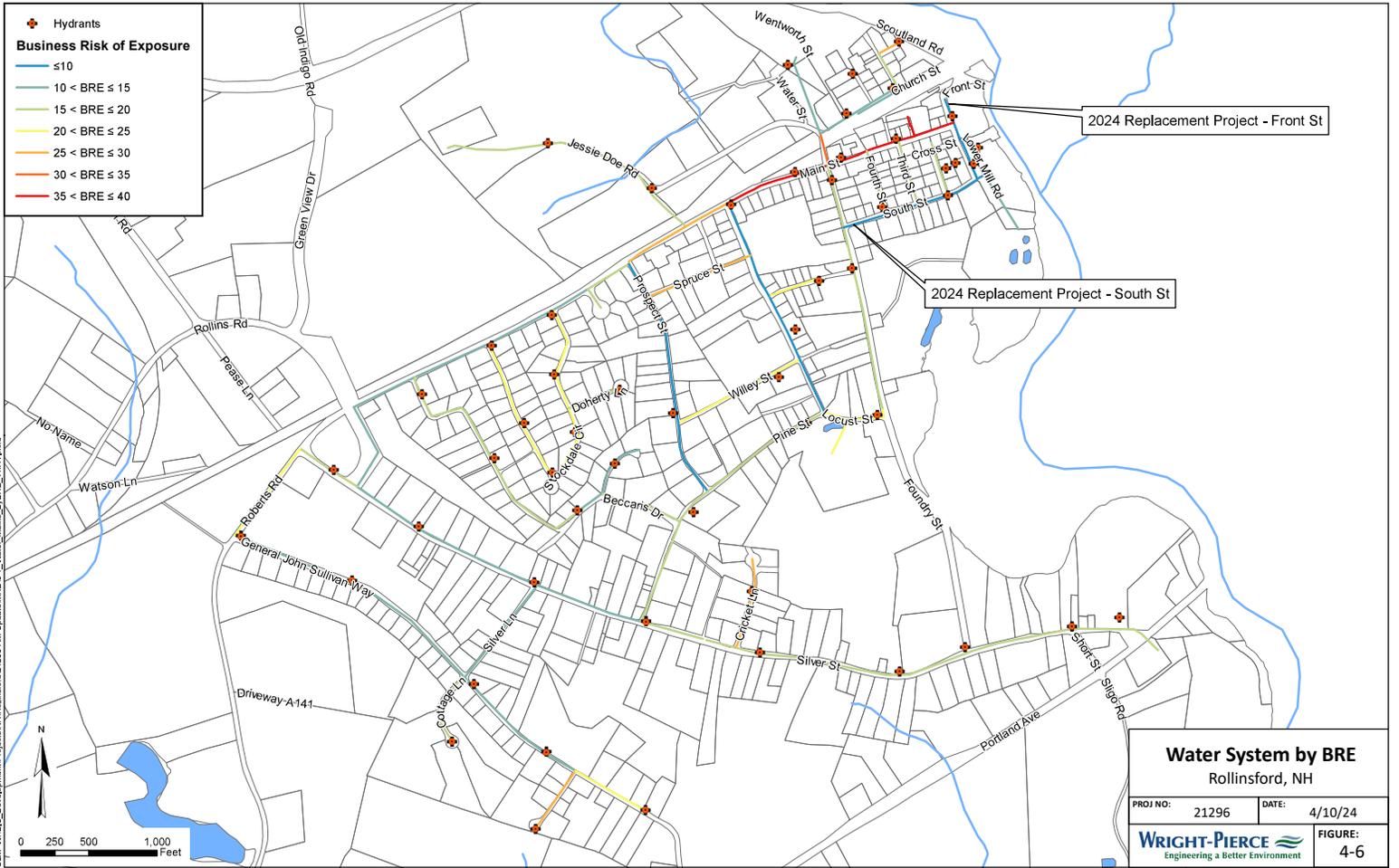
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### 4.6.3 Distribution System Business Risk Exposure

Generally, the water mains in RWSD have a low LoF score as the oldest pipes in the system, of known age, are only approximately 60 years old, and the majority of the pipes in the system are between approximately 40 and 50 years old. Asset life consumed, the likelihood of failure factor with the most weight, has not become a risk factor that would dictate water main replacement in this planning cycle.

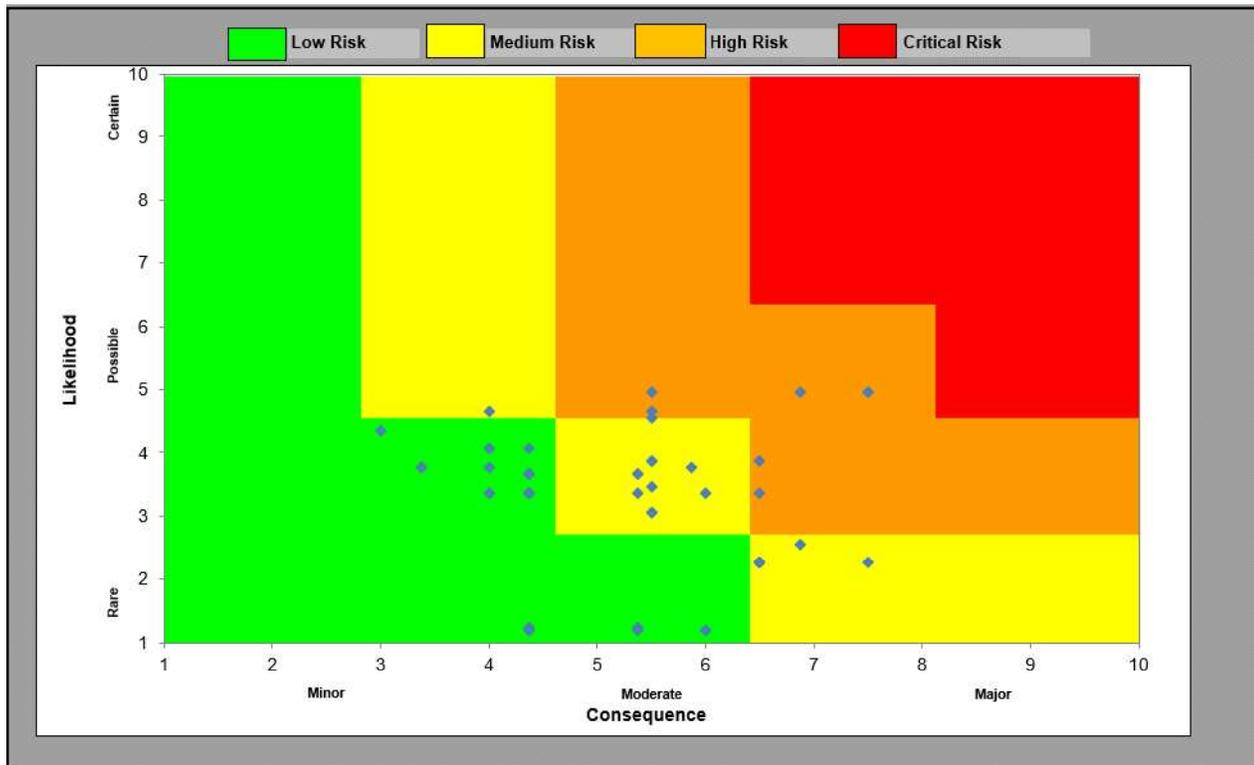
**Figure 4-6** shows the pipes with the highest ranking BRE scores in Rollinsford. As shown in the figure, the highest risk water mains are located on Main Street and Front Street. Plotting the Likelihood of Failure scores against the Consequence of Failure scores for all pipes in the system on a graph provides another visual means of reviewing this information (**Figure 4-7**). As shown on the graph it is evident that there are a number of high and medium risk assets in the distribution system but most of the distribution system assets fall into the low risk category.

Most of the larger water mains in the District are located in the areas where failure of the water mains is of the most consequence. Most of the risk associated with these assets is associated with the consequence of failure factors, and risk is not mitigated through replacement. Currently, monitoring and planning for replacement based on the District's opinion, of these high and moderate risk assets is recommended in the short to intermediate term as there may be significant service life left in these water mains. For the remainder of the water mains there is significant service life remaining, continued monitoring of these assets and reevaluation of condition of these assets is recommended every 5 years. If the maintenance frequency of assets starts to increase, replacement is recommended. A copy of the BRE water main spreadsheet is included in **Appendix B**.



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Figure 4-7 Distribution System Business Risk Exposure: All Pipes



## 4.7 Storage Tank Evaluation

### 4.7.1 General

Distribution storage provides a number of important functions to a water system. This includes establishing and sustaining adequate pressure throughout the system, water for firefighting capabilities, and storage during short-term emergency purposes. Storage also provides a "cushion" to equalize peak demand fluctuations, improves service reliability, provides operational flexibility, and allows intermittent operation of pumping and treatment systems. The RWSD owns and operates one distribution storage facility.

### 4.7.2 0.75 MG Concrete Storage Tank

The 0.75 MG concrete tank was originally constructed in 1996. This tank provides storage for the entire water system.

### 4.7.3 Storage Volume Analysis

In general, distribution system storage is necessary to satisfy the following conditions:

- To satisfy all demands which exceed the maximum available pump capacity from the groundwater supplies. The volume of storage, which is depleted during the daytime peak flow periods, is refilled during the lower demand, early morning hours.
- For fire protection: if a fire occurred during the maximum day demand, all water used to fight the fire would be drawn from storage volume.
- To meet emergency conditions such as power failures, transmission main breaks, treatment/pumping equipment failure and other unanticipated supply interruptions.

- Excess storage can be provided for pumping during off-peak electrical periods.
- For cycling pumps during normal daily operation.
- The primary criteria used to evaluate storage requirements include: average and peak water usage, water supply capabilities, as well as fire protection and reserve or emergency needs. Each of these criteria is used to establish three components of storage: equalizing volume, emergency volume and fire volume. The total of these three components is referred to as the active or required storage volume.

All of these storage components should be available while still providing, at a minimum, pressure of 20 psi at ground level throughout the distribution system under all conditions as a requirement of NHDES/Ten States Standards. Ensuring a minimum pressure of 20 psi prevents backflows from plumbing fixtures into the distribution system. When possible, storage should be located throughout the distribution system to deliver flows from multiple locations to reduce pipe velocities, maintain pressures and provide appropriate flows to a fire location.

Equalizing storage is the volume of water required during the daily demand fluctuations to meet the peak usage periods that exceed the maximum available pumping capacity. This volume should be provided independent of the required fire volume to assure sufficient reserve volume in the event of a fire during the peak demand period. Using the maximum day demand of 0.22 MG, the equalizing storage volume for the entire system was estimated to be approximately 25% of the maximum daily demand (MDD), 0.06 MG, to estimate peak hour conditions.

Fire storage is the volume of water needed for firefighting and should include a sufficient volume of water for fire protection on days of maximum demands. In most cases, the fire volume is the largest component of storage. As previously discussed, fire flow requirements have been established by the ISO as 3,000 gpm in commercial areas of the system; however, the highest fire flow required under ISO standards is 3,500 gpm. For this analysis, 3,500 gpm will be used.

Emergency storage is recommended when an additional factor of safety is desired for emergencies or when demands are unpredictable and fluctuate widely. Emergency storage may also be included when a utility desires to take advantage of off-peak electrical charges for pumping. Determining the emergency storage generally depends on the adequacy of the supply sources, redundancy and the level of safety a utility desires. Emergency storage is often simply calculated as the volume necessary to supply the system during repair or maintenance work, or in the event that the pumping facilities do not have emergency back-up power equipment. In most cases, this is calculated as a specified number of hours of the average-day demands.

#### 4.7.4 Distribution Storage Operation

Operation of the Sullivan and Porter Wells are controlled by the 0.75 MG tank level. The District reported that the system is currently operated at a hydraulic grade line of El. 229.0 based on the overflow elevation of the 0.75 MG tank. The controls for the wells are shown in [Table 4-14](#).

**Table 4-14 Current Distribution Storage Operation**

Pump Station	Tank Level On (ft)	Tank Level Off (ft)
General Sullivan	46	48.5
Porter*	Manual	Manual

These controls are adjusted based on operational needs.

### 4.7.5 Active Storage Volume Analysis

The existing storage facilities were evaluated on the three storage criteria recommended above. Storage was considered for the entire distribution system and for each service zone.

It is important to point out that in most cases, not all the storage volume within a tank is useable and is dependent upon the highest service elevations in the system and minimum operating pressures that are to be maintained under all conditions. The useable storage volume is known as the "active" volume and is the amount that will be considered in the storage analysis and is presented in [Table 4-15](#). The use of current operational levels minimizes the pumping costs to the District, but also inhibits the available active storage volume associated with this tank. Operational recommendations are presented at the end of this section.

**Table 4-15 Available Active Storage Volume**

Criteria	Main Service Zone
Total Capacity (gallons)	749,108
Overflow Elevation (feet - USGS)	229
Base Elevation (feet - USGS)	179
Available Water Depth (feet)	50
Inside Diameter (feet)	50.5
Unit Volume (gallons/foot)	14,982
Highest Elevation Served (feet - USGS)	157
Minimum Elevation to Maintain 20 psi (feet - USGS)	203.2
Available Active Volume Depth (feet)	25.8
Available Active Storage Volume (gallons)	386,535

Three primary criteria were used to develop a relationship between the supply capacity and recommended storage volumes for Rollinsford.

- The reliable supply capacity should equal or exceed the projected MDD requirements.
- Total storage should be capable of providing fire protection needs throughout the system.
- The reliable supply capacity plus the available storage volume should equal or exceed fire flow requirements plus the maximum-day volume requirements.

To determine the adequacy of the existing storage volume, an analysis of each storage component was made using current demands. Three different scenarios were evaluated for the entire system.

- Scenario #1 - A fire occurs on the maximum-day during the peak hour. Under this condition, the fire flow and hourly fluctuation volume required should be available simultaneously.
- Scenario #2 - Storage required for one average-day.

- Scenario #3 - Storage for fire flow with a 3-hour reserve for maximum-day demands.

The storage volume required is outlined as follows:

- **Equalization Storage for Peak-Hour Fluctuation** - The storage volume necessary to provide for the system's hourly fluctuation demands was estimated to be 25% of the projected MDD of the system. Twenty-five percent of the MDD of 0.22 MGD is approximately 0.06 MG.
- **Fire Protection** - The maximum fire flow required is 3,500 gpm for 3 hours, equal to 0.63 MG, which is the ISO recommended maximum necessary for a public water system to supply.
- **Emergency Storage** - Storage should be available to meet emergencies. The water system includes emergency backup power at the General Sullivan and Porter Wells. No provisions for emergency storage are recommended.

The total projected active storage volume requirement for the components described above is approximately 0.69 MG. Using this condition, it suggests that there is currently a storage deficit of 0.31 MG. This perceived deficit is a function of the system operations. General Sullivan Well has an emergency generator and is capable of supplying a flow of greater than 200 gpm, which exceeds the storage deficiency. The analysis is summarized in [Table 4-16](#).

**Table 4-16 Storage Needs Analysis**

Scenario	Storage Requirements	Present Active Storage (MG) <sup>1</sup>	Current Storage Needs (MG)	Current Surplus/ (Deficit) (MG)
1	3-hr fire @ 3,500 gpm + 25% of MDD for peak hour	0.38	0.69	(0.31)
2	Average day demand		0.09	0.294
3	3-hr fire @ 3,500 gpm + 3 hrs. of MDD		0.66	(0.28)

#### 4.7.6 Service Constraints and Tank Turnover

Isolated areas of the system are known to have inadequate pressures under current conditions. These areas are mainly in the higher elevations along Spruce Street. RWSD staff noted that residences within this area of the system are equipped with in home booster pumps to provide adequate pressures.

Based on tank operating level controls, the tank is operated over the following range as presented in [Table 4-17](#). A summary of tank control follows.

**Table 4-17 Tank Operating Levels**

Tank	Low Level (feet)	Low Level (EL USGS)	High Level (feet)	High Level (EL USGS)
0.75 MG	46	225179	48.5	227.5

The tank establishes the hydraulic grade line and provide peak demand equalization and fire storage volume to the system. Based on tank overflow elevation of EL. 229, the highest ground service elevations that the District can serve reliably without the need for auxiliary booster systems is elevation 148 feet USGS, respectively. Currently, there are a small number of customers above elevation 148 feet USGS who have booster pumps to provide the required pressure. It is important to note that NHDES regulations prohibit the installation of residential booster stations, and addition of new customers above the maximum service elevation (Table 4-18) will require a municipal booster pump station increasing line pressure to all customers served or an approved waiver from this requirement. Rollinsford has requested and obtained a waiver to this requirement from NHDES for existing services currently installed.

**Table 4-18 Maximum Service Elevation**

0.75 MG Tank	
Criteria	Elevation (USGS)
Overflow	229.0
Low Operating Level	225
35 psi in feet	<u>81</u>
Maximum Recommended Service Elevation	144

#### 4.7.7 Storage Tank Water Quality

Due to the volume of water contained within them, storage facilities can contribute to poor distribution water quality from lack of adequate circulation and turnover. Systems which use chlorine as a disinfectant are even more susceptible to forming disinfection by-products in storage tanks. The Rollinsford Water and Sewer District uses chlorine for disinfection, which can form disinfection by-products and can be subject to water age concerns.

An operational modification which could help improve tank turnover is to vary the tank operating level over a greater range. However, any change in operating level must be balanced with the ability to maintain adequate pressure and available storage volume. A better approach to improving water quality in the tank would be to consider an internal tank mixing system to promote internal water exchange within the tank.

There are generally two distinct approaches to improving mixing within storage tanks: passive or mechanical methods.

Passive mixing systems simply consist of piping placed within the tank which includes separate inlets and outlets located on opposite sides of the tank. A typical passive system consists of piping run along the floor of the tank with "duck bill" style check valves located on the inlet and outlet. In some cases, the piping and valves can be extended above the tank floor in a vertical orientation. These applications must consider winter conditions during which an ice lens can form and potentially damage the system. Passive systems are generally more difficult to maintain and service because they require dewatering the tank or the use of divers.

Mechanical mixing systems consist of one or more electrical mixing devices, which are designed to create a current and move water through the tank. Several types are available including submersible type systems, which simply rest on the tank floor, and floating units. These mechanical mixing systems require power but can be adequately powered by solar panels mounted on or near the tank.

## **4.8 Conclusions And Recommendations**

As stated at the beginning of this section, the purpose of this evaluation was to assess the strengths and weakness of the storage tanks under existing and projected future demand conditions. Based on the evaluations presented, the following conclusions and recommendations are offered.

### **4.8.1 Storage Tank Repairs and Replacements**

The 0.75 MG storage tank is concrete and generally is low maintenance. We do not recommend any specific improvements to the tank during the planning period. We recommend continued periodic inspections at a maximum interval of five years to evaluate the tank conditions. Routine inspections and surveillance of the storage tank are recommended to track performance and to identify any unanticipated or any unusual circumstances that might occur.

### **4.8.2 Water Turnover and Exchange**

Water quality complaints related to water age have not been of significant issue in the District's distribution system. We recommend that the District monitor water quality in the storage tank during the summer months to determine if thermal stratification is a concern. If so, a mixing system should be implemented.

## **4.9 Interconnections with Neighboring Water Systems**

The consideration for an emergency interconnection is recommended given the close proximity of other community water systems and Rollinsford's current active storage deficit. The key aspects that factor into potential interconnection options are length of water main, utility crossings and unique or special permits and or regulations required. There are also water compatibility considerations that would need to be reviewed later once the design process begins. Of the three neighboring water systems, the communities that offer the best options for an interconnection would be the city of Somersworth, NH and the town of South Berwick, ME.

The town of South Berwick is on the western side of the Salmon Falls River which acts as the Maine-New Hampshire border. This is the closest neighboring water system to Rollinsford with the shortest interconnection starting from the end of the distribution piping on Main Street in South Berwick. From there, approximately 650 feet of new water main would be required to connect the two distribution systems. This includes approximately 200 feet of water main installed under the bridge across the Salmon Falls River which connects Main Street in South Berwick to Front Street in Rollinsford. Although a relatively short interconnection, the bridge crossing between Main Street and Front Street would add significant cost in both the design and construction efforts. Furthermore, a connection such as this across state borders would require a large amount of regulatory coordination between Maine and New Hampshire which adds additional effort and cost that must be considered.

The city of Somersworth is located North of Rollinsford. The southern end of its distribution system is approximately one mile from the nearest connection point with Rollinsford's system. The best connection with Somersworth would south run from the 6-inch or 12-inch pipe on Main Street in Somersworth to the town line. The connection pipe would then run follow Scoutland Road in Rollinsford to the 0.75 MG storage tank. While substantially further than the option with South Berwick, the 6,400 feet of water main for this connection would be

installed predominately predominantly in rural, dirt road and reduce installation cost. Another benefit being the interconnection would tie-in at the storage tank. This interconnection option is estimated at \$3,500,000.

With concerns regarding the water quality of the current well supply due to upcoming Federal PFAS regulations, a interconnection may cost effective alternative to development of a new well source or implementation of a PFAS treatment system at the General Sullivan well to reduce the PFAS concentrations below proposed federal MCLs.

A brief modeling analysis was conducted to determine the capabilities of the Somersworth system to supply demand equivalent to the current production of the General Sullivan Well. With the current infrastructure in place, the Somersworth system would be able to provide 200 GPM at 95 PSI with a hydraulic grade line (HGL) of 388.6 feet to the proposed point of connection at the current extent of the 6-inch on Main Street under Somersworth's 2020 ADD. Under Somersworth's 2020 MDD, their system can provide 200 GPM at 94 PSI with an HGL of 385.4 ft.

Due to the coordination between two state regulatory agencies, and the anticipated increased level of effort, time, and costs associated with coordination, for an interconnection with South Berwick, the interconnection with Somersworth is likely to be the most effective alternative. These conceptual alternatives should be further investigated before investing significant capital effort into a solution to comply with PFAS regulations.

5

## Section 5 Facility Evaluation and Risk Analysis

### 5.1 General

The purpose of this section is to provide a condition assessment of the assets within the existing facilities. The evaluation was completed using observations from WP inspections of each facility and conversations with the District and system operators. WP utilized Fulcrum data collection and asset management software to collect, assess, and organize asset data in the field and Matterport 3D scans of each facility to fill in the gaps and confirm field observations once in the office.

### 5.2 Facility Risk Analysis Concept

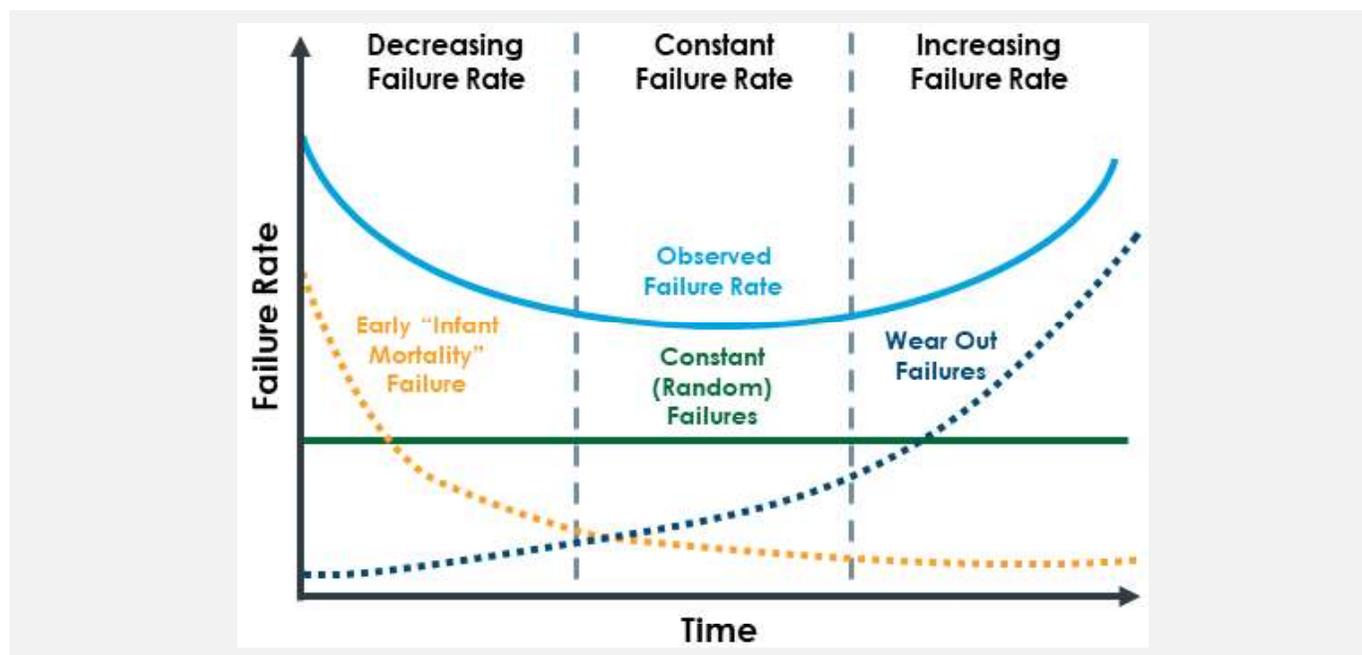
Not all assets are equally important to a water system's operation; some assets are highly critical to operations and others are much less so. Furthermore, the definition of a critical asset is completely system specific. A water system must examine its own assets very carefully to determine which current assets are critical and why.

Analyzing the existing water system assets to determine the PoF, and the CoF, provides valuable information about assets in the water system. This risk analysis is the foundation for developing cost-effective asset management strategies. Risk-based asset management planning allows for a utility to allocate money to best mitigate risk and maintain service to its customers.

#### 5.2.1 Condition Assessment

The first step to determine risk is to complete a condition assessment on each asset to determine its functionality within the system and its remaining useful life. This information is used in a Weibull analysis which determines the asset's failure rate and plots where the asset falls on the bathtub curve (Figure 5-1) below.

Figure 5-1 Bathtub Curve



The Bathtub Curve has three distinct zones:

- Decreasing Failure Rate – When an asset first starts, early Infant Mortality (defective equipment, poor installation, for example) is the primary mode of failure.
- Constant Failure Rate – Over time, random failures are the primary mode of failure.
- Increasing Failure Rate – As an asset ages and parts wear out, the failure rate increases.

The failure rate from the Weibull analysis is adjusted based on the asset’s performance and maintainability ratings to determine the final PoF score of the asset.

### 5.2.2 Probability of Failure

The PoF of an asset can be established by assessing the different types of failure the asset might experience. There are four primary failure models of which an asset can fail:

- Capacity – the asset is operational, but growth or expansion is making it unable to deliver the required capacity.
- LOS – the asset is operational but is causing violations in the LOS agreement, codes, permits, or safety.
- Mortality – physical deterioration of the asset, it is no longer operational. This is the most common mode of failure.
- Efficiency – the asset is operational but costs more to maintain and operate than alternatives.

An asset is more likely to fail if it is old, has a history of failure, has a known failure record in other locations, or has a poor condition rating. An asset is less likely to fail if it is newer, has little to no history of failure, and has a good to excellent condition assessment rating.

### 5.2.3 Consequence of Failure

The CoF considers the cost and impacts when a failure does occur. The costs potentially include: loss of fire protection, public health impact, social cost associated with the loss of the asset, repair/replacement costs related to collateral damage caused by the failure, legal costs related to additional damage caused by the failure, environmental costs created by the failure, and any other associated costs or asset losses. The CoF can be high if any of these costs are significant or if there are several of these costs that will occur with the failure.

The CoF score is calculated using the triple bottom line concept. The triple bottom line approach considers social, economic, and environmental impacts of asset failure. WP also includes replacement time and redundancy when calculating the final CoF score.

### 5.2.4 Risk Analysis

Assessing risk requires an examination of the PoF and the CoF as discussed above. To assess the risk for each particular asset, the two measures of failure are combined into a risk matrix.

Using this methodology, risk of failure for a given asset is evaluated and the most cost-effective management strategy is determined to minimize risk. Risk can typically be reduced by decreasing the PoF through augmentation, repair, replacement, or refurbishment of a given asset. Reducing the CoF may not be cost-effective in most situations, so it has to be evaluated on a case-by-case basis, but it is possible through redundancy, relocation, insurance, or alarms.

Normally, the most cost-effective means of reducing risk for aging assets is to reduce the PoF through infrastructure replacement projects. The assets that have the greatest PoF and the greatest consequences associated with the failure will be the assets that have the greatest risk and should be further evaluated to determine ways to reduce the risk.

### 5.3 Facility Risk Analysis Scoring

Due to the variety of components within a treatment facility or pump station, the categories used in analyzing facility assets need to be broad enough to assess the performance of many different types of assets. **Table 5-1** summarizes the nine categories used to determine risk for facility assets. The rest of this section will go into further detail to discuss each risk category’s scales on which every asset is evaluated upon.

**Table 5-1 Risk Categories for Facilities Analysis**

Probability of Failure	Consequence of Failure
Physical Condition	Social/Community
Reliability	Economic/Financial
Performance	Environmental
Maintainability	

#### 5.3.1 Probability of Failure Analysis and Scoring

**Physical Condition Rating** – The condition is based off several factors including vibration, noise, temperature, coating condition, wear or corrosion, and leakage. The following are the possible condition ratings:

- New or Excellent Condition
- Very Good Condition
- Minor Defects Only
- Some Defects and Deterioration
- Moderate Deterioration
- Moderate to Significant Deterioration
- Significant Deterioration
- Significant Deterioration w/ Major Repairs Performed on Equipment
- Virtually Unserviceable
- Unserviceable

**Reliability Rating** – The condition is based on the history of the asset and relates the number of reported breakdowns or unplanned maintenance calls and potential downtime related to the availability of parts and service for the asset. The following are the possible reliability ratings:

- Exceptional (No Problems)
- Random Breakdown (Every 5 Years)
- Occasional Breakdown (Every 2 Years)

- Periodic Breakdown (Once per Year)
- Continuous Breakdown (Multiple Times per Year)

**Performance Rating** – The condition is based on efficiency, attention required, and the asset’s ability to meet required demands. The following are the possible performance ratings:

- Meets or Exceeds all Performance Targets
- Minor Performance Deficiencies
- Considerable Performance Deficiencies
- Major Performance Deficiencies
- Does not meet any Performance Targets

**Maintainability Rating** – The condition is based on the level and frequency of maintenance and monitoring required to keep the asset operational. The following are the possible maintainability ratings:

- Easily Maintained
- Largely Preventative Maintenance
- Periodic Corrective Maintenance
- More Frequent Corrective Maintenance
- Work Orders Well Above Average
- Corrective Maintenance has become Routine

### 5.3.2 Consequence of Failure Analysis and Scoring

In terms of the CoF, it is important to consider various possible costs of failure. The CoF score is a sum of the factors listed below normalized to a 1-10 scale. These weighting factors have been selected for the utility to appropriately reflect the potential risk for each factor.

**Social/Community** – This factor gives weight to the social/community consequences that would occur if a given asset were to fail. Potential consequences included in this factor are of three types: Loss of Service, Safety, and the District’s Image.

**Economic/Financial** – This factor gives weight to the economic and financial consequences that would occur if a given asset were to fail. Potential consequences included in this factor are of two types: Economic and Financial.

**Environmental Impact** – This factor gives weight to the environmental consequences that would occur if a given asset were to fail. Potential consequences included in this factor are of two types: Spill/Flood Potential and Permit Compliance.

Scoring for the above weighting factors is summarized in [Table 5-2](#). After the CoF is determined, replacement time and redundancy factors are incorporated into the calculation. These two factors increase or decrease the score based on the replacement time and level of redundancy for each asset.

Table 5-2 Consequence of Failure Factors – Analysis and Scoring

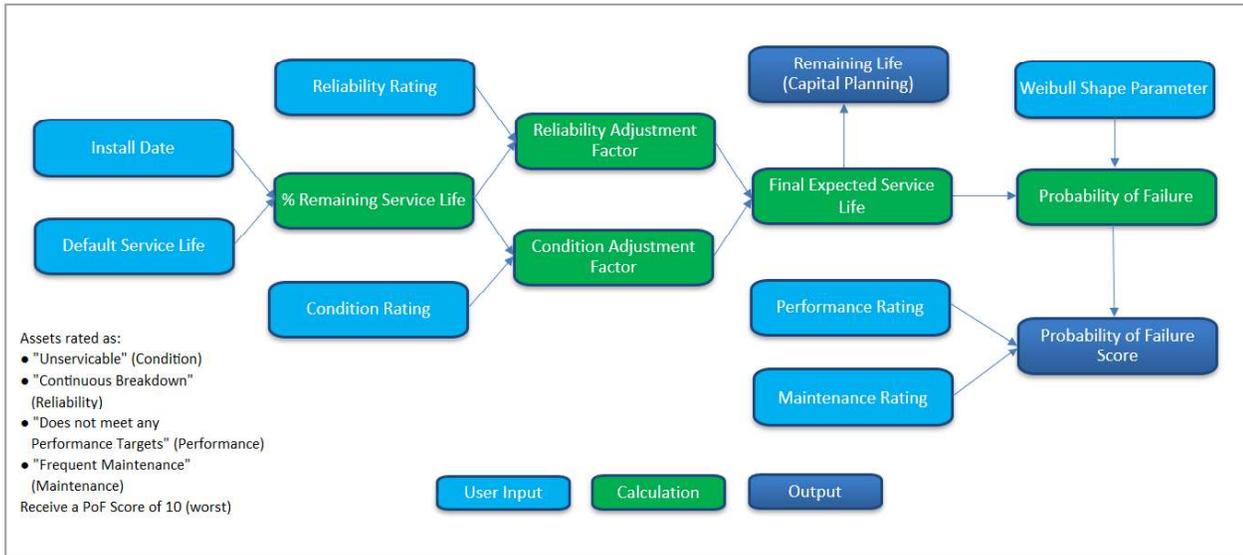
Potential Consequences		Score					
		1	3	5	7	9	10
Social and Community	Loss of Service	Can be out of service indefinitely	Cannot be down a month	Cannot be down a week	Cannot be down a day	Cannot be down 8 hours	Cannot be down one hour
	Safety	No impact	Minimal Impact	Minor injury	Moderate Impact on Public Safety	Significant Impact to Public Safety	Significant and Immediate Impact to Public Safety
	Agency's Image	No media or no consequence	Neutral coverage	Adverse media	Widely adverse media	Continual; political opposition	Nationally adverse media
Economic Financial	Economic Impact	Low cost	Moderate cost	High cost	High cost; diverts \$	Painful change of priorities	Likely to trigger rate increase, staff changes
	Financial Impact	Insignificant	<\$10k	<\$50k	<\$100K	<\$1 million	>\$1 million
Environmental Impacts	Spill/ Flood	No Impact	Short duration, small quantity	Moderate flooding, some offsite spillage	Many inconvenienced; moderate health and habitat issues	Severe health and habitat issues; some mandatory vacation of premises	Large areas vacated and closed to public access; extensive specialized containment cleanup required
	Permit Compliance	No consequence	Minor violation - reporting only	Regulatory sanction possible	Regulatory sanction likely; Damage reversible less than one year	Extensive regulatory sanction virtually assured; damage reversible in one to five years	Severe sanctions; damage reversible in five years or more

\*CoF Factors are weighted as follows: Social and Community at 35%, Economic and Financial at 30%, Environmental Impacts at 35%

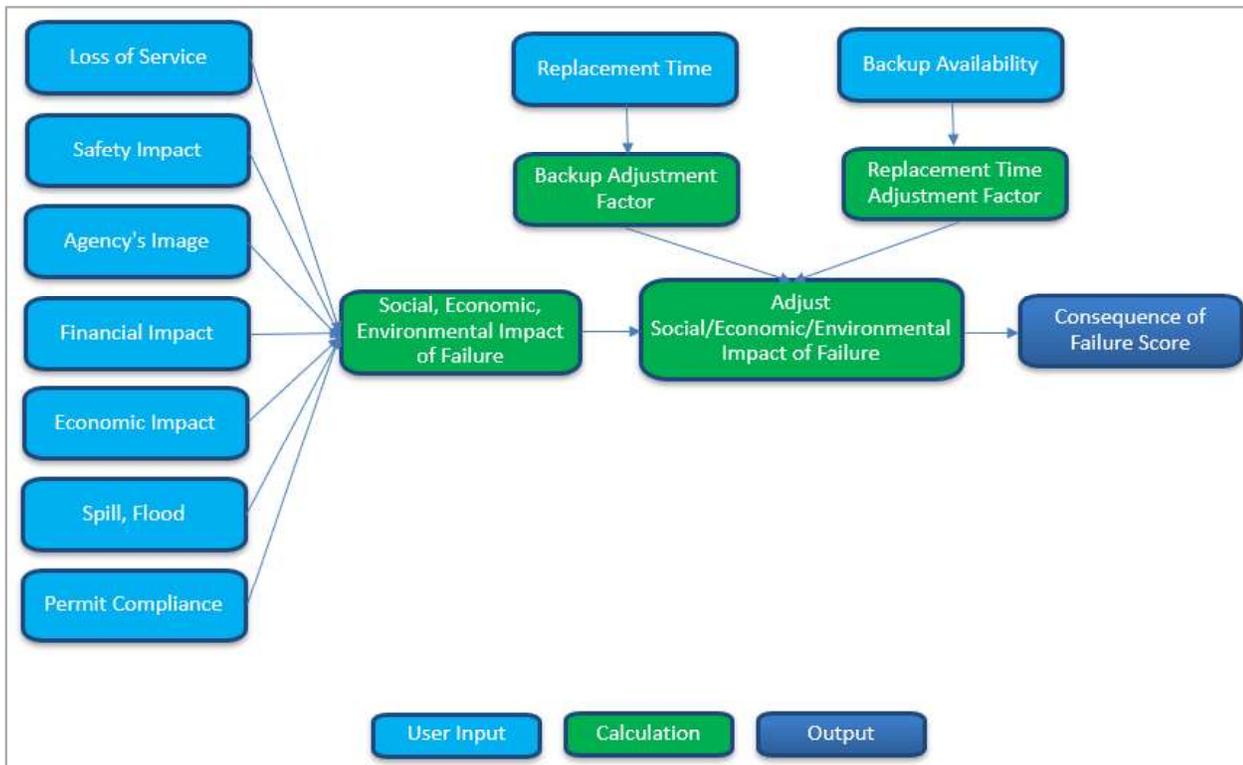
### 5.4 Facility Risk Final Score Calculations

The figures below provide visual depictions which describe how the input factors discussed above contribute to PoF (Figure 5-2) and CoF (Figure 5-3) final score calculations.

**Figure 5-2 Probability of Failure Score Calculation**



**Figure 5-3 Consequence of Failure Score Calculation**



### 5.5 Facility Risk Management Strategies

After final scores for PoF and CoF are determined, a management strategy can be assigned to each asset based on the risk matrix shown in **Figure 5-4** below. Management strategies are selected to maximize cost-effective maintenance practices and reduce the risk associated with the asset.

**Figure 5-4 Risk Matrix**

		Consequence of Failure									
		1	2	3	4	5	6	7	8	9	10
Probability of Failure	10	D	D	B	B	A	A	A	A	A	A
	9	D	D	B	B	A	A	A	A	A	A
	8	D	D	C	B	B	B	A	A	A	A
	7	D	D	C	B	B	B	B	B	A	A
	6	F	F	C	C	C	B	B	B	B	B
	5	F	F	F	C	C	C	C	C	C	C
	4	F	F	F	E	C	C	C	C	C	C
	3	F	F	F	E	E	E	E	C	C	C
	2	F	F	F	E	E	E	E	E	E	E
	1	F	F	F	E	E	E	E	E	E	E

Management strategies include:

- **Group A** – Critical Remove & Replace (R&R) – (High PoF, High CoF). Asset has reached the end of its useful life or is near the end of its useful life but has high consequence of failure. Asset should be replaced within the year or as soon as possible.
- **Group B** – Priority Remove & Replace (R&R) – (High PoF, High CoF). Asset is nearing the end of its useful life. Asset should be put on the 5-year CIP to be replaced.
- **Group C** – Predictive Maintenance Schedule – (Mid PoF, High CoF). Asset is approximately halfway through its useful life and parts will begin to wear out. A predictive maintenance schedule should be implemented. Predictive maintenance involves measuring performance standards such as vibration, temperature, and thermography to assess the current condition of the asset. For each asset, there is a defined set of performance standards that represent ideal performance. Comparisons of actual readings to the ideal performance standards should be made to determine if the asset is operating within an acceptable range. As an asset operates and parts wear-out, readings will change. By monitoring the change in readings, the failure of the parts can be predicted prior to actual failure, so preventive measures can be completed.
- **Group D** – Opportunistic Repair & Replace – (High PoF, Low CoF). Asset has a low CoF and is considered acceptable to fail. Replace as it fails. Opportunistic repair and replacement assets are recommended if funds

are available or when convenient for the District. These assets are past their expected useful life but are not critical enough to operation to warrant immediate replacement.

- **Group E** – Routine Maintenance or Preventative Maintenance Schedule – (Low PoF, High CoF). Asset is new or early in its useful life. A routine or preventative maintenance schedule needs to be implemented. Preventative maintenance consists of, but is not limited to, routine scheduled tasks such as lubrication, oil changes, changing filters, mechanical adjustments, scheduled tank cleanings, and general house cleaning items. These tasks should be scheduled based on the manufacturers’ recommendations, actual conditions, and the results of predictive maintenance measurements. Also, observations of the equipment by skilled mechanics and operators are required to notice changes in operation such as noise, vibration, temperature, leaking fluid, and grease. Preventive maintenance is performed to enable equipment to continue to operate with minimum downtime and minimal expense. Filters and grease are much cheaper than new motors and pumps.
- **Group F** – Run to Fail – (Low PoF, Low CoF). Asset has low CoF and is considered acceptable to fail. No preventative or predictive maintenance should be scheduled for these assets. The failure of these assets would not greatly disrupt operations and are run with no maintenance until it is opportunistic to conduct the renewal decision. This strategy saves the utility money by reallocating funds towards assets whose failure would be greatly disruptive to operations.
- for these assets.

### 5.6 Facility Risk Analysis

Assets belonging to each facility were evaluated using Fulcrum, a cloud-based data collection software. WP staff toured each facility with Operations staff and entered pertinent condition and operational performance information for each asset into Fulcrum using a tablet. Ratings were assigned to each asset based on industry standards for asset management, including physical condition, reliability, current performance, and maintainability in order to categorize risk.

The condition assessments of the assets are primarily based on visual and auditory observations and were limited to accessible areas. Permit-required confined space entry was not performed during the evaluations, nor was destructive testing of construction materials (concrete, paint, metal, insulation, etc.) completed to determine the condition of assets. While some non-destructive testing (auditory, vibration, thermal) was performed during the evaluation, the results of those observations were limited to the timeframe allowed for each site inspection and using commonly available tools. The tools used during the evaluations were not specifically calibrated for each use but rather the results were used as an indicator to identify assets that are performing outside their expected performance range. It is recommended that all assets be re-evaluated every five years.

Assets from each facility were evaluated using the methods and scoring strategies outlined above.

**Figure 5-5** shows a summary of management strategies for RWSD water system assets.

Figure 5-5 Summary of Assets by Strategy

Group	Strategy	Count	% Assets
A	Critical R&R	0	0%
B	Priority R&R	2	2%
C	Add PdM Schedule	2	2%
D	Opportunistic R&R	0	0%
E	Rt or PM Schedule	60	67%
F	Run to Fail	26	29%
G	(undefined)	0	0%
Total		90	

Risk can be reduced by decreasing the PoF by repair, replacement, or refurbishment of an asset. Risk can also be reduced by decreasing the CoF through redundancy, relocation, insurance, or alarms. Typically, the most cost-effective means of reducing risk for aging assets is to reduce the PoF through infrastructure replacement projects. The assets with the greatest PoF and CoF are the assets with the greatest risk. These assets should be further evaluated to determine the best way to reduce the risk.

## 5.6.1 General Sullivan Well Site

Table 5-3 Observations and Recommended Improvements to the General Sullivan Well Site

Description	Room Area	Observation	Recommendation	Plan Year
<b>Priority Asset Improvements</b>				
Control Panel	Basement	Exposed control wiring.	Control wiring should be installed back in junction box and cover put on junction box.	2024
Disconnect - Unknown	Basement	No label saying what this disconnects	Label what this disconnect switch.	2024
Fence/Gate	Exterior	Barbed wire broken in some spots.	Replace two broken sections of barbed wire fence.	2024
Building	-	Exposed insulation. Railing is needed for stairs and landing over 28 inches, currently over 40 inches. Some conduit penetrations are not sealed. Sump hole in basement is open and a falling hazard.	Seal all conduit penetrations. Cover sump hole in basement. Install ceiling panels to cover exposed insulation. Install a removable railing to prevent falls and so chemical deliveries can still be made.	2024
<b>Predictive Asset Improvements</b>				
Metering Pump – Hydroxide	Lab	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Hypochlorite	Lab	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Bicarbonate	Lab	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Phosphate	Lab	Estimated renewal date.	Replace in kind.	2030
pH Meter	Lab	Estimated renewal date.	Replace in kind.	2031
Electric Unit Heater	Lab	Estimated renewal date.	Replace in kind.	2031
Water Meter	Basement	Estimated renewal date.	Replace in kind.	2032
Fire Extinguisher	Lab	Estimated renewal date.	Replace in kind.	2032
Laptop	Lab	Estimated renewal date.	Replace in kind.	2032

**Total Estimated Cost: \$158,900**

## 5.6.2 Porter Well Site

Table 5-4 Observations and Recommended Improvements to the Porter Well Site

Description	Room Area	Observation	Recommendation	Plan Year
<b>Priority Asset Improvements</b>				
VFD – Booster Pump No. 1	Treatment Building	Estimated renewal date.	Replace in kind.	2024
VFD – Booster Pump No. 2	Treatment Building	Estimated renewal date.	Replace in kind.	2024
Lab Building	-	Holes from woodpecker on edge trim. Louver is corroded.	Replace edge trim with PVC boards.	2024
Treatment Building	-	Corrosion on interior of door. Minor cracking in floor.	Replace corroded door.	2024
<b>Predictive Asset Improvements</b>				
VFD – Well No. 6 Pump	Lab	Estimated renewal date.	Replace in kind.	2026
pH Meter	Lab	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Muriatic Acid	Treatment Building	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Ferric Chloride	Treatment Building	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Hypochlorite	Treatment Building	Estimated renewal date.	Replace in kind.	2030
Metering Pump – Phosphate	Treatment Building	Estimated renewal date.	Replace in kind.	2030
Chlorine Analyzer	Lab	Estimated renewal date.	Replace in kind.	2032
Laptop	Lab	Estimated renewal date.	Replace in kind.	2032
Turbidity Analyzer	Lab	Estimated renewal date.	Replace in kind.	2032
Water Meter	Lab	Estimated renewal date.	Replace in kind.	2032
Fire Extinguisher	Treatment Building	Estimated renewal date.	Replace in kind.	2032
Pump - Old Chlorine	Lab	No longer used in treatment operations. Abandoned in place.	Abandoned in place. No recommendation at this time.	-
Piping - Old Chlorine System	Lab	No longer used in treatment operations. Abandoned in place.	Abandoned in place. No recommendation at this time.	-
Benzene Air Stripper	Treatment Building	Benzene levels are low so unit has not been needed but is still functional.	Decommission and remove system (Complete)	-
<b>Total Estimated Cost:</b>				<b>\$263,300</b>

## **5.7 Vertical Asset Management**

The following sections provide a brief overview of important information needed for managing assets in an organized manner.

### **5.7.1 Asset Registry**

The asset registry is the backbone of an effective Computer-based Maintenance Management System (CMMS) program. If an asset is not in the asset registry, it cannot be managed or tracked very easily. The asset registry lists assets and important asset information. A well-developed asset registry will include the following (if applicable):

- Asset ID number
- Asset description
- Serial number
- Model number
- Equipment class
- Manufacturer
- Material
- Size and Capacity
- Installation Date
- Service life
- Replacement cost
- Criticality ranking
- Warranty beginning and end date
- Equipment condition rating

The asset registry should be organized in a hierarchy that allows staff to report on the performance and cost impacts of assets quickly and effectively.

### **5.7.2 Asset Hierarchy**

An asset hierarchy is the logical organization of assets that supports effective condition and cost analyses for groups of assets. The asset hierarchy is typically built upon a series of ‘parent/child’ relationships. Asset hierarchies are set up to support both high-level CMMS decision-making and more immediate maintenance management decision-making.

Wright-Pierce has developed an asset hierarchy that encompasses RWSD’s assets.

The purpose of the asset hierarchy is to:

- Support CMMS reporting.
- Support maintenance cost reporting.
- Support related CMMS functionality, such as the ability to assign assets to work orders.
- Capture all water assets.
- Provide flexibility to add new assets in the future.

The asset numbering convention uses a series of codes that provide useful information about the asset. The asset number structure includes a facility number, a location number, a room number, an asset classification, and an identifying asset number. An example asset ID is 100-110-001-PP-01:

100 = Facility Number (Water Treatment Facilities)

110 = Location Number (General Sullivan Well Site)

101 = Room Number (Lab)

CF = Asset Classification (Chemical Feed)

01 = Asset Number (Metering Pump - Hydroxide)

This example (100-110-101-CF-01) is the asset ID for the hydroxide metering pump located in the lab room of the general well site building.

The complete asset hierarchy for RWSD is in [Appendix C](#).



## Section 6 Capital Improvement Plan

### 6.1 Objective

This section presents a compilation of the recommendations made throughout this report. The proposed recommendations are sequenced and summarized in a tabular capital improvement program (CIP) plan. The CIP offers a comprehensive approach to address the immediate and future needs to assure that the RWSD can provide reliable water service to their customers throughout the planning period of this study.

### 6.2 Overview of Findings

The following is a compilation of the short-term capital improvement recommendations to be included in the forthcoming Asset Management Plan. The proposed recommendations are sequenced and summarized in a tabular capital improvement program (CIP) plan to offer a comprehensive approach to address the District's immediate needs to assure sustainable and reliable water service to its customers.

In general, the system was found to be in serviceable condition. The water systems storage system is good condition and appropriately sized for current conditions. The General Sullivan Well Facility is in good condition but needs instrumentation upgrades to continue to effectively meet the needs of the District. The Porter Well Facility is in fair condition. Building, safety, and instrumentation upgrades are recommended in the short term and intermediate term. The District has put forth substantial effort to optimize the operation of the wells to ensure a consistent water quality in the distribution system. There are still areas in distribution where water quality does not meet the desired level of service (most notably in the Church St area). Multiple distribution improvements in the system are warranted to address current deficiencies. Specifically, improvements to the piping network are needed to improve hydraulic conditions and water quality for the District's customers.

### 6.3 Basis for Estimates of Probable Costs

The cost estimates for recommended projects are referenced to the May 2024 Engineering News Record 20 City average construction cost index of 13532.

Cost estimates for recommended water main projects are based upon an average unit prices for similar publicly bid and constructed projects (unless otherwise noted) which included the installation of water mains and appurtenances, services, trench paving and typical site restoration. The estimates do not account for site specific items such as ledge, unsuitable materials, temporary water needs, contaminated soil, or dewatering requirements. All the project costs listed include an additional 40% construction and engineering contingency which is intended to account for engineering design services, permitting efforts, and unanticipated changes which arise during construction.

Vertical construction projects such as pump stations, storage tanks, treatment facilities, PRVs, etc. were assigned a budgetary cost estimate that is intended to act as a placeholder for planning purposes. The cost estimates are based on the USA BlueBook and actual costs of similar equipment. If the utility has interest in pursuing these projects, detailed cost estimates would be developed during the design phase of planning.

These estimates were primarily developed for planning level budgeting and are generally reliable for determining the relative costs associated with equipment/water main replacement. To group proposed improvements into biddable projects, additional factors not easily defined for this planning level report would need to be considered during preliminary and final design (e.g., foundation conditions, owner selected features and amenities, building

code issues, bypass pumping, etc.). Contingency was included in the estimates to account for unknown design conditions. However, this contingency allowance may not be adequate in all circumstances.

### **6.3.1 Capital Improvement Program**

The purpose of the CIP is the following:

- To prioritize and schedule recommended improvements identified as part of this study.
- To position RWSD to meet the needs of the community.
- To sustain the viability of the water system infrastructure through routine maintenance and replacement programs.
- To meet current, pending, and future federal and state regulatory requirements.

The CIP presented is intended to be flexible and subject to adjustment and modification as required to respond to changes in demands and as water regulations are promulgated. Intermediate and long-term recommendations should be reviewed and re-evaluated periodically to assure that initial assumptions used to generate specific recommended projects remain relevant and accurate. The priority of improvements within each priority category should also be periodically reassessed with the District's budget to assure the highest priorities in the system are being addressed in any given year.

The District may need to shift the priority of projects in order to respond to the needs of the community and/or to take advantage of opportunities such as roadway reconstruction or drainage projects, which were either not known or could not be predicted within this study. A summary of short, medium, and long-term recommendations are presented in [Table 6-1](#). [Table 6-2](#) contains expected replacement dates and cost for vertical facility assets. All improvements have been assigned to one of the following three categories:

#### **6.3.1.1 Priority Improvements**

Priority Improvements are the highest priority projects which have been identified for completion over a five-year period of 2025 to 2027. These short-term improvements include projects which are needed to improve safety, reliability, water quality, regulatory requirements and meet the desired LOS in the distribution system.

#### **6.3.1.2 Predictive Improvements**

Predictive Improvements are tentatively scheduled to be completed between 2028 to 2035. These projects are generally intended to improve the hydraulic and fire flow capabilities of the distribution system while maintaining the desired LOS of the District including regulatory compliance. These projects do not inhibit immediate system performance, and generally include equipment anticipated to reach the end of their useful life within three to 10 years.

The following Priority Improvements (short term 1-2 years) and Predictive Improvements (long term 3–10 years) are recommended to correct the deficiencies identified.

### 6.3.2 Water Distribution Capital Recommendations

As previously noted within Section 4 and 5, specific water main improvements were identified based on the hydraulic modeling and risk analysis to allow the RWSD to meet their desired level of service goals.

The recommendations are divided into two categories, Priority Improvements (1-2 years) and Predictive Improvements (3-10 years). The Priority Improvements include projects which are needed to improve safety, reliability and meet the desired level of service in the distribution system. The Predictive Improvements include projects that have less of an immediate impact on performance and are part of an ongoing annual renewal effort to replace aging, unlined cast iron mains that are reaching the end of their useful life within the next three to 10 years. The general target is a 1% annual renewal rate, where 1% of the total system length is replaced annual to assure the distribution system is fully replaced every 100 years to improve and maintain reliability.

Considering that the RWSD water distribution system is comprised of approximately 9.2 miles of water main, an annual 1% replacement rate equates to approximately 480 LF of main. Using rates from the recent Locust Street replacement project it is estimated that the cost to replace a linear foot of water main in the RWSD is \$550, resulting in an annual replacement cost of \$264,000, and a total estimated \$2.6 million replacement cost over year 3 through 10 of the predictive improvement period. Without outside funding, this renewal rate may be difficult to maintain.

The District may need to shift the priority of projects to respond to the needs of the community and/or to take advantage of funding opportunities or project synergies such as Town road reconstruction projects, which were either not known or could not be predicted as part of this effort. It is important that the District revisit the recommendations yearly to reprioritize, schedule and budget recommended projects as need arises.

However, based on the previous Asset Management Report the Predictive Improvements replacement program was limited to the ongoing replacement of known Cast Iron Pipes in the system. With the short term (year 1 through 2) and medium term (year 3 through 10) improvement projects, and replacement projects undergone since the 2019 Asset Management Plan, it is estimated that there is a remaining 3,425 LF CI mains in the system, resulting in an estimated total cost of \$3.5 million between 2035 and 2054.

**Table 6-1** presents the Priority Improvements (1-2 years) and Predictive Improvements (3–10 years) recommended for water main renewals.

Table 6-1 Water Main Renewal Recommendations

Description	Location	Observation	Recommendation	Plan Year
<b>Priority Asset Improvements</b>				
Front and South Street Main Replacement	1,400 LF	Replace 4-inch and 6-inch Cast Iron Water Main	Replace with 8-inch PVC Water Main (Completed)	2024
Second and Cross Street	550 LF	Ongoing annual renewal program; replaces aging cast iron water main, improves hydraulics and system reliability.	Replace with 8-inch PVC Water Main (Completed)	2024
Third Street	475 LF	Ongoing annual renewal program; replaces aging cast iron water main, improves hydraulics and system reliability.	Replace with 8-inch PVC Water Main (Completed)	2024
<b>Predictive Asset Improvements</b>				
Church Street, Washington, Franklin, Pleasant	2100 LF	Ongoing annual renewal program; replaces aging cast iron 6-inch main, improves hydraulics and system reliability. System bottlenecks where Cross St crosses RR. Low flow and water quality complaints observed in these areas.	Replace with lined ductile iron, PVC, or HDPE main. Includes two railroad crossings. Looping this water main to Front St will improve the reliability of this portion of the water system.	2027-2034
Front St	500 LF	Replace existing main.	Replacement of existing main and extension to Cross St for improvements to reliability of the water system.	2027-2034
Lower Mill	350 LF	Ongoing annual renewal program; replaces aging cast iron 4-inch main, improves hydraulics and system reliability.	Replace with lined ductile iron, PVC, or HDPE main of diameter 8-inch or greater.	2027-2034
Foundry	475 LF	Ongoing annual renewal program; replaces aging cast iron 6-inch main, improves hydraulics and system reliability.	Replace with lined ductile iron, PVC, or HDPE main of diameter 8-inch or greater. Replace from South to Main Street.	2027-2034
Fourth Street	475 LF	Ongoing annual renewal program; replaces aging cast iron 6-inch main, improves hydraulics and system reliability.	Replace with lined ductile iron, PVC, or HDPE main of diameter 8-inch or greater. (Late in planning cycle as this road was recent repaved)	2027-2034
<b>Total Estimated Cost: \$3.8 Million</b>				

### 6.3.3 Vertical Asset Capital Recommendations

Specific recommendations for each facility were summarized in this section. Estimated costs are provided, on a near-term (1-2 years) and medium-term (3-10 years) basis, also known as Priority and Predictive Asset Improvements, respectively.

The total estimated project cost for the Recommended Capital Improvement Plan (CIP) over the 10-year planning period is approximately \$2.8 million. This is a planning level budgetary cost estimate and will need to be reviewed and updated annually or as needed by RWSD over the course of the upgrade program. It is recommended that each proposed improvement project be reevaluated before beginning the design, as changes in scope can occur over the course of the 10-year plan.

The timing of the improvements in the CIP is based on our review of the probability of failure, consequence of failure, and the risk matrix developed. This represents an appropriate process to prioritize the projects in the Plan. This CIP should be coordinated with other ongoing work. The proposed 10-Year Capital Improvement Plan is shown in [Table 6-2](#).

This report provides planning level budgets for proposed improvements to help RWSD plan future capital improvements. The prioritized asset improvement list presented in this report is based on Wright-Pierce's engineering expertise and experience and should not be considered financial advice.

**Table 6-2 Vertical Asset Replacement Schedule (2025-2034)**

Location	Fiscal Year										Priority (Yr 1-2)	Predictive (Yr 3-10)
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034		
General Well Site	\$16,000	-	-	-	-	-	-	\$115,300	\$19,200	\$8,400	\$16,000	\$142,900
Porter Well Site	\$63,000	-	-	\$29,000	-	-	-	\$129,700	-	\$40,700	\$63,000	\$200,300
Total	\$79,000	-	-	\$29,000	-	-	-	\$245,000	\$19,200	-	\$79,000	343,200

### 6.3.4 Water Storage Capital Recommendations

No significant capital investment in the water storage tank is recommended during the planning period. Budgeting for continued periodic 3<sup>rd</sup> party inspections and overall site maintenance of the tank and site should be incorporated into the RWSD operating budget.

### 6.3.5 Water Service Meter Replacement Considerations

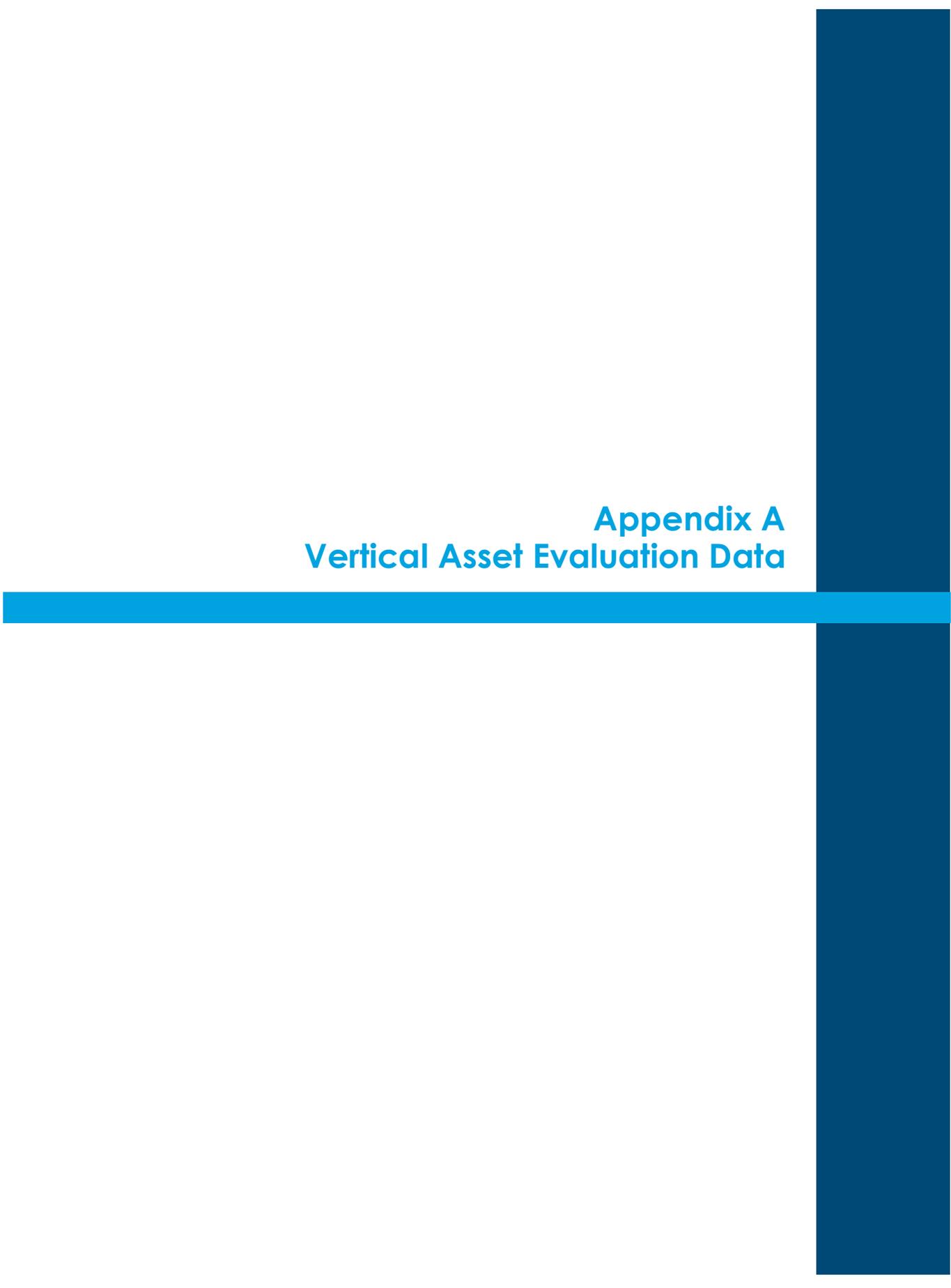
As part of the Front and South St water main replacement project, the District budgeted for the purchase of \$200,000 worth of water meters. RWSD intends to install these service meters in 2025. The cost of these meters is incorporated into the Front and South St water main replacement project. With the installation of these meters, the District will improve its meter reading capabilities, decreasing the amount of staff time required to read meters and improving the level of service that it provides to its customers.

### 6.4 Financial Evaluations and Deliverables

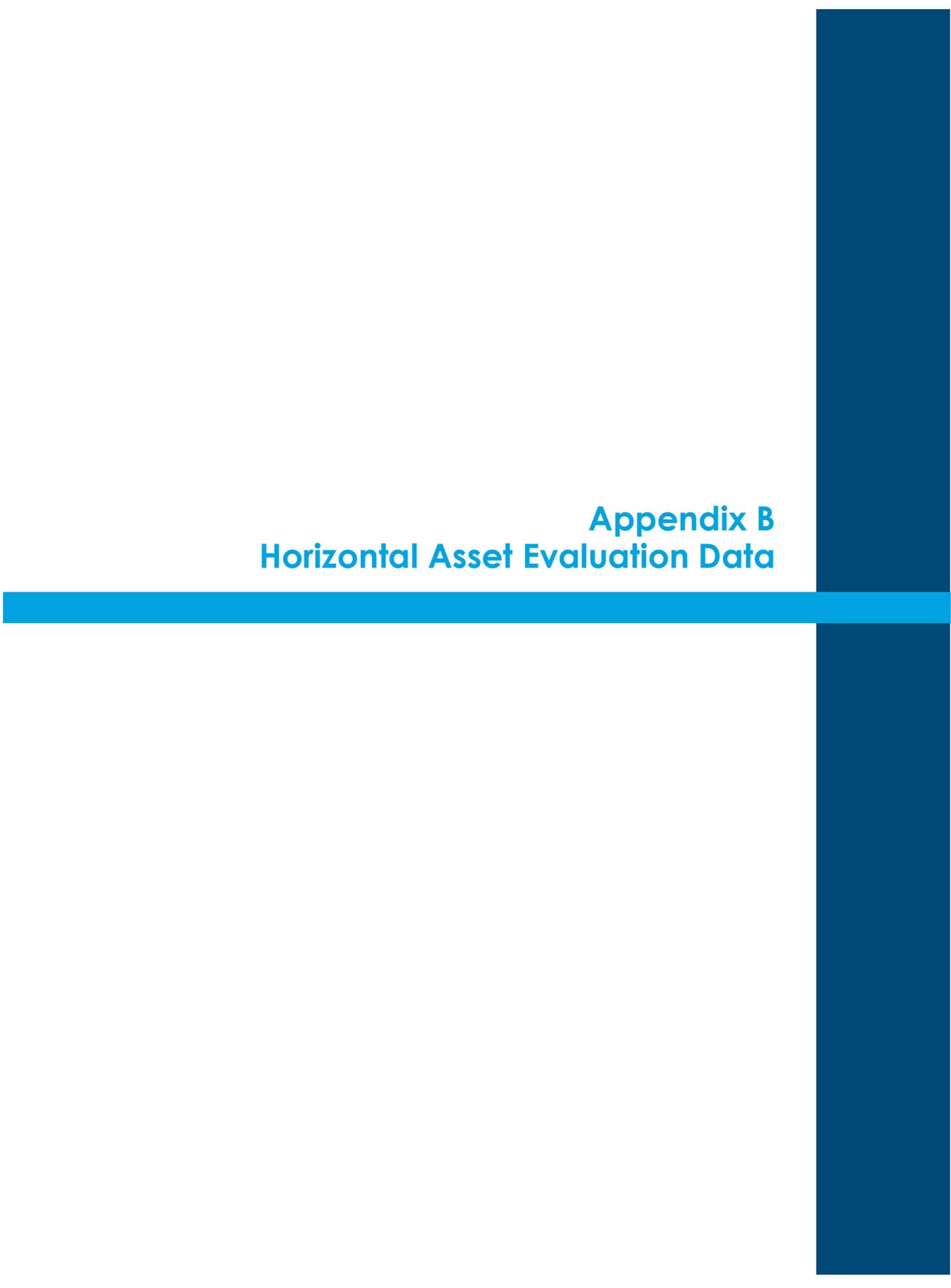
The AMP included a *Financial Implementation Plan*, *Financial Review of Cost of Service*, and *Water Rate Study* which were completed by Raftelis (subconsultant) and are included as a memo in [Appendix D](#).

The Financial Implementation Plan (FIP) incorporates RWSD’s projected income and operating expenses along with the improvement projects listed in the CIP. The Financial Review of Cost of Service examined the historic operating and future project costs along with the FIP to determine the true cost of service for the District. Lastly, the Water Rate Study reviewed existing water rates along with the true cost of service and proposed an appropriate rate structure and cost.

**Appendix A**  
**Vertical Asset Evaluation Data**



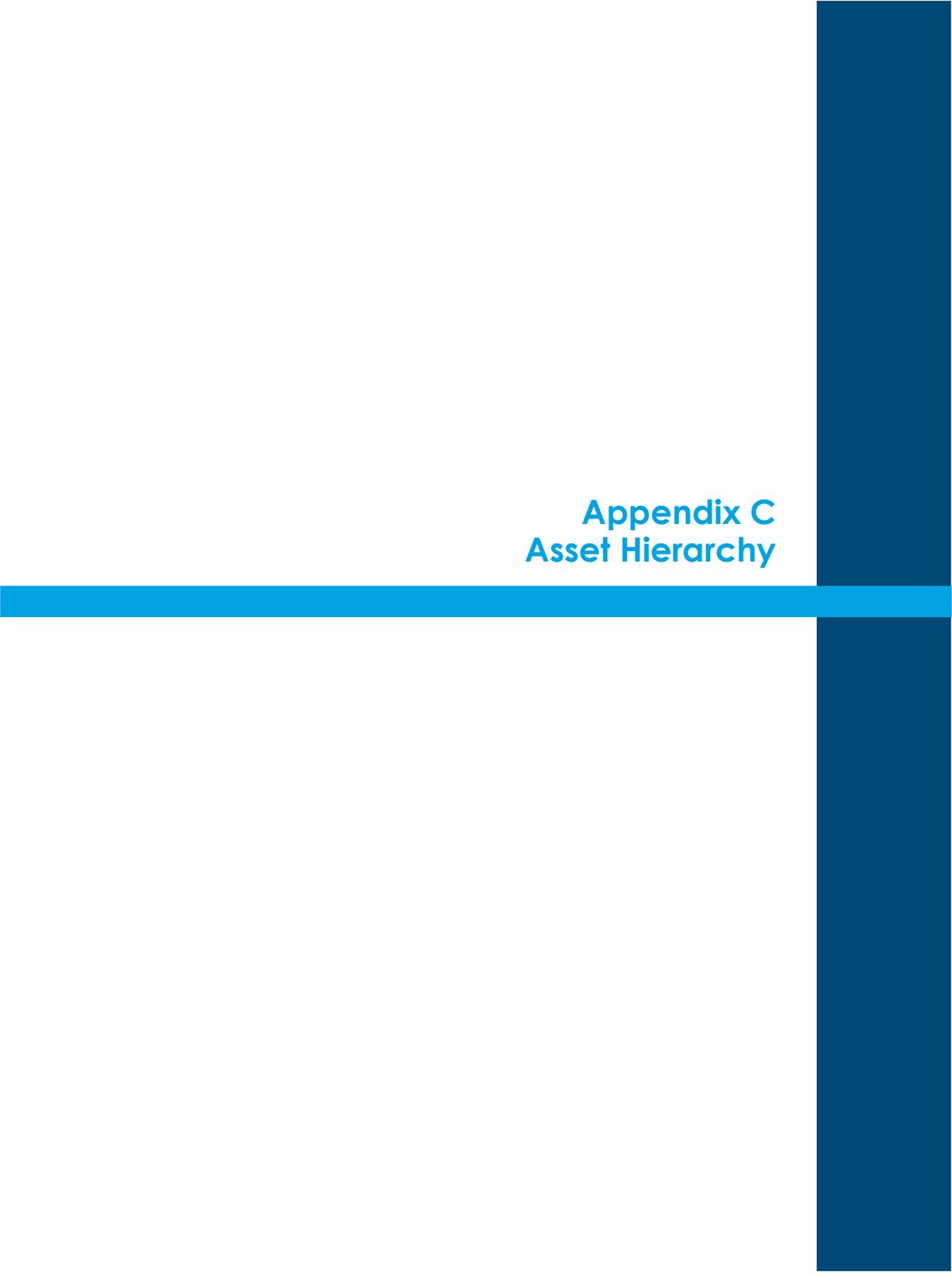
**Appendix B**  
**Horizontal Asset Evaluation Data**



Water Distribution System Business Risk Exposure Matrix

2024

Street	Segment	Asset Life Consumed (0-1)	Asset Life Consumed	Material	Static Pressure	Likelihood of Failure	Business Interruption	Traffic Issues	Fire Flow Disruption	Consequence of Failure	Business Risk Exposure (LoFxCof)
Beccaris	Main to Pine	0.54	5.4	2	2	3.4	1	2.5	7	4.4	14.7
Church	Main to Jessie Doe	0.64	6.4	5	3	5.0	5	2.5	10	6.9	34.1
Church	Trans. Sta. Rd. to Pleasant	0.64	6.4	2	2	3.8	1	2.5	5	3.4	12.7
Church	Pleasant to Washington	0.64	6.4	2	2	3.8	1	2.5	5	3.4	12.7
Cottage	Gen Sullivan to End	0.34	3.4	5	2	3.5	1	10	5.5	19.0	
Cricket	Silver St. to End	0.54	5.4	5	3	4.6	1	10	5.5	25.1	
Doherty	Stockdale Cir. to End	0.24	2.4	5	2	3.1	1	10	5.5	16.8	
Foundry	Locust to South	0.54	5.4	2	3	3.7	5	2.5	7	5.4	19.7
Foundry	South to Main	0.64	6.4	2	3	4.1	5	2.5	5	4.4	17.8
Fourth	South to Main	0.64	6.4	2	3	4.1	5	1	5	4.0	16.2
Franklin	Washington to End	0.64	6.4	5	3	5.0	1	10	5.5	27.3	
Front	South to Main	0	0	1	3	1.2	5	5	7	6.0	7.2
Front	Main to Church	0	0	1	3	1.2	5	5	7	6.0	7.2
Gen Sullivan	#79 to Woodland	0.34	3.4	5	3	3.8	1	2.5	10	5.9	22.1
Gen Sullivan	Woodland to Cottage	0.54	5.4	2	2	3.4	1	2.5	7	4.4	14.7
Gen Sullivan	Cottage to Roberts	0.54	5.4	2	2	3.4	1	2.5	7	4.4	14.7
Jessie Doe	Prospect to End	0.34	3.4	2	2	2.6	5	2.5	10	6.9	17.6
Locust	Pine to Foundry	0.54	5.4	2	3	3.7	5	2.5	7	5.4	19.7
Locust	Pine to Willey	0.01	0.1	1	3	1.2	5	2.5	7	5.4	6.7
Locust	Willey to Stevens Ct.	0.01	0.1	1	3	1.2	5	2.5	7	5.4	6.7
Locust	Stevens Ct. to Main	0.01	0.1	1	2	0.9	1	2.5	7	4.4	4.1
Lower Mill	End to South	0.64	6.4	2	4	4.4	5	1	3	3.0	13.1
Main	Rollins to Beccaris	0.34	3.4	1	2	2.3	1	5	10	6.5	14.7
Main	Beccaris to Stockdale Cir.	0.34	3.4	1	2	2.3	1	5	10	6.5	14.7
Main	Stockdale Cir. to Settlement Cir.	0.34	3.4	1	2	2.3	1	5	10	6.5	14.7
Main	Settlement Cir. To Prospect	0.34	3.4	1	2	2.3	5	5	10	7.5	17.0
Main	#521-547 to Locust	0.44	4.4	5	2	3.9	1	5	10	6.5	25.1
Main	Locust to Foundry	0.64	6.4	5	3	5.0	5	5	10	7.5	37.2
Main	Foundry to Front	0.64	6.4	5	3	5.0	5	5	10	7.5	37.2
Partridge	Beccaris to End	0.54	5.4	2	2	3.4	1	1	7	4.0	13.4
Pine	Silver to Beccaris	0.54	5.4	2	3	3.7	1	2.5	7	4.4	16.0
Pine	Beccaris to Prospect	0.54	5.4	2	3	3.7	1	2.5	7	4.4	16.0
Pine	Prospect to Locust	0.54	5.4	2	3	3.7	1	2.5	7	4.4	16.0
Prospect	Pine to Willey	0.01	0.1	1	3	1.2	1	2.5	7	4.4	5.4
Prospect	Willey to Main	0.01	0.1	1	2	0.9	1	2.5	7	4.4	4.1
Roberts	Gen Sullivan to #17	0.54	5.4	2	2	3.4	1	5	10	6.5	21.8
Roberts	#17 to Silver St.	0.54	5.4	2	2	3.4	5	5	7	6.0	20.2
Rollins	Silver St. to Main	0.34	3.4	1	2	2.3	1	5	10	6.5	14.7
Second	South to Main	0.64	6.4	2	3	4.1	5	1	5	4.0	16.2
Settlement Cir.	Main to End	0.24	2.4	5	2	3.1	1	10	5.5	16.8	
Silver Ln.	Silver St. to Gen Sullivan	0.54	5.4	2	2	3.4	1	1	7	4.0	13.4
Silver St.	Roberts to Rollins	0.54	5.4	2	2	3.4	5	2.5	7	5.4	18.1
Silver St.	Rollins to Silver Ln.	0.54	5.4	2	2	3.4	1	2.5	7	4.4	14.7
Silver St.	Silver Ln. to Pine	0.54	5.4	2	2	3.4	1	2.5	7	4.4	14.7
Silver St.	Pine to Cricket	0.54	5.4	2	3	3.7	1	2.5	7	4.4	16.0
Silver St.	Cricket to End	0.54	5.4	2	3	3.7	1	2.5	7	4.4	16.0
South	Foundry to Fourth	0	0	1	3	1.2	1	2.5	7	4.4	5.3
South	Fourth to Third	0	0	1	3	1.2	1	2.5	7	4.4	5.3
South	Third to Second	0	0	1	3	1.2	5	2.5	7	5.4	6.5
Spruce	Locust to Prospect	0.64	6.4	5	2	4.7	1	1	10	5.5	25.6
Stevens Ct.	Locust to End	0.44	4.4	5	2	3.9	1	1	10	5.5	21.2
Stockdale Cir.	Main to Main	0.44	4.4	5	2	3.9	1	1	10	5.5	21.2
Third	South to Main	0.64	6.4	2	3	4.1	5	1	5	4.0	16.2
Washington	Church to End	0.64	6.4	2	5	4.7	5	1	5	4.0	18.6
Water	Trans. Sta. Rd. to End	0.64	6.4	2	2	3.8	1	1	7	4.0	15.0
Willey	Locust to Prospect	0.64	6.4	2	2	3.8	5	2.5	7	5.4	20.2
Woodland	Gen Sullivan to End	0.54	5.4	5	3	4.6	1	1	10	5.5	25.1



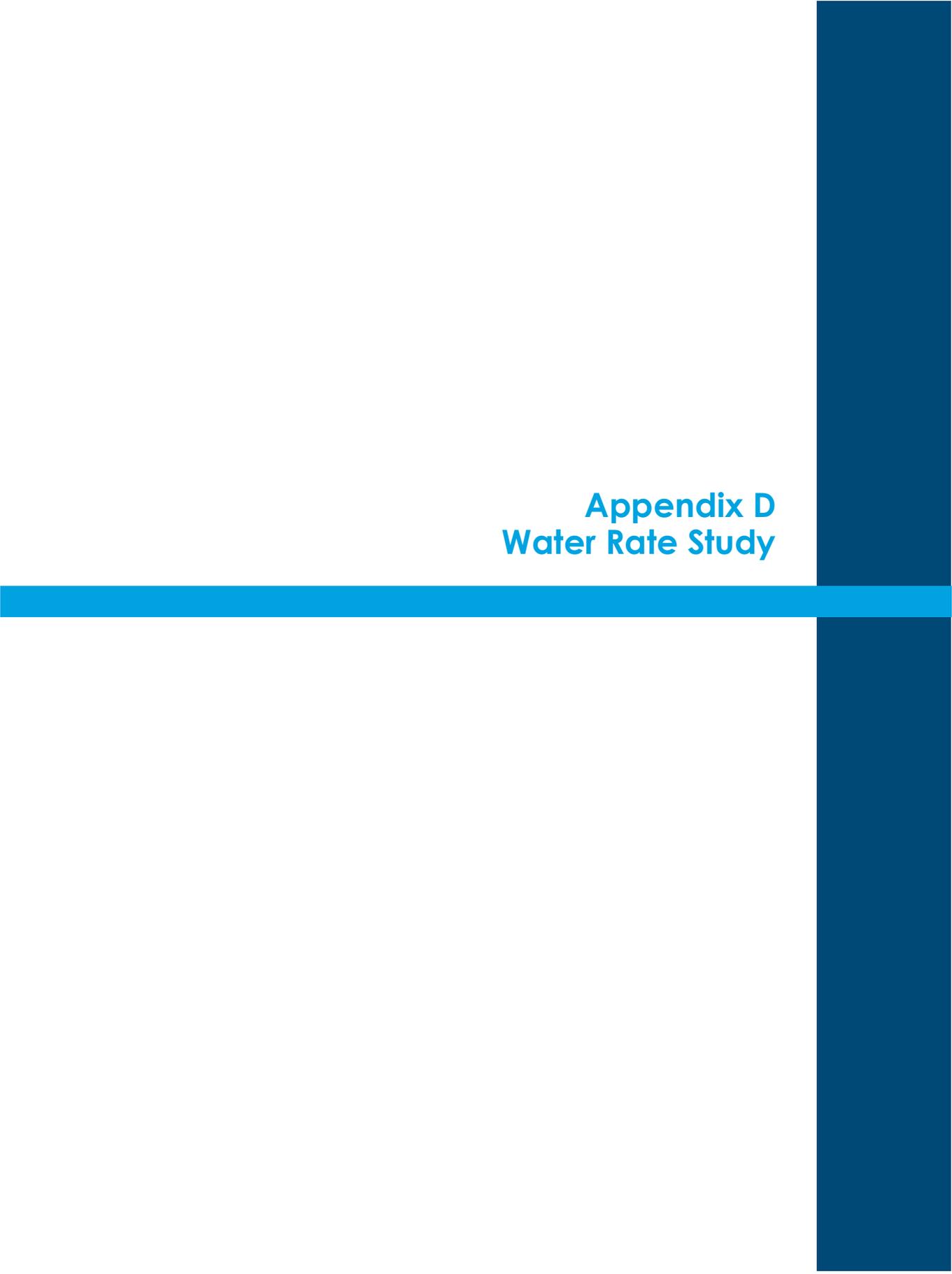
## Appendix C Asset Hierarchy

## Facility/Room Numbering Guide

Rollinsford Water and Sewer District					
Location		Facility		Room	
No.	Description	No.	Description	No.	Description
<b>100</b>	<b>Water Treatment Facilities</b>				
		110	General Sullivan Well Site		
				001	Basement
				101	Lab
				EXT	Exterior
				R01	Roof
		120	Porter Well Site		
				101	Lab
				102	Treatment Building
				EXT	Exterior
				R01	Roof
<b>200</b>	<b>Distribution System</b>				
		201	Water Main		
		202	Hydrants		
		203	Valves		
		204	Service Connections		
		205	Storage Tank		
<b>300</b>	<b>Vehicles</b>				
		301	Maintenance		
		302	Operations		

# Asset Classification List

EQUIPMENT PREFIX	EQUIPMENT NAME	EQUIPMENT PREFIX	EQUIPMENT NAME	EQUIPMENT PREFIX	EQUIPMENT NAME
AB	AERATION BASIN	FS	FUEL LEVEL SYSTEM	PW	PLOW
AC	AIR COMPRESSOR	FT	FLOAT	RB	RETENTION BASIN
AD	AUTO DIALER	FW	FLOW ELEMENT	RD	ROTARY DRUM THICKENER
AE	AERATOR	FX	FIRE EXTINGUISHER	RM	ROOM
AN	ANALYTICAL ELEMENT (D.O., GAS, ETC.)	GC	GRIT CLASSIFIER	RT	RTU
AR	AIR RELIEF	GB	GEARBOX	RW	RESILIENT WEDGE GATE VALVE
AS	ALARM SYSTEM	GG	GAUGE	SA	SAFETY EQUIPMENT/GEAR
AT	ACTUATOR	GM	GAS METER (CONFINED SPACE)	SB	SNOW BLOWER
BB	BLOCK BUILDING OR STRUCTURE	GN	GENERATOR	SC	SCREW PUMP
BC	BATTERY CHARGER	GP	GRAVITY PIPE	SD	SCADA SYSTEM
BF	BACKFLOW PREVENTER	GR	GRINDER/COMMUNUTOR	SE	SCALE
BL	BLOWER	GS	GROUNDS	SF	SUPPLY FAN
BN	BAR SCREEN	GV	GRIT VORTEX	SG	SLIDE GATE
BO	BOILER	HD	HYDRANT	SI	SWITCH (CONTROL)
BP	BELT FILTER PRESS	HE	HEAT EXCHANGER	SL	SEWER LATERAL
BS	BUBBLER SYSTEM	HF	HARMONIC FILTER	SM	SAMPLER
BT	GRAVITY BELT THICKENER	HO	CRANE/HOIST	SO	SILO
BV	BACK PRESSURE VALVE	HQ	HEAVY EQUIPMENT	SP	SURGE PROTECTOR
BY	BUTTERFLY VALVE	HV	HVAC	SR	SOLAR ARRAY
CB	CATCH BASIN (SS-Sanitary Sewer, SW-Stormwater)	HY	HYDRAULIC SYSTEM	SS	SWALE
CF	CHEMICAL FEED SYSTEM	IC	INSTRUMENTATION AND CONTROL	ST	MOTOR STARTER
CG	CENTRIFUGE	KG	KNIFE GATE	SV	WATER SERVICE
CI	CHILLER	KN	KITCHEN EQUIPMENT	SW	SWITCH GEAR
CL	CLARIFIER	LB	LAB EQUIPMENT	SY	SECURITY SYSTEM (VIDEO/CARD ACCESS/INTRUSION)
CM	CLARIFIER MECHANISM (PLOW AND RAKES)	LE	LEVEL ELEMENT	TA	TRANSFER FAN
CO	CONTROL PANEL	LG	LAGOON	TB	TRAVELING BRIDGE
CR	CONVEYOR	LI	LIGHTING/LIGHTING SYSTEM	TE	TEMPERATURE ELEMENT
CS	CONCRETE STRUCTURE	LM	LAMELLA	TF	TRICKLING FILTER
CU	COMPUTING UNIT (SERVER/WORKSTATION/OIT COMPUTER)	LP	LIGHTING PANEL	TH	TROUGH
CV	CHECK VALVE	LV	LOUVER	TK	TANK, BASIN, FLOW STRUCTURE, STORAGE
CY	HYDROCYCLONE	LW	LAWN MOWER	TM	TRANSMITTER
DF	DIFFUSER/DIFFUSER SYSTEM	MC	MCC PANEL	TP	WW TREATMENT PLANT
DH	DEHUMIDIFIER	MH	MANHOLE (SS-Sanitary Sewer, SW-Stormwater)	TR	TRANSDUCER
DI	DIGESTER	MN	MAINTENANCE/TOOLS	TS	TRANSFER SWITCH
DP	DAMPER	MO	MOTOR	TX	TRANSFORMER
DR	DRIVE (MOTOR AND GEARBOX)	MP	MISCELLANEOUS PROCESS EQUIPMENT	UH	UNIT HEATER
DS	DROP SHAFT	MT	METER	UP	UPS
DT	DISCONNECT	MX	MIXER	UV	UV DISINFECTION SYSTEM
DW	DRY WELL	NW	INTERNET SYSTEM/ROUTER (NET WORK)	VA	VALVE
EF	EXHAUST FAN	OD	OVERHEAD DOOR	VB	VIBRATION ELEMENT
EL	EMERGENCY LIGHTING	OE	OFFICE EQUIPMENT	VD	VARIABLE SPEED DRIVE
EP	ELECTRIC PANEL	OR	OILER	VE	VEHICLE
ES	ELECTRICAL SYSTEM	OS	ODOR CONTROL SYSTEM	VP	VALVE PIT
EW	EYE WASH/SHOWER	OT	OUTLET	VR	VOLTAGE REGULATOR
FB	FECAL BATH	PE	PRESSURE ELEMENT	WA	WASH PRESS
FC	FORCE MAIN	PF	PARSHALL FLUME	WH	WATER HEATER
FG	FENCE/GATE	PI	PIPING	WL	WELL OR WELL HOUSE
FH	FUME HOOD	PL	PLC	WP	WATER PLANT
FI	FILTER	PM	PHASE MONITOR	WW	WET WELL
FL	FLIGHTS	PP	PUMP	XA	GENERAL ALARM ELEMENT
FM	FLOWMETER	PR	PRESSURE REDUCING VALVE	YS	WYE STRAINER
FN	FURNACE	PS	PUMPING STATION	ZE	POSITION (DIMENTION) ELEMENT
FP	FIBER OPTIC PATCH PANEL	PV	PLUG VALVE		



**Appendix D**  
**Water Rate Study**

# Rollinsford Water & Sewer District

## Water & Wastewater Rate Study

Final Report / June 21, 2024

September 2, 2024

Mr. Ray McNeil  
Superintendent  
Town of Rollinsford  
5 Lower Mill Road  
Rollinsford, NH 03869

Subject: 2024 Water & Wastewater Rate Study

Dear Mr. McNeil:

Raftelis is pleased to provide this final report documenting our process and results of the 2024 Water & Wastewater Rate Study for the Rollinsford Water & Sewer District. If you have any questions or need any additional information, please do not hesitate to contact me at (774) 243-0619 or [dfox@raftelis.com](mailto:dfox@raftelis.com). It has been a pleasure working with you and the District, and we thank you for the support provided during this project.

Sincerely,

A handwritten signature in black ink, appearing to read 'David Fox', with a stylized flourish at the end.

**David Fox**  
Vice President  
Raftelis  
24 Superior Drive, Suite 107  
Natick, MA 01760

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# 1. Introduction

Raftelis Financial Consultants, Inc. (Raftelis) was engaged by the Rollinsford Water & Sewer District (District) to perform a Water and Wastewater Rate Study (Study). This report details the Study and its conclusions.

## 1.1. Scope of Services

The main goals of this study were to assess the appropriateness of the District's current water and sewer rates in comparison to the District's financial objectives and to develop a forecast of water and sewer rates and charges to fund current and future operating and capital needs. Specifically, Raftelis was tasked to:

1. Evaluate revenue sufficiency and recommend rates that recover the necessary revenues to meet existing and future operating and capital revenue requirements;
2. Evaluate current financing practices for water and sewer, current debt levels, and existing projections of debt issuance;
3. Provide a user-friendly, non-proprietary, financial planning and rate model, designed for ongoing use by District staff.

Raftelis held several in-person and virtual meetings with District staff to identify the District's primary objectives and financial goals. During these meetings, it was determined that the District prioritized revenue sufficiency, revenue stability, and the minimization of customer impacts.

Raftelis has developed a financial planning and rate model to forecast annual revenue requirements (costs), customer demand, rates, and system revenues over a multi-year planning period. The model allows the District to analyze its current financial position and the future impacts of the recommended program of rate adjustments to the system and its customers, as well as alternative rate structures in future years.

## 2. Rate Study Process

Raftelis utilizes a systematic approach for rate setting which was tailored to the District's goals and objectives. The first step in the rate-setting process was the identification of financial objectives, which occurred during a project kick-off meeting with District staff. During this meeting, it was determined that the District prioritized rate and financial goals of revenue sufficiency, revenue stability, and the minimization of customer impacts.

The next step in the rate-setting process was the development of a financial plan, which summarizes the revenue requirements and projected revenues for a five-year planning period, fiscal years (FY) 2025 through FY 2028. The financial plan projects revenue shortfalls under the District's existing rates and indicates the additional level of revenues necessary to support the projected revenue requirements.

Revenue requirements include all operations and maintenance (O&M) costs, capital costs (including debt service payments and other cash funded capital), and any other need for purposes of maintaining financial viability.

After the financial plan was developed, the process of calculating rate increase adjustments to recover the revenue shortfall identified in the financial plan began. Based on information provided during the kick-off meeting and subsequent correspondence, the District's primary goal for the rate study was financial sufficiency and meeting all capital costs, while minimizing economic impact on its customer base. The District also did not want to modify the water and sewer rate structures at this time given the exacerbated customer impacts. Raftelis developed rate recommendations to address these objectives.

## 3. Financial and Rate Plan

The next step in the rate-setting process was the development of a financial plan, which includes establishing a forecast of revenue requirements, determining the necessary revenue increases using demand projections, and examining the forecasted operating results over the five-year forecast period (FY 2024 to FY 2028).

### 3.1. Revenue Requirements

Revenue requirements refer to the District's annual costs that must be recovered through annual revenues. The first major task in establishing a financial plan is developing an understanding of the revenue requirements of a utility over the forecast period. Revenue requirements are comprised of cash-based expenses including: operations and maintenance (O&M) expenses, annual debt service payments, cash-funded capital, and contributions to reserves, as necessary.

#### 3.1.1. Operating and Maintenance Expenses

O&M expenses represent normal, recurring expenses necessary to sustainably operate and maintain the system during the District's annual accounting cycle, which is a Fiscal Year ending June 30th. The 2023 operating budget and 2024 operating budget were provided to Raftelis by District staff and serve as the baseline for the projection of utilities operating costs.

To develop a five-year forecast of system operating costs and account for growing utility costs and inflation, escalation factors are used for each major operating expense category. These escalation factors resulted in an increase of approximately 1.5% and 12.5% for the water and sewer systems, respectively, to revenue requirements in FY 2024. The predominant source of these increases is due to increasing operations expenses and cash-funded capital. In the fiscal years thereafter, the average O&M expenses for water and sewer are forecasted to increase by approximately 2.6% to 4.4% annually.

The District's budgeted revenue requirements and forecasted revenue requirements for the five-year period through FY 2028 are presented in Table 1 and Table 2 below.

**Table 1 – Water Revenue Requirements from FY 2023 to FY 2028**

Water Revenue Requirements	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Operations	\$ 315,069	\$ 355,577	\$ 366,244	\$ 377,231	\$ 388,548	\$ 400,205
Contracted Services	3,621	3,620	3,729	3,840	3,956	4,074
Utilities	30,103	30,263	31,171	32,106	33,069	34,061
Other	12,041	12,970	13,359	13,759	14,172	14,597
Cash Funded Capital	-	25,000	25,000	25,000	25,000	25,000
Debt Service	101,510	41,676	71,157	50,319	78,142	78,142
<b>Total: Revenue Requirements</b>	<b>\$ 462,344</b>	<b>\$ 469,105</b>	<b>\$ 510,659</b>	<b>\$ 502,256</b>	<b>\$ 542,887</b>	<b>\$ 556,079</b>

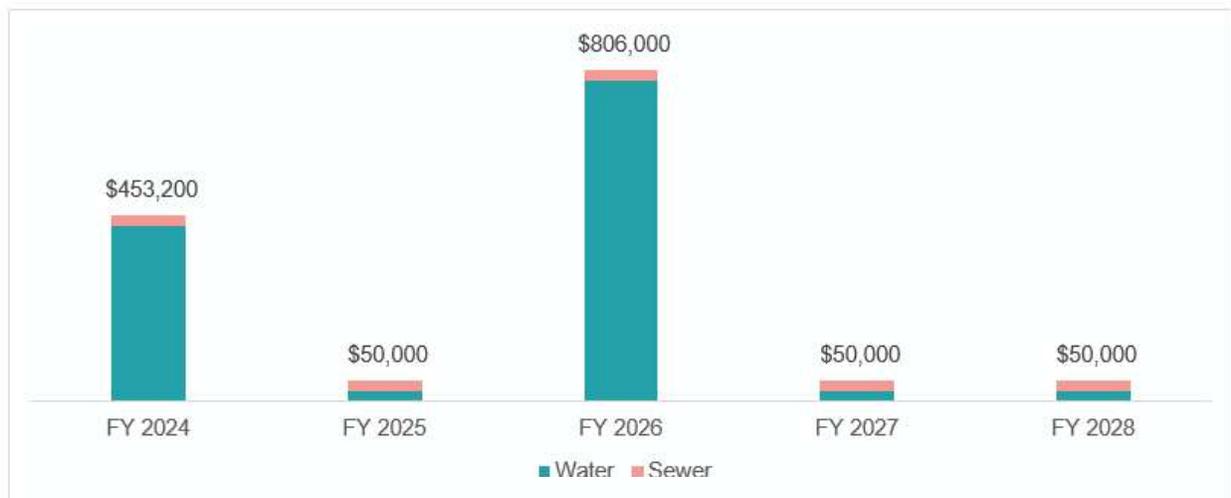
**Table 2 – Sewer Revenue Requirements from FY 2023 to FY 2028**

Sewer Revenue Requirements	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Operations	\$ 349,861	\$ 390,955	\$ 402,684	\$ 414,764	\$ 427,207	\$ 440,023
Contracted Services	63,749	68,150	70,195	72,300	74,469	76,703
Utilities	31,100	31,386	32,328	33,298	34,297	35,326
Other	4,741	7,370	7,591	7,818	8,053	8,295
Cash Funded Capital	-	25,000	25,000	25,000	25,000	25,000
Debt Service	60,639	51,039	51,532	51,602	51,639	50,770
<b>Total: Revenue Requirements</b>	<b>\$ 510,090</b>	<b>\$ 573,900</b>	<b>\$ 589,329</b>	<b>\$ 604,783</b>	<b>\$ 620,665</b>	<b>\$ 636,117</b>

### 3.1.2. Capital Improvement Plan

A significant part of the District's future costs is its capital improvement plan. The District provided Raftelis its latest plan, which projects infrastructure investments through FY 2028. The District plans to spend between \$50,000 and \$806,000 per year to address infrastructure needs. Figure 1 below shows the planned capital spending, separated into water and sewer fund spending.

**Figure 1– Capital Improvement Plan Spending from FY 2024 through FY 2028**



The District also identified its plans for financing these improvements. Water system improvements will utilize cash (PAYGO), and low-interest SRF loans. Sewer system improvements will utilize PAYGO funds.

Table 3 shows a summary of the funding mechanisms for the District's capital improvement plan.

**Table 3 – Funding Sources for Rollinsford’s Capital Improvement Plan**

	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>
<b>Water Capital Funding</b>					
<i>Cash (PAYGO)</i>	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000
<i>Debt (Utility)</i>	-	-	-	-	-
<i>Debt (SRF)</i>	403,200	-	756,000	-	-
<i>Subtotal: Water Capital Funding</i>	<u>\$ 428,200</u>	<u>\$ 25,000</u>	<u>\$ 781,000</u>	<u>\$ 25,000</u>	<u>\$ 25,000</u>
<b>Sewer Capital Funding</b>					
<i>Cash (PAYGO)</i>	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000
<i>Debt (Utility)</i>	-	-	-	-	-
<i>Debt (SRF)</i>	-	-	-	-	-
<i>Subtotal: Sewer Capital Funding</i>	<u>\$ 25,000</u>	<u>\$ 25,000</u>	<u>\$ 25,000</u>	<u>\$ 25,000</u>	<u>\$ 25,000</u>
<b>Total: Capital Funding</b>	<b>\$ 453,200</b>	<b>\$ 50,000</b>	<b>\$ 806,000</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>

### 3.2. Existing Rates and Revenues

The District’s revenues come principally from user fees and rates. Because of this, a rate study necessarily must examine customer trends to estimate future revenues. Raftelis was given access to historical billing data to examine customer water usage patterns. Raftelis has taken a conservative view by assuming in our forecast that the number of accounts and consumption will remain steady over the forecast period, although annual fluctuations are expected.

The District’s existing rates are shown in Table 4 and Table 5 below. Both water and sewer rate structures have a volumetric and quarterly meter service charge component

**Table 4 – Current FY 2023 Water Rates**

<b>Water Rates (Quarterly)</b>	<b>Current</b>
<u>Volumetric Rate (per Kgal)</u>	
All Customers	\$ 7.20
<u>Minimum Charge</u>	
5/8"	\$ 83.00
1"	\$ 207.00
1 1/2"	\$ 413.00
2"	\$ 660.00

**Table 5 – Current FY 2023 Sewer Rates**

Sewer Rates (Quarterly)	Current
<u>Volumetric Rate (per Kgal)</u>	
All Customers	\$ 14.00
<u>Minimum Charge</u>	
5/8"	\$ 95.00
1"	\$ 237.00
1 1/2"	\$ 509.00
2"	\$ 759.00

### 3.2.1. Financial Health Under the *Status Quo* – No Rate Increase

If the District continues to operate under the *status quo*, an unsustainable financial position is created for the water and sewer funds. This assumes the required funding of all revenue requirements as described in this report and that the current (FY 2023) rates stay the same through FY 2028.

As shown in the figures below, if rate increases are not approved, or conversely, if the District does not reduce its projected costs, which it cannot do without compromising clean and reliable service for the District's residents, while maintaining its regulatory compliance, the financial health of the water and sewer utilities will deteriorate. Unfortunately, the District's water and sewer funds do not have adequate reserve fund levels to offset the required rate increases, as can be seen by the water and sewer reserve fund balances approaching zero or going negative over the forecast period. This is an unworkable financial situation that must be avoided.

Figure 2 – Water Cashflow Under Existing FY 2023 Rates

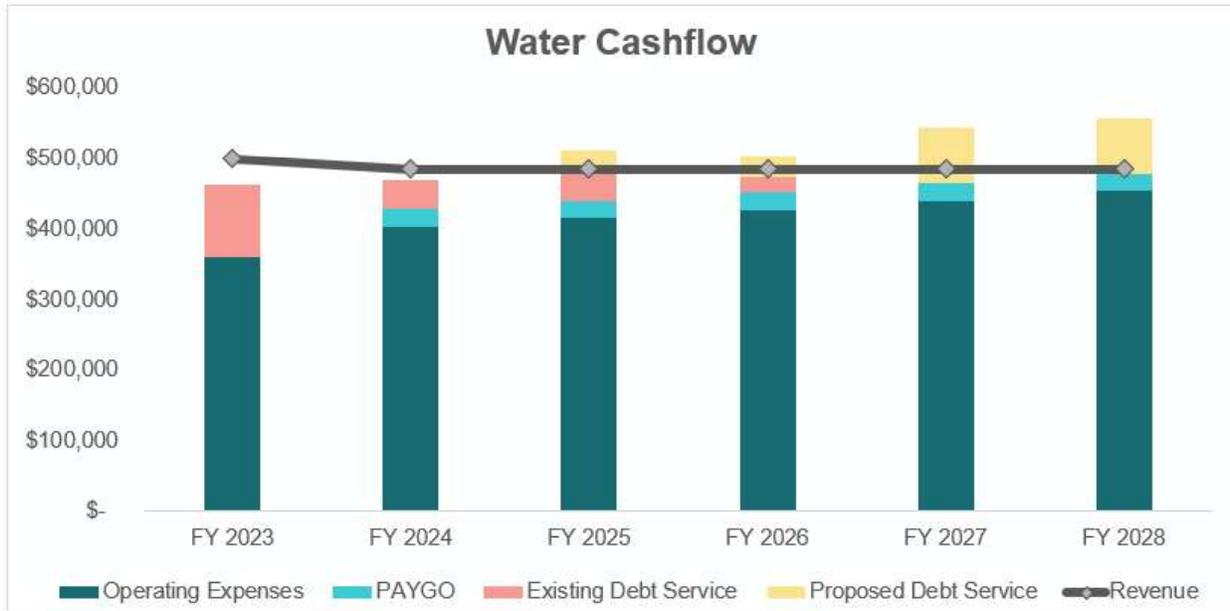


Figure 3 – Water Fund Balance Under Existing FY 2023 Rates

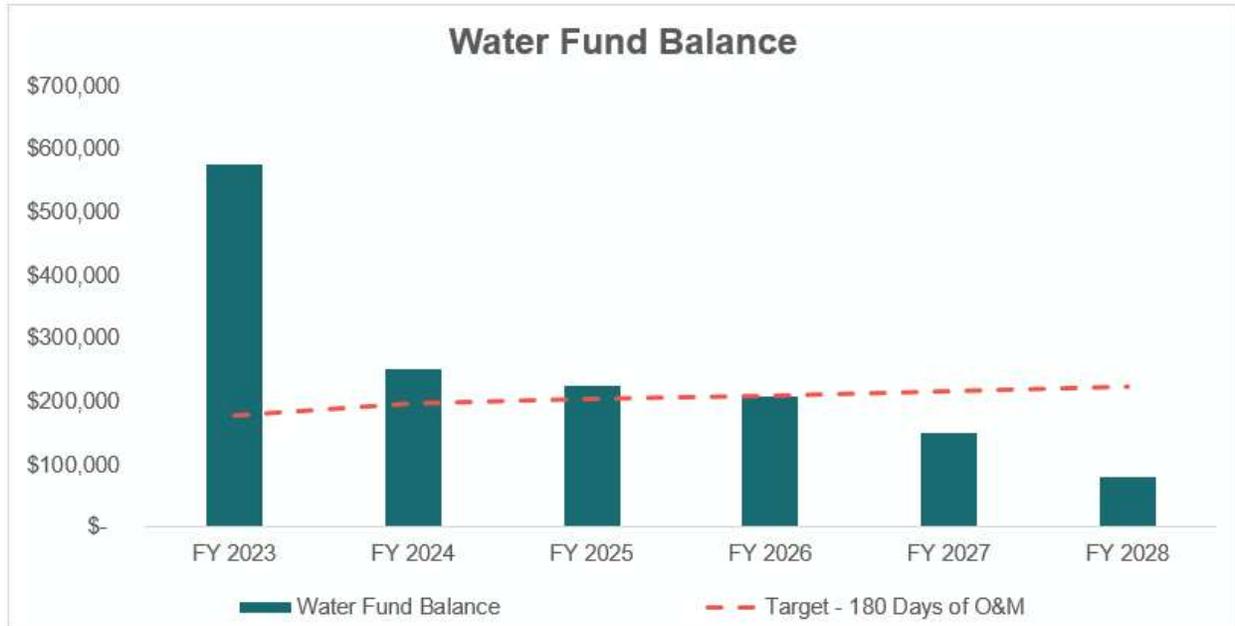


Figure 4 – Sewer Cashflow Under Existing FY 2023 Rates

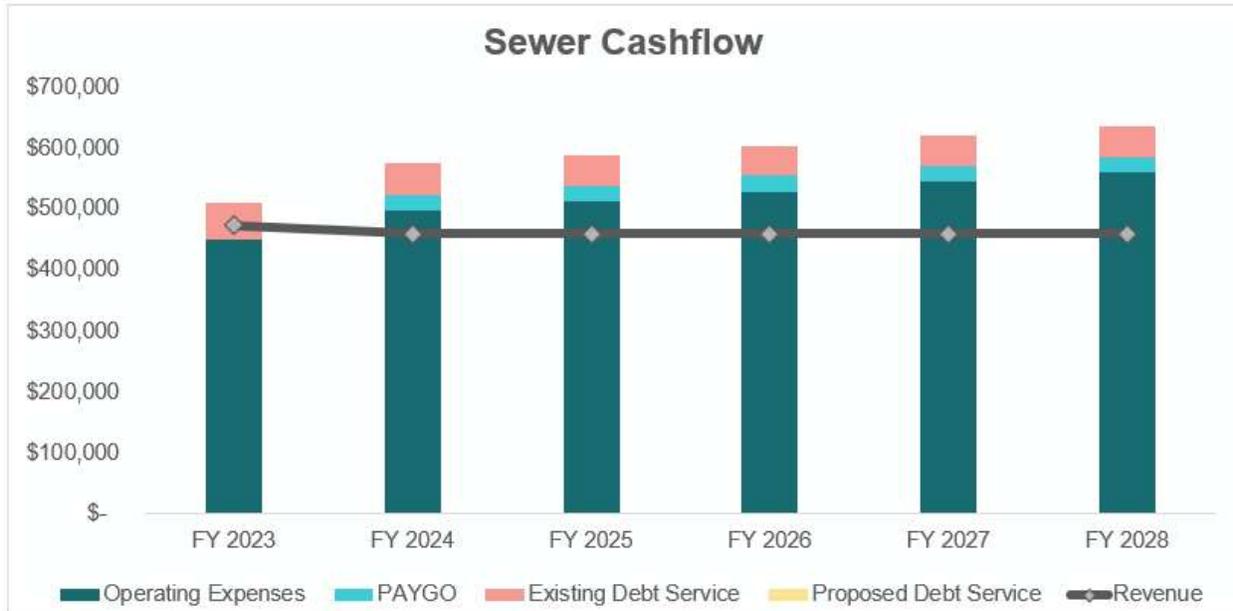
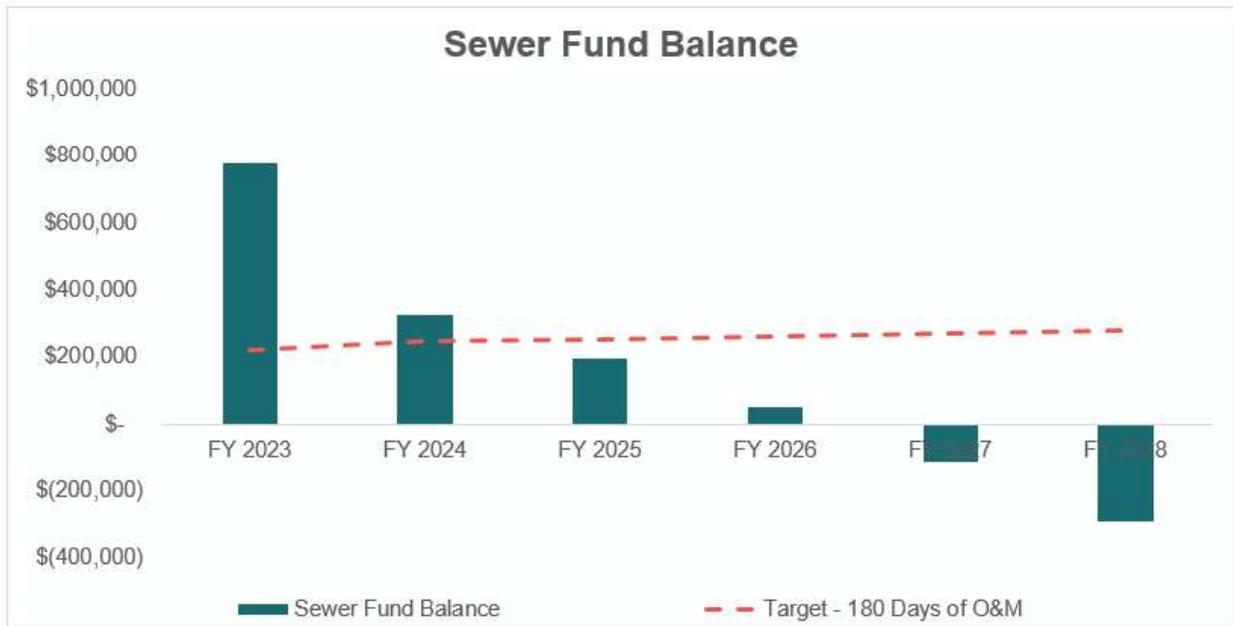


Figure 5 – Sewer Fund Balance Under Existing FY 2023 Rates



### 3.3. Recommended Financial Plan

Raftelis has examined the water and sewer funds’ financial situation as described above and proposes rate increases that would guide the utilities to a healthier financial footing.

Raftelis recommends the rate increases over the next 5 years as shown in Table 6. These rate increases were designed, in conjunction with District staff, to do the following:

1. Fund all proposed revenue requirements, including the District's water and sewer capital improvements plan, as detailed in this report.
2. Generate a consistent operating surplus for the water and sewer funds.
3. Continue establishing an adequate amount of reserves over time for financial viability purposes.

**Table 6 – Recommended Rate Increases Assuming Existing Rate Structures**

<b>Rate Increases</b>	<b><u>FY 2024</u></b>	<b><u>FY 2025</u></b>	<b><u>FY 2026</u></b>	<b><u>FY 2027</u></b>	<b><u>FY 2028</u></b>
Water	2.00%	2.00%	2.00%	2.00%	2.00%
Sewer	8.00%	8.00%	8.00%	8.00%	8.00%
Fire	2.00%	2.00%	2.00%	2.00%	2.00%

The above rate increases begin in FY 2024 with a 2.0% across-the-board water rate increase, an 8.0% across-the-board sewer rate increase, and a 2.0% fire rate increase. All rate increases are assumed to take effect January 1<sup>st</sup> of each year to coincide with the District's fiscal year.

Figure 6 through Figure 9 below are cashflow and fund balance charts of the water and sewer utilities finances from fiscal year 2024 (projected year-end) through 2028 if the recommended rate increases are adopted. As can be seen, a majority of the revenue requirements are due to operating expenses, with the remaining coming from existing and future debt service payments and PAYGO. The water fund is projected to run a slight surplus throughout the forecast period. The sewer fund is projected to run a slight deficit until FY 2025, at which point it is projected to run a slight surplus through the remainder of the forecast period, supported by the rate increases as presented in Table 6. The water fund balance is projected to exceed the target level by the end of the forecast period. However, the sewer fund balance is not projected to reach the target level by the end of the forecast period. The sewer rate increase required to do so would lead to rate shock on customers. By operating in a financial sufficient manner, the utility's funds will be on a much stronger financial footing and can slowly build their reserve fund balances up over time.

Figure 6 – Water Cashflow Under Recommended Rate Increases

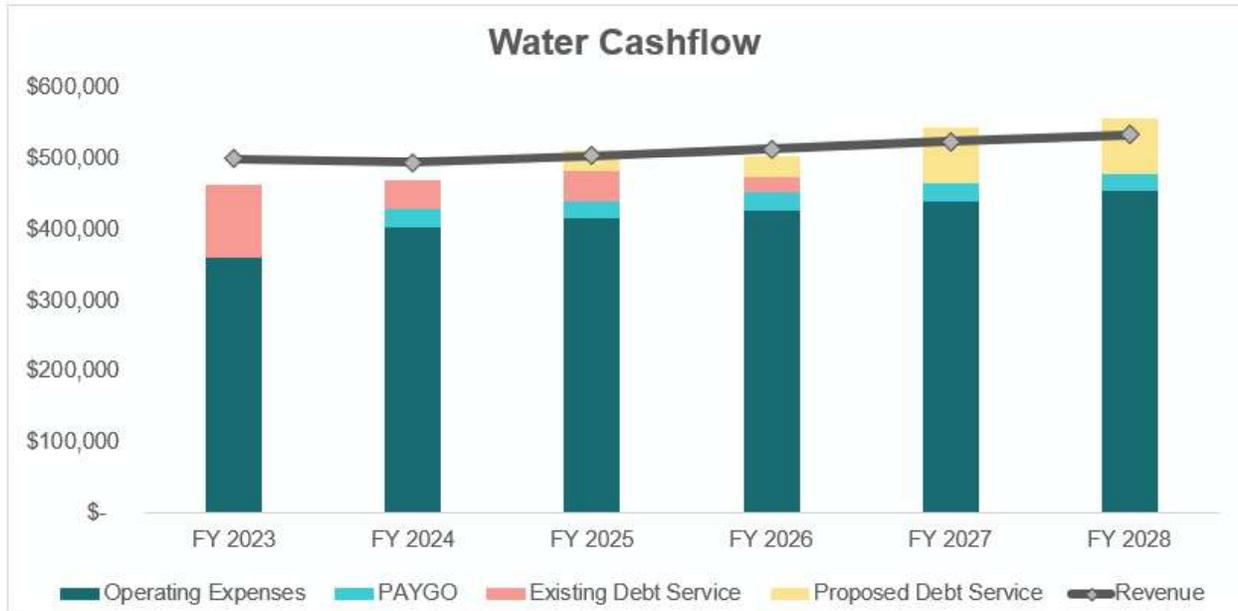


Figure 7 – Water Fund Balance Under Recommended Rate Increases

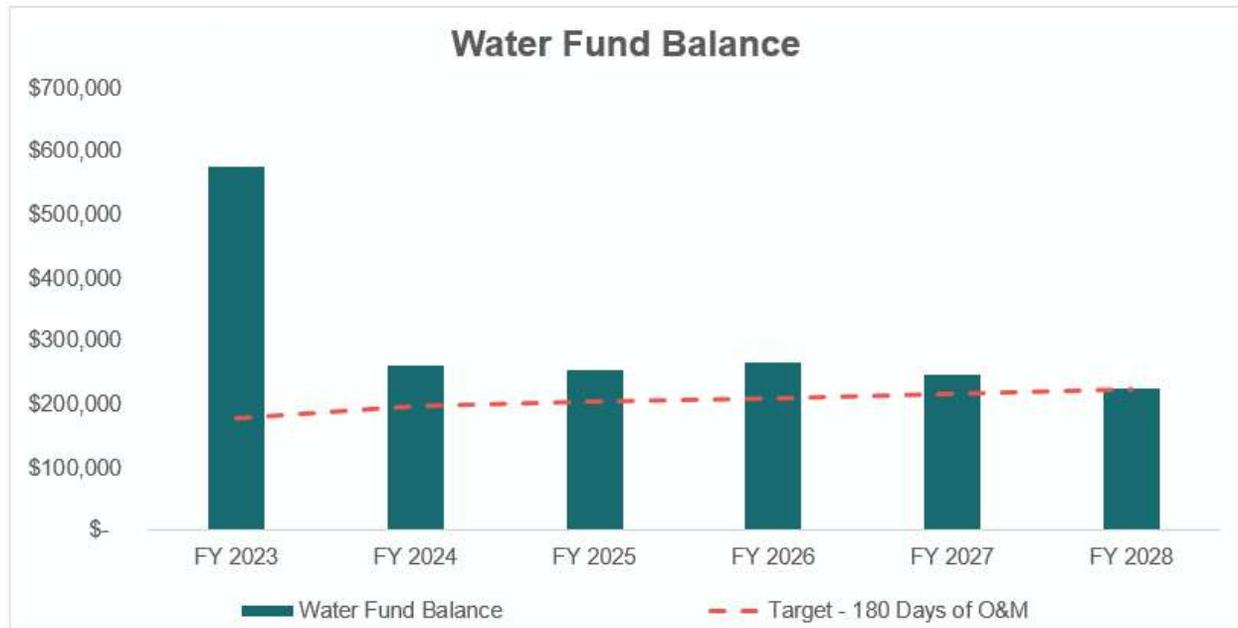


Figure 8 – Sewer Cashflow Under Recommended Rate Increases

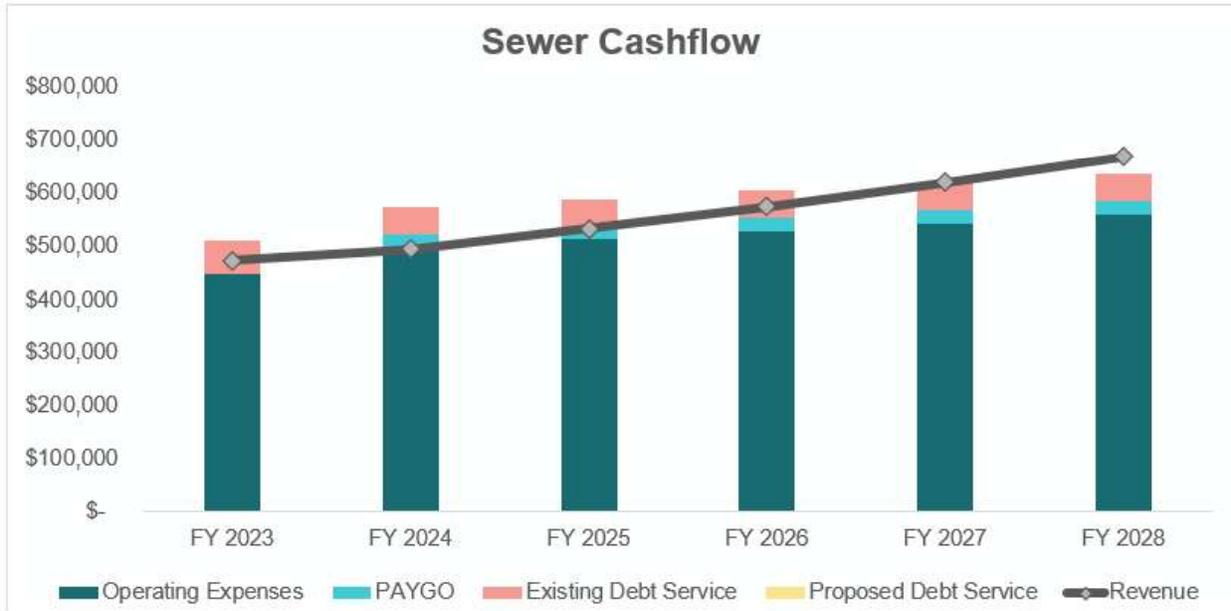
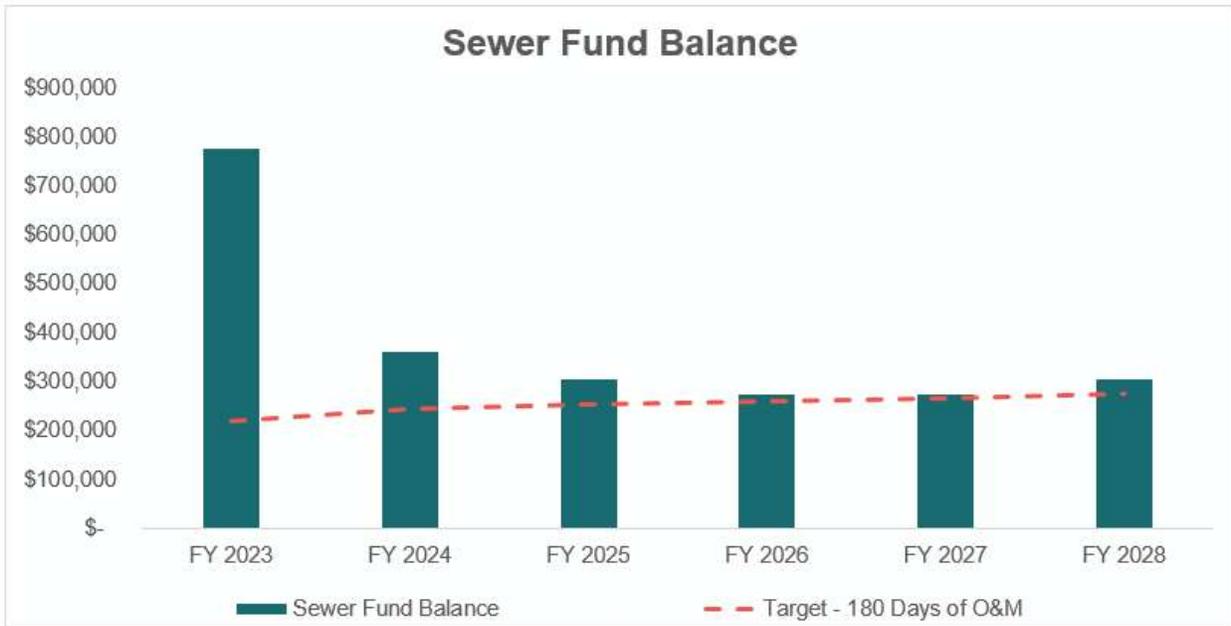


Figure 9 – Sewer Fund Balance Under Recommended Rate Increases



### 3.4. Customer Impacts and Affordability

The proposed rate increases for FY 2024 shown in Table 6 will have impacts on customers. While relying on the District’s existing rate structure, a single-family residential customer with consumption of 11

thousand gallons (Kgal) / Quarter will see an increase in their quarterly combined water and sewer bill from \$411.20 to \$434.36.

The proposed customer rate schedules can be viewed in Table 7 through Table 8 below.

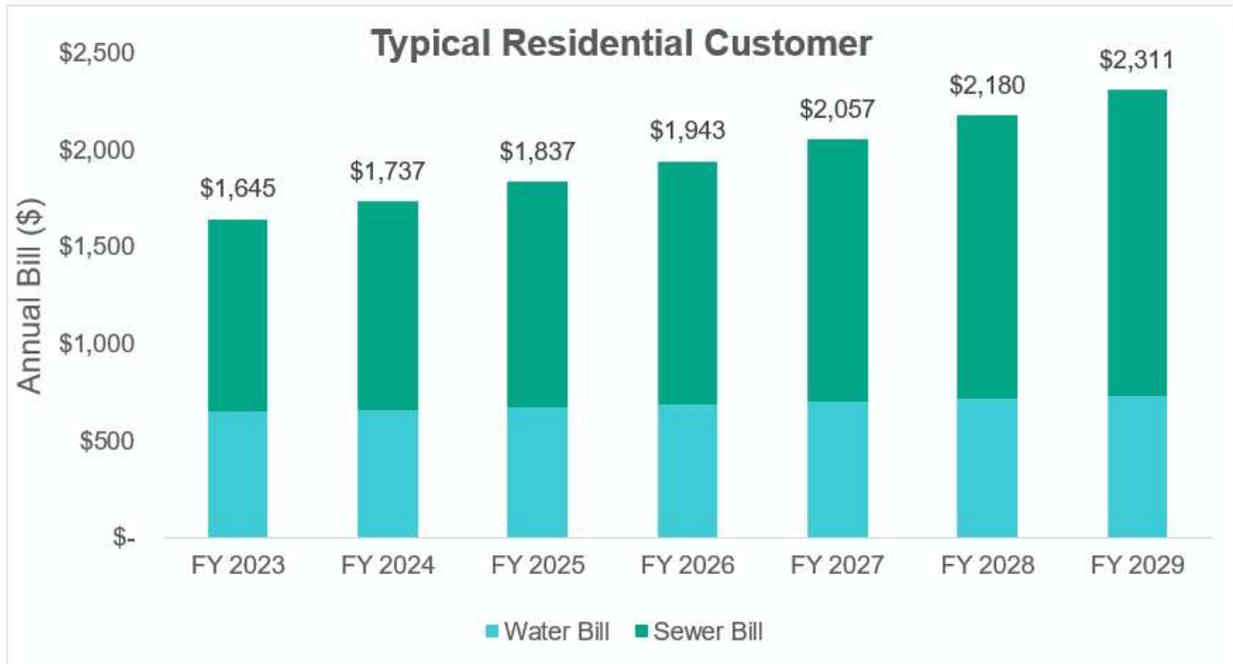
**Table 7 – Proposed Water Rates**

<b>Water Rates (Quarterly)</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>
<u>Volumetric Rate (per Kgal)</u>					
All Customers	\$ 7.34	\$ 7.49	\$ 7.64	\$ 7.79	\$ 7.95
<u>Minimum Charge</u>					
5/8"	\$ 84.66	\$ 86.35	\$ 88.08	\$ 89.84	\$ 91.64
1"	\$ 211.14	\$ 215.36	\$ 219.67	\$ 224.06	\$ 228.54
1 1/2"	\$ 421.26	\$ 429.69	\$ 438.28	\$ 447.04	\$ 455.99
2"	\$ 673.20	\$ 686.66	\$ 700.40	\$ 714.41	\$ 728.69

**Table 8 – Proposed Sewer Rates**

<b>Sewer Rates (Quarterly)</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>
<u>Volumetric Rate (per Kgal)</u>					
All Customers	\$ 15.12	\$ 16.33	\$ 17.64	\$ 19.05	\$ 20.57
<u>Minimum Charge</u>					
5/8"	\$ 102.60	\$ 110.81	\$ 119.67	\$ 129.25	\$ 139.59
1"	\$ 255.96	\$ 276.44	\$ 298.55	\$ 322.44	\$ 348.23
1 1/2"	\$ 549.72	\$ 593.70	\$ 641.19	\$ 692.49	\$ 747.89
2"	\$ 819.72	\$ 885.30	\$ 956.12	\$ 1,032.61	\$ 1,115.22

Figure 10 – Average Annual Bill; 11 Kgal/Quarter, 5/8” Meter



Annual Combined Water and Sewer Bill \$ Change by Year						
	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029
<b>Annual \$ Change</b>	\$ 92.66	\$ 99.29	\$ 106.44	\$ 114.14	\$ 122.45	\$ 131.40
<b>Quarterly \$ Change</b>	\$ 23.16	\$ 24.82	\$ 26.61	\$ 28.54	\$ 30.61	\$ 32.85
<b>Monthly \$ Change</b>	\$ 7.72	\$ 8.27	\$ 8.87	\$ 9.51	\$ 10.20	\$ 10.95
<b>Daily \$ Change</b>	\$ 0.25	\$ 0.27	\$ 0.29	\$ 0.31	\$ 0.34	\$ 0.36

## 4. Conclusions & Recommendations

Based on the review of Rollinsford's water and sewer financial data as presented in this report, Raftelis has arrived at the following conclusions and recommendations:

Raftelis recommends that the District consider the financial plan established in this report and implement rate increases to begin planning for increased operating expenses and capital needs. The financial plan recommendations include a rate increase beginning in FY 2024 with a 2.0% across-the-board water rate increase and an 8.0% across-the-board sewer rate increase. The water and sewer rates will increase by the same percentage each year throughout the forecast period. All rate increases are assumed to take effect January 1<sup>st</sup> of each year to coincide with the District's fiscal year.

On March 26, 2024, Raftelis presented its findings to the Rollinsford District Commission. The Board unanimously voted in favor of the recommended rate increases.

We would be remiss to not mention that there are often differences between the forecasted and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material. We recommend that the District continually monitor the immediate five-year financial plan in order to maintain a proactive approach to financial planning and rate setting. Upon completion of the Study, Raftelis will provide District staff with the final Rate Model. The Rate Model was developed in Microsoft Excel, built and designed specifically for the District, and is designed for continued use by the District as a financial planning tool. The Rate Model provides the flexibility to analyze various financial operating and capital scenarios and the impacts that these scenarios have on the utility rates. It should provide the road map that will keep the District on the path to long-term, sustainable financial health.



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