ASSET MANAGEMENT PLAN UPDATE

March 2021

Hooksett Village Water Precinct
Hooksett, NH

TATA & HOWARD

Asset Management Plan Update
Hooksett Village Water Precinct
Hooksett, New Hampshire

March 2021

Prepared by

TATA & HOWARD

TATA & HOWARD

March 29, 2021

Mr. Mike Heidorn, Superintendent
Hooksett Village Water Precinct
7 Riverside Street
Hooksett, NH 03106

Subject: Asset Management Plan Update
Hooksett Village Water Precinct
T&H No. 6525

Dear Mr. Heidorn:

In accordance with our agreement, Tata & Howard is pleased to present this Asset Management Plan Update for the Hooksett Village Water Precinct water distribution system. The Asset Management Plan completed by Tata & Howard in May 2020 discussed the need to develop a hydraulic model for further investigation of the system with the potential of reprioritizing those improvements recommended based solely on asset management criteria. The analysis and improvements in this report are based on the Three Circles Approach for optimum capital efficiency, which combines hydraulic and critical component considerations with an asset management rating system to evaluate the condition of the water mains in the distribution system. Supply and storage needs were also evaluated in this report.

A hydraulic model using field flow tests was developed to identify hydraulic recommendations developed as part of this study. Critical areas of the system were identified and evaluated in the hydraulic model for redundancy. Finally, the previous asset evaluation completed by Tata & Howard in May 2020 was incorporated with this new analysis. The results were combined to determine the water mains most in need of replacement and establish a prioritized set of improvements in the system. A detailed description of the improvements and estimated costs is presented in Section 7.

During the course of this project, the undersigned served as Project Officer, Mr. Yogesh Jitoo, P.E. served as Project Manager, Ms. Jenna O'Connell served as Assistant Project Engineer, and Ms. Justine Carroll, P.E. provided technical reviews.

Tata & Howard
67 Forest Street | Marlborough, MA 01752
T: 508-303-9400 | F: 508-449-9400
www.tataandhoward.com

Other Offices
MA | NH | CT | VT | AZ

At this time, we wish to express our continued appreciation to the Precinct for their participation in this study and for their help in collecting information and data. We appreciate the opportunity to assist the Precinct on this important project.

Sincerely,

TATA & HOWARD, INC.

Jenna Rzasa, P.E.
Co-President

TABLE OF CONTENTS

Letter of Transmittal

Section - Description	Page
SECTION 1 – Executive Summary	1
1.1 General	1
1.2 Water Supply Evaluation	1
1.3 Water Storage Evaluation	1
1.4 System Hydraulics	2
1.5 Critical Components	2
1.6 Asset Management	2
1.7 Distribution System Evaluation	3
1.8 Implementation of System Improvements	3
SECTION 2 – System Description and Operations	4
2.1 System Description	4
2.2 Water Supply Sources	4
2.3 Water Storage Facilities	7
2.4 Interconnections	8
SECTION 3 – Water System Demands	9
3.1 General	9
3.2 Water System Demands	9
3.3 Adequacy of Existing Water Supply Sources	11
3.4 Adequacy of Existing Water Storage Facilities	12
SECTION 4 – Hydraulic Evaluation	16
4.1 General	16
4.2 Model Verification	16
4.3 Adequacy of Existing Distribution System	18
4.4 Hydraulically Deficient Areas	19
SECTION 5 – Critical Component Assessment	22
5.1 General	22
5.2 Evaluation Criteria	22
5.3 Critical Components	22
SECTION 6 – Asset Management Considerations	25
6.1 General	25
6.2 Evaluation Criteria	25
6.3 Asset Management Areas of Concern	27
SECTION 7 – Recommendations and Conclusions	28
7.1 General	28
7.2 General Recommendations	28
7.3 Prioritization of Water Distribution System Improvements	30
7.4 20-Year Improvement Plan	38

LIST OF TABLES

Table - Description	Page
Table No. 3-1 Well Withdrawal Volumes	11
Table No. 4-1 Flow Test Results	17
Table No. 4-2 ISO Hydrant Flow Summary May 2016	19
Table No. 5-1 Critical Areas	24
Table No. 6-1 Asset Management Grading System	26
Table No. 7-1 Prioritization of Improvements – Phase I	35
Table No. 7-2 Estimated Improvement Cost – Phase I	35
Table No. 7-3 Prioritization of Improvements – Phase II	36
Table No. 7-4 Estimated Improvement Cost – Phase II	36
Table No. 7-5 Estimated Improvement Cost – Phase III	37
Table No. 7-6 20-Year Improvement Plan	39

LIST OF FIGURES

Figure - Description	Page
Figure No. 2-1 Water Main Diameter Distribution	5
Figure No. 2-2 Water Main Material Distribution	6
Figure No. 3-1 Lewis Engineering Demand Projections	10

LIST OF APPENDICES

Appendix	Description
A	Water Distribution System Map
B	Lewis Engineering Water Supply Evaluation Report
C	Link Map Input Data
D	Hydraulic Deficiencies Map
E	Critical Components Map
F	Asset Management Rating Map
G	Three Circles Integration Map
H	Phase I and II Improvements Map Phase III Improvements Map

SECTION 1 – Executive Summary

1.1 General

Tata & Howard, Inc. was retained by the Hooksett Village Water Precinct (Precinct) to complete an Asset Management Plan Update for the Hooksett Village Water Precinct water system. The purpose of the Asset Management Plan Update is to update the existing Asset Management Plan completed in May 2020, to identify areas of the water distribution system in need of rehabilitation, repair, or replacement; and to prioritize improvements to make the most efficient use of the Precinct's capital budget. In addition to distribution system water mains, water supply and storage needs are evaluated and prioritized.

Tata & Howard evaluated the water distribution system piping using the Three Circle Approach, which consists of the following evaluation criteria:

- System hydraulic evaluation,
- Critical component assessment,
- Asset management considerations.

Each circle represents a unique set of evaluation criteria for each water main segment. From each set of criteria, system deficiencies are identified and then compared. Any deficiency that falls into more than one circle is given higher priority than one that falls into a single circle. Using the Three Circle Approach, recommended improvements will result in the most benefit to the system. In addition, the Three Circle Approach allows us to identify any situations that mitigate a deficiency in one circle and eliminate a deficiency in another circle. By integrating all three sets of criteria, the infrastructure improvement decision making process and overall capital efficiency are optimized.

1.2 Water Supply Evaluation

The existing water supply sources were evaluated relative to current and future water demands as part of a Water Supply and Usage Evaluation Assessment completed by Lewis Engineering, PLLC in May 2020. This study was used as the basis for the analysis of the Precinct's water supply. The 24-hour withdrawal volume is 1.87 million gallons per day (mgd) with a 16-hour withdrawal volume of 1.25 mgd. With a projected Maximum Day Demand (MDD) of 1.84 mgd, the Precinct currently does not have enough available supply volume to safely meet the needs of the system through 2030 with the completion of the proposed housing development in the HSA. Water supply evaluation is discussed further in Section 3.3.

1.3 Water Storage Evaluation

The projected demands calculated in the assessment completed by Lewis Engineering, PLLC and existing water distribution system operating conditions were considered by Tata & Howard to evaluate the available storage in the system. The projected 2030 required storage in the Precinct's Main Service Area (MSA) was estimated to be approximately 0.77 million gallons (mg). The total available storage is 1.20 mg for the MSA and was based on storage needed to meet peak water

demands and provide fire protection. This leaves the MSA with a surplus of 0.43 mg in storage in the MSA. Additionally, the High Service Area (HSA) has a projected available storage volume of 0.68 mg under 2030 demand conditions. The available storage in the HSA is 0.69 mg, which leaves the HSA with a storage surplus of 0.01 mg if the proposed housing development is completed. Water storage evaluation is discussed further in Section 3.4.

1.4 System Hydraulics

The Precinct had previously contracted Lewis Engineering, PLLC to conduct a Water Supply Assessment and evaluate the demand projections through 2030 based on historic pumping data and building development plans within the Precinct's service area. For consistency, the results of this assessment were used as demand projections for Tata & Howard's hydraulic analysis. These demand projections were input into the hydraulic model and simulations were run to identify the system's ability to provide adequate flows and pressures during both average day, maximum day and peak hour demands. The model runs identified multiple areas where system hydraulic deficiencies may exist. The demand projections were also used to review existing and projected water supply and water storage needs for the water system.

Hydraulic deficiencies were identified as part of a system wide evaluation to review transmission capabilities of the system, review the system's ability to provide Insurance Service Office (ISO) recommended fire flows, and eliminate dead ends and bottlenecks in the system, when possible. System hydraulics are discussed further in Section 4.

1.5 Critical Components

A critical component assessment was performed for the water distribution system to evaluate the impact of potential water main failures on the system. The critical component assessment includes identification of critical areas served, critical water mains, and the need for redundant mains. Critical areas served were identified by the Hooksett Village Water Precinct (Precinct) staff and include Precinct facilities, sewer department facilities, schools, top users, and emergency services. Critical water mains include primary transmission lines, mains connecting water storage tanks and sources to the system, mains that will cause a system demand shortfall if a break occurs, and water mains that cross rivers, streams, waterways, and railroad tracks. Critical components are discussed further in Section 5.

1.6 Asset Management

An asset management evaluation on all water mains in the water distribution system was previously completed for the Precinct as part of an Asset Management Grant awarded by the New Hampshire Department of Environmental Services (NHDES). A number of factors were considered in the rating system, including installation year, diameter, material, water quality, break history, and soil characteristics. These factors affect the decision to replace or rehabilitate a water main. Using the asset management rating approach, each water main in the system was assigned a rating based on these factors. Water mains with a total rating less than 25 are considered to be in good to excellent condition. Mains with a total rating between 25 and 44 are considered to be

in fair to good condition, and mains with a total rating of 45 or greater are considered to be in poor to fair condition. Asset management is discussed further in Section 6.

1.7 Distribution System Evaluation

Utilizing the Three Circles Approach, water main improvements were recommended and prioritized based on the aforementioned criteria. Phase I improvements generally include any recommended improvements that fall into all three circles and are hydraulically deficient, critical, and have a high asset management score. The total estimated probable construction cost of the Phase I recommended improvements is approximately $5,221,000. Phase II improvements include any recommended improvements that fall into two of the circles. The total estimated probable construction cost of the Phase II recommended improvements is approximately $1,643,000. Phase III recommendations include any recommended improvements that have a high asset management score indicating poor to fair condition. The total estimated probable construction cost of Phase III improvements is approximately $4,930,000. These water mains are identified on the Recommendations Maps in Appendix H.

Costs are based on recent bid tabulations and do not consider escalation based on an actual planned construction date for each recommended improvement. Estimated costs for each improvement include construction costs for the water main, hydrants, services, appurtenances, and temporary and permanent trench pavement. A 25 to 30-percent allowance for engineering, permitting, and contingency is included in each project's estimated cost. The standard allowance for engineering and contingency is 25-percent, but for any improvements that include a horizontal directional drill, the allowance is increased to 30-percent due to the complexities associated with these projects.

1.8 Implementation of System Improvements

The list of water main improvements included in Section 7 is extensive due to the nature of this report. The prioritization of the recommended improvements based on the Three Circle Approach serves as a guide for implementation of the infrastructure improvements with the greatest to least benefit based on the prioritization and weighted criteria established jointly by the Precinct Staff and Tata & Howard. The implementation of these improvements is intended to be completed over multiple years and will require close coordination with the Precinct's Board of Water Commissioners and evaluation of water rates to determine appropriate funding sources. Based on the recommended system improvements and the estimated probable construction costs presented in this report, it is recommended that all Phase I and II improvements, which will provide the greatest benefit to the system, be completed over a 10-year period.

SECTION 2 – System Description and Operations

2.1 System Description

The Precinct's water distribution system has approximately 1,200 service connections, serving a population of approximately 2,900 year round. All of the customers served are metered for water consumption and billing purposes. The distribution system includes approximately 28 miles of water main, including 4 miles of private water mains, ranging in size from two inches to 16-inches. Figure No. 2-1 displays the breakdown of water main size by diameter based on the miles of each size in the water distribution system. Approximately three percent of the system is 4-inch diameter main, 24 percent is 6-inch diameter main, 34 percent is 8-inch diameter main, one percent is 10-inch diameter main, 34 percent is 12-inch diameter main, and four percent is 16-inch diameter main.

The distribution system pipe materials include, ductile iron (DI), asbestos cement (AC), copper, polyvinyl chloride (PVC), and high density polyethylene (HDPE). Figure No. 2-2 displays the breakdown of water main materials based on the miles of each material in the water distribution system. Approximately 18 percent of the system is DI main, 28 percent is AC main, less than one percent is copper, and 54 percent is plastic, PVC, or HDPE main.

The Precinct has four active groundwater supply sources including the North Well, East Well, South Well, and South Well Backup. The Precinct has three water storage facilities including the West (Quarry) Tank, Thompson Corner (Oak Hill) Tank, and Manor Drive Tank. The system has one high pressure service area served by the booster pump station. The system also includes a water supply interconnection with the Central Hooksett Water Precinct which is for emergency service only. A map of the existing water distribution system is included in Appendix A.

2.2 Water Supply Sources

The Precinct has four groundwater sources, the North Well, located off Pine Street, the East Well, located off Ardon Drive, and South Well and South Well Backup both located off Pinnacle Street. Groundwater from each well is treated with chemical injection at each well's pump station.

North Well

North Well is a 12-inch diameter gravel packed well located off Pine Street and was constructed in 1987. The well was most recently cleaned and redeveloped in March 2020, resulting in a capacity of 18.9 gallons per minute/foot (gpm/ft) at 400 gpm following redevelopment. A new Goulds pump rated for 400 gpm at 290 feet total dynamic head (TDH) was installed at this time and the 40 horsepower (HP) motor was rehabilitated. The well is 76 feet deep and has a screen length of fifteen feet. Water from the North Well is pumped to the North Well Pump Station where it is injected at the pump station with Calciquest liquid for sequestering and corrosion control, sodium hypochlorite for disinfection, and soda ash for pH adjustment.

Figure No. 2-1
Water Main Diameter Distribution

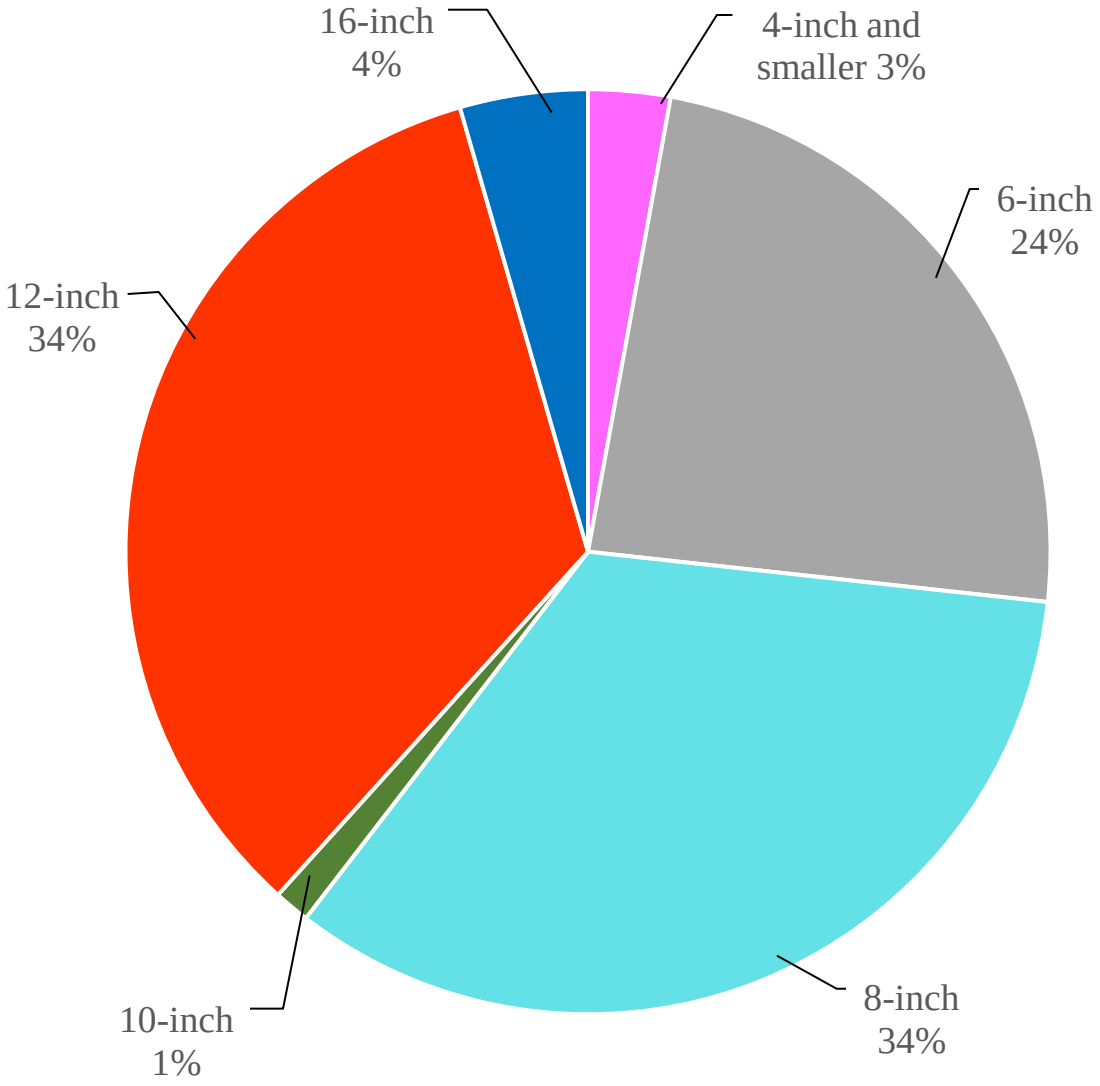
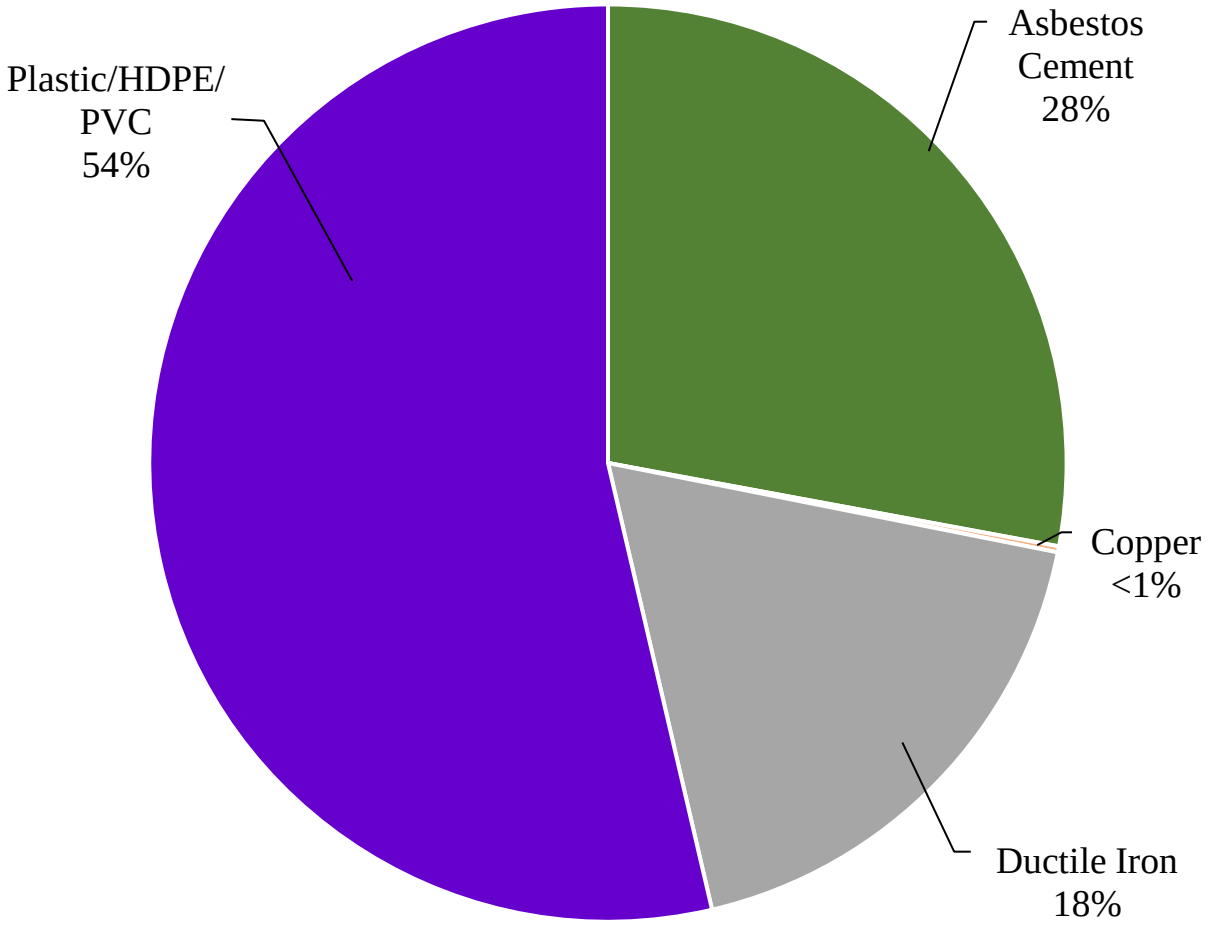


Figure No. 2-2
Water Main Material Distribution



East Well

East Well is a 12-inch diameter gravel packed well located off Ardon Drive and was constructed in 2004. The well was most recently cleaned and redeveloped in 2017, resulting in a capacity of 29 gpm/ft at 500 gpm following redevelopment. It is scheduled next for cleaning and redevelopment in 2021. The well is 79.7 feet deep and has a screen length of fifteen feet. The well has an American Marsh pump with a capacity of 400 gpm at 333 feet TDH and a 50 HP motor which were both rehabilitated in 2017. Water from the East Well is pumped to the East Well Pump Station where it is injected with Calciquest liquid for sequestering and corrosion control, sodium hypochlorite for disinfection, and soda ash for pH adjustment.

South Well and South Well Backup

South Well is a 12-inch by 8-inch relined and gravel-packed well located off Pinnacle Street, originally constructed in 1986. The South Well Backup is a 12-inch diameter gravel-packed well in the same location and was constructed in 2003. Both wells were most recently cleaned and redeveloped in 2018, resulting in a capacity of 29.52 gpm/ft at 400 gpm for the South Well and 14.57 gpm/ft at 400 gpm for the South Well Backup following redevelopment. The South Well is 56.6 feet deep with a screen length of twelve feet. The South Well Backup is 65 feet deep with a screen length of fifteen feet. Both wells have 40 HP motors. The wells operate in tandem and only one is pumped at one time. Water is pumped from both wells to the South Well Pump Station where it is injected with Calciquest liquid for sequestering and corrosion control, sodium hypochlorite for disinfection, and soda ash for pH adjustment.

2.3 Water Storage Facilities

The Precinct has three water storage facilities with a total storage capacity of 2.3 million gallons.

West (Quarry) Tank

The West (Quarry) Tank is a 1.0 mg glass-fused-to-steel storage tank located off Brickyard Pond Road. The tank has an overflow elevation of approximately 435 feet above mean sea level (MSL) and an inside diameter of 58.75 feet. The height of the tank from the overflow to the base is 50 feet. The tank was constructed in 2019 by Statewide Aquastore, Inc.

Thompson Corner (Oak Hill) Tank

The Thompson Corner Tank is a 200,000-gallon welded steel storage tank located off Hooksett Road. The tank has an overflow elevation of approximately 425 feet above MSL and an inside diameter of 33 feet. The height of the tank from the overflow to the base is 30 feet. The tank was constructed in 1950 by Chicago Bridge & Iron Company and is in need of repair or replacement.

Manor Drive Tank

The Manor Drive Tank is a 1.1 mg concrete storage tank located off Manor Drive. The tank has an overflow elevation of approximately 643 feet and an inside diameter of 50 feet. The height of the tank from the overflow to the base is 75 feet. The tank was constructed in 2007 by DN Tanks. This tank serves the high service area.

2.4 Interconnections

The Precinct maintains one emergency water supply interconnection with the Central Hooksett Water Precinct. The interconnection is metered and is for emergency use only. The Central Hooksett Water Precinct purchases water from Manchester Water Works and is contractually restricted by volume. Manchester Water Works provides all treatment for Central Hooksett Water Precinct, including chloramine addition. The Hooksett Village Water Precinct is currently studying the feasibility of an interconnection with the Bow Municipal Water System and a second emergency interconnection for the Main Service Area with the City of Manchester Water Works. The interconnection with the Bow system offers the possibility of both purchased and emergency water with similar chemistry and treatment, without the addition of chloramines.

SECTION 3 – Water System Demands

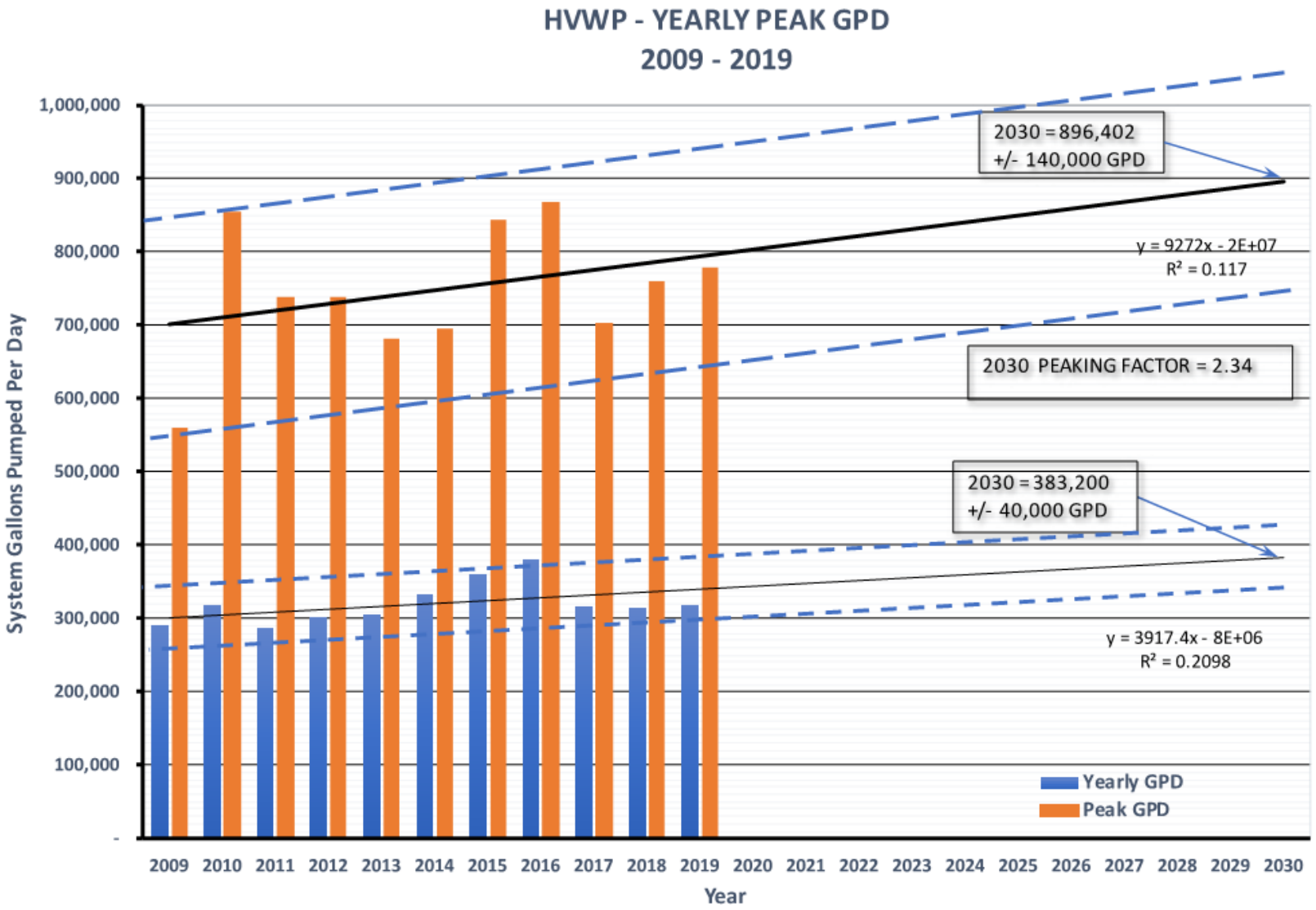
3.1 General

For the purposes of evaluating the water needs of a community, several parameters are typically reviewed to better understand the demands of a distribution system. These parameters are defined in the sections below and are presented with existing and projected demand estimates. In accordance with the NHDES and Ten State Standards, the supply sources of a water system must be capable of meeting existing and projected maximum day demand (MDD) conditions with all sources on-line and existing and projected average day demand (ADD) conditions with the largest source out of service.

3.2 Water System Demands

The Lewis Engineering Water Supply Assessment reviewed historical average daily water usage between 2009 and 2019 to determine a trend in the average daily usage. This trend was used to estimate a 2030 average day demand (ADD) of approximately 383,200 gallons per day (gpd), plus or minus 10 percent. The report also reviewed historical peak daily flows between 2009 and 2019 to estimate a 2030 maximum day demand (MDD) of approximately 896,400 gpd, plus or minus 16 percent. A housing development is slated to be built in the University Heights and Heads Pond area of Hooksett which would require an estimated additional 390,000 mgd under ADD conditions and 940,000 mgd under MDD conditions. The development was begun but construction has stalled with the recent fluctuations in the economy and the schedule for completion of this development is not currently determined. However, to be conservative in future estimates, it is assumed that this development will be completed by 2030 and these additional demands have been added into the system wide demand projections. With the development included, the projected 2030 ADD is approximately 770,000 mgd and the projected MDD is approximately 1,840,000 mgd. The Lewis Engineering Water Supply Assessment Demand Projections without the additional housing development demand are presented in Figure No. 3-1 and the Lewis Engineering report is included in Appendix B.

Figure No. 3-1
Lewis Engineering Demand Projections



Average Day Demand

Average day demand (ADD) is the total water supplied to a community in one year divided by 365 days. This term is commonly expressed in mgd. This demand includes all water used for domestic (residential), commercial, and municipal purposes. The municipal component includes water used for system maintenance such as water main flushing and fire flows. In addition, the ADD includes unaccounted-for water attributed to unmetered water uses and system leakage. According to the pumping records between 2015 and 2019, the ADD supplied for the Precinct ranged from 0.32 mgd to 0.36 mgd.

The estimated ADD for the design year 2030 based on the above criteria as determined in the Lewis Engineering Assessment and including the housing development is approximately 0.77 mgd.

Maximum Day Demand

Maximum day demand (MDD) is the maximum one-day (24-hour) total quantity of water supplied during a one-year period. This term is typically expressed in mgd.

The Lewis Engineering assessment used the historical peak day pumping rates between 2009 and 2019 to project an estimated 2030 MDD of 1.84 mgd, including demand from the housing development.

Peak Hour Demand

Peak hour demand is the maximum total quantity of water supplied in a single hour over a one-year period, typically expressed in mgd. These demands are typically met by distribution water storage facilities.

The Lewis Engineering assessment calculated a 2030 Peaking Factor of 2.34 based on the ratio of the projected 2030 ADD and MDD. The MDD/ADD ratio for a community can be used to estimate the peak hour/ADD peaking factor. Under current conditions, the MDD/ADD ratio is 0.50, with the corresponding peak hour factor for the system approximately 3.8. Using the MDD/ADD values for 2030 with the full housing development demand, the ratio is 0.40, with the corresponding peak hour factor for the system approximately 5.0.

3.3 Adequacy of Existing Water Supply Sources

The Precinct system uses four active groundwater supply sources to meet system demands. Table No. 3-2 provides the maximum withdrawal rates for each of the Precinct's supply sources. These withdrawal rates are based on reported or approved well pump capacities.

Table No. 3-1
Well Withdrawal Volumes

Source Name	Pump Capacity (gpm)	24-hour Withdrawal Rate (mgd)	16-hour Withdrawal Rate (mgd)

North Well	500	0.72	0.48
East Well	400	0.576	0.38
South Well/South Well Backup	400	0.576	0.38
Total:		**1.87**	**1.24**

Water industry guidelines recommend that a system have adequate supply to meet (1) the projected MDD with all wells online and (2) the projected ADD with the largest source offline. The projected ADD and MDD for the year 2030, including the proposed housing development, are 0.77 mgd and 1.84 mgd, respectively. The system's total combined maximum pumping rate of all active supply sources is 1.87 mgd if all wells are pumped for 24 hours. Based on the 2030 MDD of 1.84 mgd, the Precinct can meet the projected MDD only if the existing wells are pumped for 24 hours. Based on information from the Precinct, the sustainable pumping capacity is unknown and Precinct staff do not believe that the wells would be able to pump for 24 hours. If the wells were operated for 16 hours per day, the combined pumping rate is 1.24 mgd. This would result in a MDD supply deficit of 0.60 mgd. The Precinct water system would have a slight deficit of 0.01 mgd under the projected ADD of 0.77 mgd with the largest source, the North Well, offline for a combined 16 hour supply of 0.76 mgd.

The above discussion makes the basic assumption that each source is available when it is needed under the MDD/ADD scenarios described. However, the Lewis Engineering assessment points out a critical potential vulnerability in that assumption. A potential contamination incident at Pinnacle Pond, adjacent to the Interstate 93 highway and where all of the sources are located, could result in the catastrophic temporary or permanent loss of one or more of those sources. The assessment recommends the development of new wells and/or interconnections to offset this critical vulnerability. The Precinct is currently nearing completion of a joint feasibility study with the Town of Bow on a potential interconnection and has begun re-energizing its groundwater exploration program.

It is recommended that the Precinct continue these tasks, which will address the Lewis Engineering concern and help to meet the projected demands with the proposed housing development. To best address the latter, it is further recommended that the Precinct investigate the safe yield of each well to maximize existing sources. Historical test data, especially recent data that may be available for the East Well and South Well Backup, should be used to streamline the design of the safe yield investigation.

3.4 Adequacy of Existing Water Storage Facilities

Distribution storage is provided to meet peak consumer demands, such as peak hour demands, and to provide a reserve for fire-fighting purposes. Storage may also serve to provide an emergency supply in case of temporary breakdown of pumping facilities or for pressure regulation during periods of fluctuating demand. There are three components that must be considered when evaluating storage requirements. These components include equalization, fire flow requirements, and emergency storage. The three components of the storage evaluation were calculated under current and future water demand conditions for both the Main Service Area (MSA) and High Service Area (HSA). Based on 2019 pumping and usage data, on average the MSA represents

approximately 75 percent of the total demands and the HSA represents approximately 25 percent of the total demands. During peak demand periods, HSA usage approaches 39 percent of the total demand.

Equalization storage provides water from the tanks during peak hourly demands in the system. Typically, equalization storage is a percentage of the maximum day demand. The percentages can range from 15-percent to 25-percent, with 15-percent used for a large system, 20-percent for a medium sized system, and 25-percent used for a small system. A system is considered small if it has less than 3,300 customers, while a system is considered large if it has more than 50,000 customers. With a service population of approximately 2,900 people, the Precinct system was considered to be a small system, and 25-percent of the maximum day demand should be available in the storage tanks for meeting equalization storage guidelines.

The fire flow storage component is based on the representative fire flow requirement multiplied by the required duration of the flow. The basic fire flow is defined as a fire flow indicative of the quantities needed for handling fires in important districts, and usually serves to mitigate some of the higher specific fire flows. For the Precinct system, a representative fire flow of 3,500 gpm for a duration of three hours was used for the MSA, and a representative fire flow of 2,000 gpm for a duration of three hours was used for the HSA.

The emergency storage component is typically equivalent to one ADD. However, if there is emergency power available at the sources or emergency connections with surrounding communities capable of supplying at least one ADD, the emergency storage component can be waived. All of the water supply sources are located in the MSA. Emergency power is available at the each of the wells, and with the Central Hooksett Water Precinct interconnection, there is a combined capability of supplying at least one ADD. Emergency power is also available at the Booster Pump Station, which supplies water from the MSA to the HSA. Therefore, the emergency component has been waived in the storage evaluation for both service areas.

The three components of the storage evaluation were calculated under current and projected water demand conditions for both the MSA and the HSA. The peak MDD recorded in 2016 was higher than the historical peak MDD for other years reviewed, therefore, to be more conservative, the 2016 data was used as the current year for the storage evaluation. The projected 2030 MDD is based on the Lewis Engineering assessment with the completed housing development. The housing development is located entirely within the HSA and therefore, the additional 0.94 mgd was added to the HSA calculations only.

Main Service Area

1. Equalization
   - Small sized system = 25-percent of the Maximum Day Demand
   - MSA Estimated Maximum Day Demand in year 2016 = 0.53 mgd
   - MSA Projected Maximum Day Demand in year 2030 = 0.57 mgd
   - MSA Equalization (2016) = 0.25 x 0.53 = 0.13 mg
   - MSA Equalization (2030) = 0.25 x 0.57 = 0.14 mg

2. Basic Fire Flow Requirements
   - Representative fire flow = 3,500 gpm
   - Duration of 3 hours or 180 minutes
   - Basic Fire Flow Requirement = 3,500 x 180 = 0.63 mg

3. Emergency Storage: Waived

The total required storage for any given year is the equalization component plus the basic fire flow requirement. Therefore, the current (year 2016) and projected (year 2030) total required storage is as follows:

- Total MSA Required Storage (2016) = 0.13 mg + 0.63 mg = 0.76 mg
- Total MSA Required Storage (2030) = 0.14 mg + 0.63 mg = 0.79 mg

A minimum pressure of 20 pounds per square inch (psi) should be maintained at the highest served customer under MDD conditions with a coincident fire flow. To maintain a minimum pressure of 20 psi at a highest customer elevation of 335 feet on Hooksett Road north of Ash Street, the level of the water in the storage tanks should not drop below 381 feet, which is below the base elevation of both tanks. Based on this information, all the available storage in both tanks in the MSA are considered usable emergency storage. The total available useable storage is 1.21 mg for the MSA and the required storage is 0.76 mg in the 2016 MDD scenario and 0.77 mg 2030 MDD scenarios. This leaves the MSA with a surplus of 0.44 mg in storage under existing conditions and 0.43 mg in storage under projected conditions.

High Service Area

1. Equalization
   - Small sized system = 25-percent of the Maximum Day Demand
   - HSA Estimated Maximum Day Demand in year 2016 = 0.33 mgd
   - HSA Projected Maximum Day Demand in year 2030* = 1.27 mgd
   - HSA Equalization (2016) = 0.25 x 0.33 = 0.08 mg
   - HSA Equalization (2030) = 0.25 x 1.27 = 0.32 mg

   *Includes housing development

2. Basic Fire Flow Requirements
   - Representative fire flow = 2,000 gpm
   - Duration of 3 hours or 180 minutes
   - Basic Fire Flow Requirement = 2,000 x 180 = 0.36 mg

3. Emergency Storage: Waived

The total required storage for any given year is the equalization component plus the basic fire flow requirement. Therefore, the current (year 2016) and projected (year 2030) total required storage is as follows:

- Total HSA Required Storage (2016) = 0.08 mg + 0.36 mg = 0.44 mg

- Total HSA Required Storage (2030) = 0.32 mg + 0.36 mg = 0.68 mg

The highest customer in the HSA is located at an elevation of approximately 550 feet above MSL on Crawford Lane. To maintain a minimum pressure of 20 psi at this customer, the level of water in the storage tank should not drop below 596 feet, therefore, only the top 47 feet of the tank is usable volume. Based on this scenario, the Manor Drive Tank has a useable storage volume of 0.69 mg. The HSA has a storage surplus of 0.25 mg in the 2016 MDD scenario and 0.01 mg in the 2030 MDD scenario.

SECTION 4 – Hydraulic Evaluation

4.1 General

A comprehensive computer model was utilized to mathematically simulate the water distribution system to evaluate the Precinct's existing water distribution system and to obtain a basis for recommending water distribution system improvements. The hydraulic model was developed using InfoWater software. InfoWater software allows the user to conduct hydraulic simulations using mathematical algorithms in an ArcGIS environment. The computer model is represented by the node, pipe, and tank information provided in Appendix C. The hydraulic input data in Appendix C provides data on system demands, length and diameter of water mains, roughness coefficient or C-value of water mains, elevations, pumping rates of water supply sources, and overflow elevations at storage facilities.

As part of this project, the model was developed based on the most recent GIS files provided by the Precinct, and correspondence with the Precinct to confirm the accuracy of this information.

4.2 Model Verification

Verification of the computer model was completed under steady state conditions based on fire flow testing and information pertaining to the Precinct's hydraulic gradeline and current operating procedures. Flow tests were conducted by the Precinct personnel at 12 locations throughout the distribution system on September 9, 2020 and September 30, 2020. Flow test locations were selected to be representative of the entire distribution system. Table No. 4-1 presents the results of the flow testing. The data obtained from the flow tests served as input data for the model verification under steady state conditions. The data included static and residual pressure readings and measurements of flow from the hydrants tested. Each simulation in the model reflected actual field conditions at the time of the testing to properly calibrate the model.

When results of the model simulations were calibrated to within approximately five percent of the hydraulic data collected from the actual flow tests, the computer model was considered verified under steady state conditions. After completing the verification process, the model mathematically represented the physical operating conditions of the existing water distribution system.

Table No. 4-1
Flow Test Results

Location of Flowing Hydrant	Flowing Hydrant Static Pressure (psi)	Residual Hydrant A Static Pressure (psi)	Residual Hydrant A Residual Pressure (psi)	Residual Hydrant B Static Pressure (psi)	Residual Hydrant B Residual Pressure (psi)	Observed Flow (gpm)	Calculated Estimated Flow at 20 psi (gpm)
502 West River Road No. 33	66	70	42			1,100	1,500
7 Main Street	84	78	63	88	78	1,100	2,200
22 Birch Hill B	47	50	28			850	1,000
23 Bullard Street	64	64	50			750	1,400
39 Main Street	78	86	77	73	64	1,100	2,800
11 Northview	89	85	80			1,100	4,400
10 Bursar Drive	126	120	104			1,100	2,900
149 University Circle	94	88	66	60	50	1,100	1,400
55A Dale Road	92	86	54	84	50	750	1,000
2 Wedgewood No. 10	72	68	34			750	900
1 West Bank	102	100	50			1,000	1,200
9 Sunrise Boulevard	102	90	56			1,100	1,600

4.3 Adequacy of Existing Distribution System

The Hydraulic Evaluation facet of the Three Circle approach evaluates the system's ability to meet varying demand conditions. In general, a minimum pressure of 35 psi at ground level is recommended during average day, maximum day, and peak hour demand conditions. During MDD with a coincident fire flow, a minimum pressure of 20 psi is required at ground level throughout the system. To evaluate the system's ability to meet these criteria, the following hydraulic simulations were run in the model:

Minimum/Maximum Pressures

During current ADD conditions, there are locations throughout the Precinct where a minimum pressure of 35 psi is not met. Therefore, during the projected year 2030 ADD, MDD, and peak hour demand condition (no coincident fire flow), a minimum pressure of 35 psi is not met in some areas of the distribution system. Pressures near the Manor Drive Tank and the Mount Saint Mary's Condominiums have a static pressure of approximately 22 psi. These are the only areas in the system below 35 psi under current ADD conditions.

On the contrary to low pressures in the system, an upper limiting pressure of 120 psi is generally recommended, as older fittings in the system are generally rated at 125 to 150 psi. Pressure above this level can result in increased leakage from the distribution system. Also, the Ten State Standards published Recommended Standards for Water Works recommends that normal working pressures on utilized mains and services not exceed 80 psi. Based on the current operating conditions, the system experiences pressures greater than 120 psi only in the lower elevations of the High Service Area, including lower sections of University Circle, College Park Drive and Post Road as well as Hooksett Road north of Post Road. These areas have all been constructed after 2004 with newer system fittings rated for a minimum pressure of 150 psi.

Insurance Services Office (ISO) Fire Flow Recommendations

The recommended fire flow in any community is established by the ISO. The ISO determines a theoretical flow rate needed to combat a major fire at a specific location, taking into account the building structure, floor area and the building contents. In general, the flows recommended for proper fire protection are based on maintaining a residual pressure of 20 psi in the distribution system. This residual pressure is considered necessary to maintain a positive pressure in the system to allow for continued service to customers and to avoid negative pressures that could adversely impact the distribution system and potentially introduce groundwater into the system through joints and cracks in the water mains.

The Precinct system was last inspected for fire insurance ratings by the ISO in May 2016. The results of the ISO inspections and fire flow testing were provided by the Precinct and are shown in Table No. 4-2. The testing was performed across the entire Town of Hooksett and as such only two hydrants were tested within the Precinct's jurisdiction. The test results indicate the available flow and estimated recommended fire flow in various sections of the distribution system at the time of the tests. The estimated recommended fire flows established by ISO for both locations was 500 gpm. It should be noted that a water system is only required by ISO to provide a maximum of 3,500 gpm at any point in the system. Recommended fire flows greater than 3,500 gpm are not considered in determining the Public Protection Classification (PPC) of the Precinct when using

the Fire Suppression Rating Schedule. ISO individually grades the protection of buildings with a recommended fire flow in excess of 3,500 gpm, and the PPC of those buildings can differ from that of the community that provides fire protection.

According to the May 2016 ISO study, the available fire flow at both testing locations exceed the ISO recommended flow. For each ISO location, the recommended fire flow was simulated in the hydraulic model verified as part of this project. The hydraulic model results confirm that both locations exceed the ISO recommended flow.

Table No. 4-2
ISO Hydrant Flow Summary
May 2016

Test No.	Test Location	Static Pressure (psi)	Residual Pressure (psi)	Recommended Flow at 20 psi (gpm)	Available Flow at 20 psi (gpm)
18	Blackwater	103	80	500	2,900
5	Main Street & Rosedale Street	91	38	500	2,000

Additional Flow Recommendations

A review of the Precinct was completed to identify the recommended fire flows in areas not tested in the latest ISO evaluation. Recommended fire flows were estimated for larger structures and facilities such as condominiums, apartment complexes, schools, hotels, and other commercial or industrial buildings. Recommended flows were estimated for these areas based on location and building size using the 2014 ISO published Guide for Determination of Needed Fire Flow. The guide uses factors such as building size, material, location, and contents to calculate the recommended fire flow. These factors were estimated based on aerial photos and street level observations. Not all information was readily available for the review and the estimated recommended fire flow should not be used for any other purpose than evaluating the adequacy of the water distribution system. It should also be noted that the Guide does not account for the use of fire protection systems, such as a sprinkler system, when estimating a recommended fire flow.

According to the 2014 ISO published Guide for Determination of Needed Fire Flow, the minimum recommended fire flow in residential areas with homes greater than 30 feet apart is approximately 500 gpm. The recommended fire flow for homes between 21 feet and 30 feet apart is approximately 750 gpm. Areas with homes between 11 feet and 20 feet apart have a recommended fire flow of 1,000 gpm. A fire flow of 1,500 gpm is recommended for homes closer than 10 feet apart. The residential neighborhoods in the Precinct were evaluated to determine average distances between homes for determination of the recommended residential fire flow in those areas. An estimated fire flow of 500 gpm was used for most residential areas of the system with homes greater than 30 feet apart.

4.4 Hydraulically Deficient Areas

The estimated recommended fire flows were simulated in the computer model. All scenarios were run using the projected 2030 MDD conditions. All storage tanks in the system were set at their

standard operating level based on information provided by Precinct staff. Sources were all set to be off to replicate the typical daytime conditions of all pumps remaining off throughout the day and only pumping for an eight-hour period overnight to refill the tanks. Areas where the available fire flows did not meet the ISO recommended fire flow or estimated recommended fire flow were considered hydraulically deficient and improvements were developed to alleviate these deficiencies.

Hydraulic deficiencies were identified as part of a system wide evaluation and include deficiencies in areas that were and were not included in the most recent ISO testing, as well as addressing residential fire flow deficiencies. In general, the hydraulic deficiencies were broken down into Priority 1 and 2 deficiencies. Priority 1 deficiencies identify areas where looping the system or eliminating bottlenecks significantly increases overall system resilience and flow efficiency. Priority 2 deficiencies identify areas with needed fire flow improvements. Areas selected for Priority 2 would provide the recommended ISO fire flow only if improvements to Priority 1 deficiencies were implemented first. The following list provides a description of each Priority 1 and 2 deficiency. All hydraulic deficiencies are shown in the Hydraulic Deficiencies map in Appendix D.

Priority 1 Hydraulic Deficiencies

1. To finish the primary feed to the new West (Quarry) Tank, it is recommended that a cross country 12-inch diameter water main be installed from the 8-inch diameter water main at the end of Vista Drive to the 12-inch diameter water main on Route 3A. In addition to this, the existing 8-inch AC water main on Vista Drive is recommended to be replaced with a new 12-inch diameter water main to connect to the existing 12-inch diameter water main on Pinnacle Street and the proposed cross country extension to Route 3A. This will increase available flow in the south western and central portions of the distribution system and help move the water stored in the West (Quarry) Tank out into the distribution system more efficiently.

2. To increase available fire flow to the southern portion of the system and to create a loop on either side of the river that will increase system resiliency and redundancy, it is recommended that the Precinct install a 12-inch diameter water main across the Merrimack River. As shown on the Deficiencies map in Appendix D, this could be connected to the 12-inch water main on Route 3A on the west side and to the 8-inch water main on Dale Street on the east side.

3. The 12-inch diameter transmission main from the West (Quarry) Tank and South Pump Station connects to 8-inch and 6-inch diameter AC water mains on Pinnacle Street and West River Road which creates a bottleneck in flow from these critical facilities to the rest of the distribution system. Replacing the 8-inch water main on Pinnacle Street and the 6-inch water main on West River Road, and the 8-inch water main on Maple Street with a new 12-inch diameter water main would improve transmission from the West (Quarry) Tank and South Pump Station to the central portion of the distribution system and will increase the available fire flow in this area. It will also improve flow availability and fire fighting capacity in the Pinnacle Street neighborhood.

4. Replacing the 8-inch and 6-inch diameter AC water mains that run south on Route 3 and Main Street from the intersection with College Park Drive to the end of the southeastern portion of the system is recommended to improve transmission and flow to the southeastern portion of the system. Replacing this section of water main with a 12-inch diameter water main increases the available fire flow to many commercial customers and important municipal facilities and increases system resiliency by providing a larger sized transmission main for the eastern portion of the system.

5. Pine Street serves as a transmission main for the North and East Wells and is currently only 6-inches in diameter. It is recommended to replace this main with a 12-inch diameter water main both to increase flow from the wells and to improve the inherent capacity for fire flow to the large residential complexes and the I-93 rest areas located north of Pine Street.

6. To complete a 12-inch diameter transmission main loop through the center of the distribution system, it is recommended that the portion of 8-inch diameter water main on Route 3A that stretches from north of Pine Street to the I-93 Rest Area be replaced with a new 12-inch diameter water main. This will improve the inherent capacity for fire flow to Windsor Terrace apartments, River Hill apartments, and the I-93 Rest areas and associated residential areas, which are top users for the system. This will also be important for transmission of water to and from the proposed interconnection with the Town of Bow which is currently being considered for a location on Route 3A north of the rest areas.

7. The Thompson Corner Tank is currently connected to Main Street with an 8-inch cross country AC water main. To improve the hydraulics of the transmission main to this tank, it is recommended that a new 12-inch water main is installed from the south end of the existing 12-inch water main on Daniel Webster Highway to the existing 6-inch water main on Main Street/Route 3, which is proposed to be upgraded to 12-inches as part of Improvement 4 as discussed above.

Priority 2 Hydraulic Deficiencies

The Priority 2 Hydraulic Deficiencies Map in Appendix D depicts the following deficiencies. It was determined that these areas would be considered Priority 2 as these improvements in conjunction with those recommended as Priority 1 deficiencies will improve the inherent capacity for recommended fire flow in these areas.

8. An estimated recommended fire flow of 1,750 gpm was calculated at the Precinct office using the 2014 ISO Published Guide for Determination of Needed Fire Flow. The available fire flow is estimated to be 1,000 gpm at 20 psi. It should be noted that the recommended fire flow at this location does not consider if a fire protection system is installed in the building. To provide the recommended fire flow at this location, a new 12-inch diameter water main is recommended on Riverside Street to replace the section of 8-inch diameter water main, and a new 8-inch diameter water main is recommended to replace the existing 6-inch diameter water main that serves the hydrant near the Precinct office building.

SECTION 5 – Critical Component Assessment

5.1 General

The critical evaluation facet of the Three Circle approach evaluates the impact of potential water main failures and the system's ability to meet varying demand conditions. The critical component assessment includes identification of critical areas served, critical water mains, and the need for redundant mains.

5.2 Evaluation Criteria

Critical areas served are locations in the distribution system that require continual water supply for public health, welfare, or financial reasons. Examples of critical service areas include water department facilities, medical facilities, nursing homes, schools, and business districts. All water mains within 500 feet of a critical area are considered to be critical mains. Because water storage tanks and water supply sources provide water and maintain pressure to critical service areas, tanks and primary water supply sources are also considered critical components. Therefore, any water main within 500 feet of a water storage tank or primary water supply source is considered a critical component.

Additional categories of critical water mains include those mains that are the sole transmission main from a source or tank, and main transmission lines without a redundant main. The evaluation included a visual review of the water mains leading into and out of the critical areas and the transmission grid.

5.3 Critical Components

Critical areas served, critical supply mains, and redundant mains were evaluated in the Precinct water system based on the criteria described above. The following provides a listing of the areas that are considered critical components. A map of the critical components is included in Appendix E.

Critical Areas Served

A system-wide review of critical areas served such as water department facilities, medical facilities, schools, and critical institutions was completed and discussed with Precinct personnel. Table No. 5-1 presents all critical areas served including critical users and critical components of the distribution system.

Critical Water Mains

Critical water mains include primary transmission lines as well as mains connecting water storage tanks and sources to the system. Critical transmission mains are highlighted on the Critical Components Map found in Appendix E.

Additional critical water mains were identified based on a review of the distribution system model and using the model's protector tool. The protector tool simulates breaks on each pipe in the model. The model calculates if the system can still be served with adequate flow and pressures

after a pipe is taken out of service. This feature can identify areas served by multiple mains which would no longer be able to serve customers if one of the mains were taken out of service. The following were identified by the protector tool in InfoWater as causing a system demand shortfall of 3.0 percent or greater, and are considered critical mains:

- The 8-inch and 12-inch water main on Route 3A/West River Road/Main Street from the I-93 North Rest Area to the intersection with Maple Street which serves as the only connection to the northern most customers in the system.

- The segments of the 12-inch water main on Route 3A south of Riverside Street stretching to the end of the system, providing the only connection to the south western customers in the system.

- The 6-inch and 8-inch water main on Hooksett Road and Main Street from the intersection with Morse Drive to the transmission main to the Thompson Corner Tank which provides the only connection to the south eastern portion of the system.

Water mains that cross streams, rivers, and active railroads are also considered critical because of the costly consequences of failure that could occur if a water main broke in these areas, and the difficulty in repairing the mains in these locations. Critical mains are highlighted on the Critical Components Map found in Appendix E. There are two 12-inch diameter water mains that cross the Merrimack River from Riverside Street to North Main Street providing redundancy for the system, but as these are the only points in the system that connect the eastern and western portions of the system on either side of the system and due to the difficulty in repairing these mains were a break to occur, these have been considered to be critical components.

Table No. 5-1
Critical Areas

Critical Area		Location
Water Distribution System Components		
	Precinct Office Building	7 Riverside Street
	North Well Pump Station	29 Pine Street
	East Well Pump Station	19 Ardon Drive
	South Well Pump Station	38 Pinnacle Street
	Booster Pump Station	2 Post Road
	West (Quarry) Tank	81 Brickyard Pond Road
	Thompson Corner Tank	Hooksett Road
	Manor Drive Tank	20 Manor Drive
Schools		
	Hooksett Memorial School	5 Memorial Drive
Emergency Services		
	Fire Station	1 Riverside Street
	Hooksett Public Library	31 Mount St. Mary's Way
Miscellaneous		
	I-93 Rest Areas/Pennichuck Utilities	530 West River Road
	Hooksett Town Hall	35 Main Street
	Sewer Department Pump Station	Riverside Street
	Sewer Department Pump Station	Veterans Drive
	Sewer Department Pump Station	Memorial Drive
	Sewer Department Treatment Plant	1 Egawes Drive
	Department of Public Works Garage	210 West River Road

SECTION 6 – Asset Management Considerations

6.1 General

The existing water distribution system includes approximately 42 miles of water mains. A number of factors, including installation year, diameter, material, water quality, break history, and soil characteristics, affect the decision to replace or rehabilitate a water main. The Precinct previously completed an Asset Management Evaluation for their system with Tata & Howard through the NHDES Asset Management Grant Program. This evaluation used an Asset Management approach tailored for the Precinct system to assign each water main in the system a grade based on these factors. These grades were used to establish a prioritized schedule for water main replacement or rehabilitation and serves as the third facet of the Three Circle approach.

This section summarizes the process and recommendations of the previous Asset Management Evaluation which was completed in May 2020.

6.2 Evaluation Criteria

To prioritize water main replacement or rehabilitation, a water main grading system was established. The grading system uses water main characteristics including installation year, diameter, and material, as well as known areas with water quality concerns, water main break history, static pressures, and soil characteristics surrounding the water main to assign point values to each pipe in the system. The performance criteria within each asset category are assigned a rating between zero and 100, with zero being the most favorable and 100 being the least favorable within the category. Each category is then given a weighted percentage, which represents priorities within the system. Tata & Howard worked with the Precinct to adjust the weighted percentages of each category and the ratings of the performance criteria based on existing system performance and conditions. Our recommendation was to assign a maximum weight of 30 percent to any one category. The assigned rating is then multiplied by the weighted percentage to determine the weighted rating for the performance criteria in each category. The weighted rating for each performance criteria was totaled to determine an overall rating for each pipe section in the model. The pipes with the highest grade are most in need of replacement or rehabilitation.

As part of the Asset Management Evaluation project, a workshop was held with the representatives of the Precinct to establish a rating system specific to the Precinct water system. During the workshop, it was determined that break history was of primary concern to the Precinct, followed by diameter, material, and installation year. The grading system is shown in Table No. 6-1 and was used to assign scores to individual water mains.

Table No. 6-1
Asset Management Grading System

Weight	Performance Criteria	Rating	Weighted Rating
25%	Break History		
	Two or More Breaks	100	25
	One Break	75	18.75
	No History of Breaks	0	0
20%	Diameter		
	Less than 4-inch	100	20
	4-inch water main	90	18
	6-inch water main	70	14
	8-inch water main	30	6
	10-inch water main	20	4
	12-inch water main	10	2
	16-inch water main	5	1
15%	Material		
	Asbestos Cement	100	15
	Plastic	80	12
	Copper	20	3
	Ductile Iron	10	1.5
	PVC/HDPE	5	0.75
15%	Installation Date		
	1950-1979	100	15
	1980-1989	90	13.5
	1990-1999	40	6
	2000-2010	10	1.5
	2010-present	0	0
15%	Poor Soils		
	Known Corrosive Soils	100	15
	Potentially corrosive soils	80	12
	Gravel, sand	0	0
10%	Static Pressure		
	Greater than 100 psi	100	10
	80 to 100 psi	80	8
	60 to 80 psi	60	6
	Less than 60 psi	0	0
5%	Water Quality		
	Water Quality Concerns	100	5
	No Water Quality Concerns	0	0

6.3 Asset Management Areas of Concern

Based on the asset management ratings, there are several areas of concern in the system. Water mains with a total rating less than 25 are considered to be in good to excellent condition. Mains with a total rating between 25 and 44 are considered to be in fair to good condition, and mains with a total rating of 45 or greater are considered to be in poor to fair condition. This rating system is specific to the Hooksett Village Water Precinct system and reflects the Precinct's priorities of replacing mains with a history of breaks and those with poor material. Asset management ratings are presented graphically in Appendix F.

During the previous Asset Management Evaluation, completed in May 2020, two phases of recommended improvements were developed. Sections of water main included in Phase I had asset management scores of above 60 and represented the areas of the Precinct system that are the most in need of attention. Sections of water main included in Phase II had asset management scores between 45 to 59 and all had at least one break. Fifty three percent of the pipes had scores between 30 and 44, most located in the Pinnacle Street and Thompson Avenue neighborhoods. These areas were all developed around the same time and therefore, should be all replaced around the same time. It was recommended that these areas be included in a Phase III as the Precinct moves forward with improvements in Phases I and II.

The evaluation discussed the need to develop a hydraulic model for further investigation of the system with the potential of reprioritizing those improvements recommended based solely on asset management criteria. This led directly to the completion of the hydraulic model for the Precinct during this Asset Management Plan Update. The hydraulic modeling evaluation and critical component considerations discussed earlier in this report were used to evaluate each water main in conjunction with the asset rating scores from the May 2020 evaluation to develop the recommendations and conclusion discussed in the following section.

SECTION 7 – Recommendations and Conclusions

7.1 General

The following section summarizes the findings of the study and presents a prioritized plan for recommended improvements and associated costs. The prioritization of improvements allows for constructing the necessary improvements over an extended period of time as funds allow. Costs are based on recent bid tabulations and include costs associated with the water mains, valves, fittings, water services, hydrants, and other appurtenances, permanent and temporary trench pavement, and a 25 to 30 percent allowance for engineering and contingencies. The standard allowance for engineering and contingencies is 25 percent, however, for any improvements that are assumed to include a bridge crossing or horizontal directional drilling, the allowance is increased to 30 percent due to the inherent complexities associated with these projects. Estimates do not include costs for land acquisition, easements, or legal fees. Unit costs when installing less than 1,000 feet of water main are based on a higher unit rate and are accounted for in each applicable recommendation. If these projects were to be grouped, the estimated costs may decrease.

The capital improvement projects considered by this study will provide a direct benefit to the overall level of service to the Precinct's customers, reduce operation and maintenance costs by reducing the frequency of water main failures and the damage they cause, improve water quality, as well as improve fire protection to homeowners and businesses.

The Water Research Association's (formerly the American Water Works Research Foundation) study on "Cost of Infrastructure Failure," which was completed in 2002, found that in addition to direct costs paid by water utility ratepayers for water main failures, there are also societal costs which are paid by the public. Examples of direct costs include outside contractor costs, engineering costs, police assistance, fire department assistance, electrical, telephone, and gas utility damage costs, landscaping restoration costs, and laboratory costs. Examples of societal costs include the cost of traffic impacts, business customer outage impacts, public health impacts (including loss of life), property damage not covered by direct costs, and the cost of reduced fire fighting capability during a water main failure event.

Rehabilitation and replacement of one percent of a system each year (a 100 year replacement cycle) is a reasonable guideline based on industry experience and analysis. For the Precinct distribution system, this would equate to approximately 2,200 linear feet of water main replacement each year as a guideline. Regular rehabilitation of water mains reduces main failures, leakage, and water quality issues. Water main rehabilitation can also provide socio-economic benefits by reducing operational costs associated with chemical and energy usage. Additionally, rehabilitation or replacement of water mains that are inadequately sized to provide needed fire protection will improve public safety.

7.2 General Recommendations

To maintain a comprehensive database of the condition of the system, it is recommended that the Precinct regularly provide break data to Tata & Howard to update the water main database.

Currently, the Precinct maintains documentation of breaks with the nearest street address and date. In addition, the Precinct should record joint type, type of lining, and type of failure such as ring crack, lateral split, hole in the pipe, "punky" AC pipe failure, joint leak, or service connection failure, and how the pipe was repaired. If possible, the Precinct should include the apparent cause of the failure such as frost load, traffic load, direct contractor damage, settlement, water hammer, or external soil corrosion. The documentation should also be filed electronically following each event. This data can be used to create a Water Main Failure Map for identifying areas of concern in the system on an ongoing basis. The map can be used to easily identify break locations, determine if streets or areas have a higher frequency of failures, and to view any patterns in the location, type, pipe manufacturer, or other characteristics in occurrences of failure. The water main failure database will aid the Precinct in making water main rehabilitation and replacement decisions in the future. Providing data of any new water main replacements or rehabilitations performed by Precinct staff as part of regularly scheduled maintenance to Tata & Howard will also help to keep the hydraulic model up to date and as accurate as possible.

The Precinct has a requirement in their operation standards to consider all materials of water main when investigating the installation of a new water main, with ductile iron and HDPE or PVC as the main materials used throughout the system. It is recommended that the Hooksett Village Water Precinct consider changing their standard specifications to zinc coated ductile iron piping in potentially corrosive soil areas. Zinc coated ductile iron piping is more expensive than polyethylene wrapping, but installation is less sensitive to properly protect the piping. If HDPE or PVC water main is to be installed, the Precinct should verify groundwater elevations in the project area and review any history of oil or hazardous material (OHM) release as these types of contaminants may reportedly penetrate the permeable HDPE or PVC piping. Polyethylene wrapped or zinc coated ductile iron are better options in areas where OHM may be present.

The Precinct should continue to perform regularly scheduled maintenance programs, including hydrant and valve maintenance and meter testing/calibration. It is also recommended that the Precinct develop a unidirectional flushing (UDF) plan to increase the cleaning achieved by regular flushing of the water mains. The cost to develop a UDF plan for the Precinct is estimated at $16,000.

The Precinct is currently investigating mazimizing their existing sources, including a possible back up source for the North Well, as well as conducting a test well exploration program to identify and reserve a future water supply source outside of the Pinnacle Pond aquifer. The catastrophic loss of the existing sources at Pinnacle Pond due to a potential contamination incident has been identified as an important system vulnerability. It is recommended that the Precinct continue with their preventive maintenance on their wells and continue to monitor specific capacity of the existing wells in an effort to monitor and maximize their yields. It is recommended that the Precinct continue with the test well investigation program This will prepare the Precinct for new source development in the future. Given the rate of development in Hooksett and the shrinking number of possible source locations, this should be considered a priority recommendation.

As outlined in the October 2020 Sanitary Survey conducted by New Hampshire Department of Environmental Services (NHDES), corrective action is required to address the condition of the Thompson Corner Tank. To evaluate the impacts to the distribution system if the tank was taken

off-line, field studies completed in November 2020 show that fire protection on the east side of the river is cut nearly in half when this tank is taken temporarily off-line. The hydraulic model developed in this study and system field hydraulic observations by the operators further suggest that additional distribution system improvements are needed on the west side of the river to relieve a bottleneck in the Pinnacle Street area that is restricting flow from the West (Quarry) Tank constructed in 2019.

It is recommended that the Precinct complete an evaluation of the Thompson Corner Tank to identify a cost effective approach to address the Significant Deficiency outlined in the Sanitary Survey and maintain adequate fire protection in the system. The primary goal of the evaluation will be to compare tank rehabilitation or replacement options. The evaluation will include tank inspection and metal loss analysis by a certified corrosion inspection firm, which is already ongoing; identification and analysis of any sanitary, safety and hydraulic improvements needed as part of the rehabilitation effort; the preparation of budgetary cost estimates for tank repair; identification of a potential replacement tank location and associated site logistics given current site constraints; the preparation of budgetary cost estimates for tank replacement; and the modeling and analysis of any water distribution system improvements needed to be implemented when the tank repair/replacement is completed. The cost of the evaluation is $10,000.

7.3 Prioritization of Water Distribution System Improvements

Based on the Three Circles Approach including the hydraulic, critical component, and asset management circles, a prioritized list of improvements was created for the buried infrastructure. Improvements were separated into three phases. The Phase I and Phase II improvements are prioritized based on hydraulic needs, location in the distribution system (critical component), the condition of the water main (asset rating), and the professional opinion of Tata & Howard of how to best impact the distribution system. Typically, the Phase I improvements include water mains that fall into all three circles but some improvements that would add new pipes to the system to improve hydraulics and strengthen critical areas have been included in Phase I. Phase II improvements include water mains that fall into any two circles.

Phase III improvements fall into one circle. These improvements include the remaining hydraulic recommendations from Section 4 not included in the Phase I or Phase II improvements and remaining areas with a poor asset management rating. The hydraulically deficient areas, critical component considerations, and asset management ratings are combined on one Three Circles Integration Map included in Appendix G.

The list of water main improvements is extensive due to the nature of this report. The prioritization of the recommended improvements based on the Three Circle Approach serves as a guide for implementation of the infrastructure improvements with the greatest to least benefit, as it is currently perceived based on the data in this report. The implementation of these improvements is intended to be completed over several years based on available funding sources and as circumstances allow.

Table No. 7-1, at the end of this section, includes a prioritized list of Phase I improvements and the hydraulic, critical component, and asset management status of each improvement. Table No.

7-2 includes the linear feet and estimated cost of each Phase I improvement. Table No. 7-3 includes a prioritized list of Phase II improvements and the hydraulic, critical component, and asset management status of each improvement, and Table No. 7-4 includes the linear feet and estimated cost of each Phase II improvement.

Phase III improvements include the water mains that have high asset management ratings that are not included in any Phase I or Phase II improvements and should be replaced when funding becomes available. The total length of water main by pipe diameter recommended for Phase III improvements is summarized in Table No. 7-5. The estimated cost to replace these water mains is also included in Table No. 7-5. The recommended improvements maps are included in Appendix H. It should be noted that paving schedules and other improvements to roadways were not evaluated as part of this study.

Phase I Improvements

1. A new 12-inch diameter cross country main is recommended from the end of Vista Drive to Route 3A. Creating this connection will partially finalize the transmission main from the West (Quarry) Tank to the southern and central portions of the distribution system. This will provide the inherent capacity for the estimated needed fire flow to these areas and increase system resiliency. The estimated probable construction cost of 1,100 linear feet of 12-inch diameter water main is approximately $432,000. With this cross country main, it is recommended that the existing 8-inch diameter water main on Vista Drive be increased to 12-inch diameter. This will complete the connection to the West (Quarry) Tank. The estimated probable construction cost of 700 additional linear feet of 12-inch diameter water main is approximately $274,000. Completing both improvements together would be an estimated probable construction cost $706,000 if traditional open cut construction was used for the cross-country portion of water main. The cross-country portion of water main could be installed via directional drilling which has an estimated probable construction cost of $390,000. If directional drilling was utilized, the estimated probably construction cost for the 1,800 linear feet of new water main is $664,000. The directional drilling cost estimate is used for the Phase I total cost.

2. A new 12-inch diameter main is recommended to replace the existing 6-inch diameter water main on Pine Street from the North Well driveway to Main Street, the 6-inch diameter water main on the North Well driveway from the North Well to Pine Street, the 8-inch water mains on Ardon Street from the East Well to the Pine Street. The existing mains are considered critical as they serve as a transmission main from the North and East Wells. The upgrade will increase the available fire flow to the I-93 Rest Areas and the Windsor Terrace and River Hill apartment complexes, which are top users. The estimated probable construction cost of 2,400 linear feet of 12-inch diameter water main is approximately $750,000.

3. New 12-inch diameter main is recommended to replace the existing 8-inch diameter water main on Route 3A. The portions of the existing mains are considered to be in fair to poor condition with asset management ratings ranging from 36 to 46. The poor ratings are due to the age, material, and potentially corrosive soil. This portion of main is considered critical because a break here would cause at least three percent of the system to lose water

service and the main is the only connection to the I-93 Rest Areas and associated residential complexes affiliated with Pennichuck Utilities, which are top users and critical customers. The upgrade will improve the hydraulic capacity of the water mains and better provide residential fire flow in the area. The estimated probable construction cost of 3,100 linear feet of 12-inch diameter water main is approximately $853,000.

4. New 12-inch diameter main is recommended from the intersection of Main Street with College Park Road to the 12-inch water main at the South end of the distribution system. The existing water main on Main Street is considered critical because it provides the only connection to the southeastern portion of the distribution system and a break here would cause at least three percent of the system to lose water service. The mains have asset management ratings ranging from 36 to 69 and are considered to be in fair to poor condition. The poor condition is due to age, material, and history of breaks. The upgrade will improve the hydraulic capacity of the water main and provide residential fire flow in the area. The estimated probable construction cost of 7,500 linear feet of 12-inch diameter water main is approximately $2,063,000.

5. A new 12-inch diameter main is recommended along Daniel Webster Highway from the intersection with Main Street/Route 3 to the Thompson Corner Tank transmission main. The existing tank transmission main is 8-inches in diameter with an asset management rating of 36, so is considered to be in good to fair condition but is hydraulically insufficient to serve as a main transmission main to the south western portion of the system. The main is considered to be critical as it serves as a transmission main to the Thompson Corner Tank and currently the main runs through private property. Installing a new 12-inch diameter main along Daniel Webster Highway to connect to the existing 8-inch water main on Precinct owned property would be beneficial in providing easier access to a critical main and in improving the system hydraulics in this area. The estimated probable construction cost of 700 linear feet of 12-inch diameter water main is approximately $265,000.

Phase II Improvements

6. A new 12-inch diameter cross river water main is recommended to be installed across the Merrimack River between the 8-inch water main to Tritown Ice Rink and the 8-inch water main on Dale Road. This position has been chosen to utilize an existing river crossing easement owned by the Sewer Department. Creating this connection between the transmission mains on Route 3A and 3 will increase the available fire flow for the entire system and especially to the critical and large users in the southern portion of the system. This will also increase system resiliency. The cost of installing 2,400 linear feet of 12-inch diameter pipe, with approximately 550 linear feet via directional drilling, is approximately $982,000.

7. New 8-inch and 12-inch diameter water mains are recommended to replace the existing 6-inch and 8-inch diameter mains along Riverside Street to the area near the Precinct office building. The existing main is hydraulically deficient and is considered to be in fair to poor condition with an asset management rating of 41 due to size, age and material of the main. The upgrade will improve hydraulic capacity of the water main and provide increased fire flow to the Precinct office which is considered a critical building. Upgrading to a 12-inch

diameter water main on Riverside Street will complete a larger 12-inch diameter transmission loop between all major points in the system. The estimated probable construction cost of 100 linear feet of 12-inch diameter water main and 200 linear feet of 8-inch diameter water main is approximately $157,000.

8. A new 12-inch diameter main is recommended to be installed on West River Road. The existing 6-inch diameter water main on West River Road is considered to be in poor condition with an asset management rating of 50 due to the diameter, age and material. This improvement, in conjunction with the Pinnacle Street project, will eliminate a bottleneck from the West (Quarry) Tank and the center of the distribution system which will increase fire flow to this area. The need for this improvement should be re-evaluated once the Vista Drive Project is completed. The estimated probable construction cost of 1,200 linear feet of 12-inch diameter ductile iron water main is approximately $315,000.

9. A new 12-inch diameter water main is recommended on Pinnacle Street and Maple Street from Vista Drive to West River Road. This improvement will eliminate the bottleneck from the West (Quarry) Tank to the center of the distribution system and replace a problematic valve at the intersection of Pinnacle Street and West River Road. Increasing the size of the water mains in this area will greatly improve the flow in the center of the distribution system. The need for this improvement should be re-evaluated once the Vista Drive project is completed. The estimated probable construction cost for 2,300 linear feet of 12-inch diameter water main is approximately $604,000.

10. A new 12-inch diameter main is recommended to replace the existing 8-inch diameter main along Veterans Drive from the river crossing to Merrimack Street. The existing 6-inch diameter water main is considered to be in poor condition with an asset management rating of 61 due to age, material, and history of breaks. The water main is also considered critical due to its proximity to a sewer pump station which is considered a critical user. The estimated probable construction cost of 600 linear feet of 12-inch diameter water main is approximately $189,000.

Phase III Improvements – Asset Management

11. A new 8-inch diameter water main is recommended on Highland Street from Granite Street to Dundee Avenue. This water main is considered in poor condition with asset ratings ranging from 50 to 72 due to age, material, size, and history of breaks. The estimated probable construction cost for 1,000 linear feet of 8-inch diameter water main is approximately $392,000.

12. A new 8-inch diameter water main is recommended to replace the existing AC 8-inch diameter water main on Heather Drive as well as extending this main to connect to West River Road with a new 8-inch water main. The water main is considered to be in poor condition with an asset management rating of 61 due to age, material, and history of breaks and would improve the overall system if it was connected to West River Road as an additional loop. The estimated probable construction cost for 750 linear feet of 8-inch diameter water main is approximately $294,000.

13. A new 8-inch diameter water main is recommended to replace the existing 6-inch and 8-inch diameter water mains on Granite Street, Chase Street, and Otterson Street. These water mains are considered in poor condition with asset management ratings ranging between 50 to 63 due to age, size, material, and history of breaks. The estimated probable construction cost for 3,600 linear feet of 8-inch diameter water main is approximately $1,125,000.

14. A new 12-inch diameter water main is recommended on Merrimack Street from Veterans Drive to the end to replace the existing 8-inch diameter water main and to complete a loop to College Park Drive. This water main is considered to be in poor condition with an asset management rating of 52 due to age and material. The estimated probable construction cost for 1,800 linear feet of 12-inch diameter water main is approximately $704,000.

15. New 8-inch diameter water main is recommended to replace the existing 6-inch diameter water main on Green Street and Scott Avenue. These water mains are considered to be in poor condition with an asset management rating of 57 due to size, history of breaks, and corrosive soils. The estimated probable construction cost for 2,600 linear feet of 8-inch diameter water main is approximately $813,000.

16. A new 8-inch diameter water main on Bullard Drive from Stevens Drive to the end is recommended to replace the existing 6-inch water main. This water main is considered to be in poor condition with an asset management rating of 54 due to size, age, material, and corrosive soils. The estimated probable construction cost for 700 linear feet of 8-inch diameter water main is approximately $274,000.

17. A new 8-inch diameter water main on Dale Road from Morse Drive to the end is recommended to replace the existing 8-inch diameter water main. This water main is considered to be in poor condition with an asset management rating of 45 due to age and history of breaks. The estimated probable construction cost for 3,200 linear feet of 8-inch diameter water main is approximately $1,000,000. The Precinct noted that a break occurred here recently and that the existing pipe was determined to be White PVC, which was very brittle. It is recommended that an alternate material be identified and used for the replacement of this water main.

18. It is recommended that the existing 8-inch diameter water main on Bayview Terrace Road and West Bank Road be replaced with a new 8-inch water main. The water main is considered in poor condition with an asset management rating of 45 due to age and history of breaks. The estimated probable construction cost of 1,300 linear feet of 8-inch diameter water main on Bayview Terrace Road and West Bank Road is approximately $407,000.

Table No. 7-1
Prioritization of Improvements – Phase I

Item No.	Location	From	To	Hydraulic Priority	Asset Management Rating	Critical
1	Vista Drive and Cross Country	Pinnacle Street	Route 3A	1	36	N
2	Pine Street, North Well, and Ardon Drive	Main Street	North/East Wells	-	35	Y
3	Route 3A	12-Inch tie in	I-93 Rest Area	1	36 -46	Y
4	Route 3	College Park Road	End of System	1	36 - 69	Y
5	Daniel Webster Highway	Main Street/Route 3	Thompson Corner Tank Property	-	36	Y

Table No. 7-2
Estimated Improvement Cost – Phase I

Item No.	Location	From	To	Proposed Diameter (in)	Length (LF)	Estimated Cost
1	Vista Drive and Cross Country	Pinnacle Street	Route 3A	12	1,800	$664,000
2	Pine Street, North Well, and Ardon Drive	Main Street	North/East Wells	12	2,400	$750,000
3	Route 3A	12-Inch tie in	I-93 Rest Area	12	3,100	$853,000
4	Route 3	College Park Road	End of System	12	7,500	$2,063,000
5	Daniel Webster Highway	Main Street/Route 3	Thompson Corner Tank Property	12	700	$265,000
Total Estimated Phase I Cost:						**$4,595,000**

Table No. 7-3
Prioritization of Improvements – Phase II

Item No.	Location	From	To	Hydraulic Priority	Asset Management Rating	Critical
6	River Crossing	Route 3A	Dale Road	1	-	-
7	Riverside Street	Main Street	Precinct Office	2	41	Y
8	West River Road	Route 3A	Maple Street	1	50	N
9	Pinnacle Street	West (Quarry) Tank	West River Road	1	43	Y
	Maple Street	Route 3A	Main Street	1	-	N
10	Veterans Drive	River Crossing	Merrimack Street	-	52	Y

Table No. 7-4
Estimated Improvement Cost – Phase II

Item No.	Location	From	To	Proposed Diameter (in)	Length (LF)	Estimated Cost
6	River Crossing	Route 3A	Dale Road	12	2,400	$982,000
7	Riverside Street	Main St	Precinct Office	12	900	$157,000
8	West River Road	Route 3A	Maple Street	12	800	$315,000
9	Pinnacle Street	West (Quarry) Tank	West River Road	12	1,800	$604,000
	Maple Street	Route 3A	Main Street	12	400	
10	Veterans Drive	River Crossing	Merrimack Street	12	500	$189,000
Total Estimated Phase II Cost						**$2,247,000**

Table No. 7-5
Estimated Improvement Cost – Phase III

Item No.	Location	From	To	Asset Management Rating	Proposed Diameter (in)	Length (LF)	Estimated Cost
11	Highland Street	Granite Street	Dundee Ave	72	8	1,000	$392,000
12	Heather Drive	Ardon Drive	End	61	8	600	$294,000
13	Granite Street	Hooksett Road	Merrimack Street	63	8	3,555	$1,125,000
	Otterson Street	Granite Street	Highland Street	55			
	Chase Street	Granite Street	Bert Street	50			
14	Merrimack Street	Veterans Drive	End	52	12	1,800	$704,000
15	Scott Avenue	West River Road	End	57	8		
	Green Street	Scott Avenue	End	57	8	2,500	$813,000
16	Bullard Drive	Stevens Drive	End	54	8	700	$274,000
17	Dale Road	Morse Drive	End	45	8	3,200	$1,000,000
18	Bayview Terrace Road	West River Road	End	45	8	1,300	$407,000
						Total Estimated Phase III Cost:	**$5,009,000**

7.4 20-Year Improvement Plan

In addition to the prioritized recommended improvements outlined in Section 7.3, it is beneficial for the Precinct to have an annual plan for construction of improvements. If feasible based on available resources and funding, it is recommended that Phase I and II improvements be completed over an initial 10-year interval since these improvements will provide the greatest benefit to the system. Phase III improvements are recommended to be implemented in the second 10-year interval.

The five Phase I improvements represent approximately ten percent of the total length of the Precinct's water distribution system with 15,000 linear feet of new water main and adding an additional 1,500 linear feet of new water main to areas that currently do not have water mains. The five Phase II improvements represent approximately five percent of the total length with 6,800 linear feet of new water main and adding an additional 2,400 linear feet of water main for the Merrimack River crossing. The eight Phase III improvements represent approximately ten percent of the system with 14,700 linear feet of new water main and adding approximately 200 linear feet of new water main to connect Merrimack Street and College Park Drive. In total, the estimated cost for all three phases of improvements is approximately $11,851,000 and would replace approximately 25 percent of the total system length.

To complete all 18 improvements over a 20-year interval, the Precinct would need to budget approximately $592,550 per year. Table No. 7-6 indicates the total estimated value and length for all three phases of improvements, as well as the estimated annual cost and length of improvements over the 20-year improvement plan. The total overall cost and length of improvements has increased by approximately $4,000,000 and approximately 17,000 linear feet relative to those originally identified in the May 2020 Asset Management Plan.

It should be noted that while these costs are considerable. This study reviews the entire distribution system in detail for the first time from a longterm perspective. The nature of this evaluation is very in depth and as a result highlights the key components of a distribution system's water mains that should be prioritized and invested in gradually as funds become available. Improving the water mains listed in this set of recommendations will lead to an additional 3,900 linear feet of water main to create two redundant loops in the Precinct's system and strengthen the system overall, while also replacing approximately 23 percent of the system's below ground infrastructure. The recommended improvements should be considered in conjunction with any necessary capital improvements to the Precinct's above ground infrastructure when developing the budget for system improvements. Cost savings may be incurred by coordinating these improvement projects and employing a variety of other approaches including but not limited to:

- Periodic re-evaluation of improvement needs and priorities as other improvements are completed,
- Application for grant opportunities and low-interest loans,
- Leveraging water main extension opportunities with developers,
- Favorable timing of competitive bidding when possible,
- Coordinating with other planned roadway and sewer main projects,

- Focusing on small, proactive, and regular rate increases rather than large, infrequent rate hikes.

Finally, Tata & Howard is ready to assist the Precinct with determining other alternative or creative phased funding strategies as needed to accomplish these critical improvements.

Table No. 7-6
20-Year Improvement Plan

Recommended Improvements	Total Estimated Value	Total Length (feet)
Phase I	**$4,595,000**	15,500
Phase II	**$2,247,000**	6,800
Phase III	**$5,009,000**	14,700
Total	**$11,851,000**	**37,000**
Annual Improvements over 20-Year Interval	$592,550	1,850

Appendix A

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1 mg
Overflow Elevation: 435 ft

Booster Pump Station

Manor Drive Tank
Capacity: 1.1 mg
Overflow Elevation: 643 ft

Thompson Corner Tank
Capacity: 0.2 mg
Overflow Elevation: 425 ft

Merrimack River

West River Rd
Edgewater Dr
Merrimack St
Pleasant St
Hooksett Rd
Post Rd
Beaver Way
Deer Run
Springer Rd
Pine St
Brighdewine Dr
Heather Dr
Arclon Dr
Main St
Maple St
Rosedale St
Riverside St
Veterans Dr
N Main St
College Park Dr
Pinnacle St
Summit Dr
Vista Dr
Donald St
Birch Hill Rd
Dupont Ave
Highland St
Bernice St
Chase St
Stevens Dr
Bullard Dr
Knights Ave
Bart St
Granite St
Northview Ter
Campus Dr
University Dr
Thompson Ave
Roy Dr
Grant Dr
Morgan Dr
Albert Ave
Pleasant View Rd
Blackwater Dr
Crawford Ln
Main St
Water Precinct Access Rd
Fire House Access Rd
Cate Rd
Mountain View Rd
Almeda Ln
Roy Rd
Grandview Dr
Pearl Dr
Quimby Mountain Rd
South Bow Rd
Viewpoint Dr
Orchard Dr
Mason Ave
Hilltop Cir
Morningside Dr
Brown Rd
Stow Hill Rd
Palmer Rd
Morse Dr
Mortuary Ln
Dale Rd
Wedgewood Cir
Memorial Dr
Eastview Dr
Avon Rd
Dove Rd
Shannon Rd
Tay Rd
Trent Rd
Maidstone Rd
Thames Rd
Bayview Terrace Rd
West Bank Rd
Cross Rd
Meadowcrest Rd
Scott Ave
Green St
Gary Ave
Marlette Ave
Dartmouth St
Howard Ave
Hunt St
Kerri Ln
Lehoux Dr
Peters Brook Dr
Industrial Park Dr
Oak Hill Rd
Sterling Ave
Julia Dr
Westview Terr
Burbank Way
Virginia Ct
Nancy Ln
Legends Dr
Sunrise Blvd
West River Rd
Hidden Ranch Dr
Gosselin Ave
Technology Dr
Quality Dr
Kimball Dr
Benton Rd
O'Neagh Ave
Whitehall Rd
McAllister St
Martins Ferry Rd
Depot Rd
Harvest Dr
Menifee Dr
Jefferson Dr
N River Rd
Sherwood Dr
Lancelot Dr
Camelot Dr
Goffstown Rd
Valley View Dr
Corriveau Dr
Hacker Hill Rd
Briar Ct
Poore Rd
Bemis Savoie Rd
W Riverbank Rd
Goonan Rd
Central Park Dr

Legend

- Blow Off Valve

Water Main Diameter

- 4-Inch or Smaller
- 6-Inch
- 8-Inch
- 12-Inch
- 16-Inch
- Private Mains

Water Distribution System
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
March 2021

Appendix B

TATA & HOWARD

Placeholder for Lewis Engineering Report

Appendix C

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1 mg
Overflow Elevation: 435 ft

Booster Pump Station

Manor Drive Tank
Capacity: 1.1 mg
Overflow Elevation: 643 ft

Thompson Corner Tank
Capacity: 0.2 mg
Overflow Elevation: 425 ft

Edgewater Dr
West River Rd
Springer Rd
Pine St
Bridgewater Dr
Merrimack St
Pleasant St
Hooksett Rd
Post Rd
Beaver Way
Rum Brook
Merrimack River
Maple St
Rosedale St
Riverside St
Pinnacle St
Donald Dr
Summit Dr
Vista Dr
Birch Hill Rd
Veterans Dr
Village Park Dr
Thompson Ave
Grant Dr
Allegan Dr
Pleasant View Dr
Alden Dr
Beacon St
Highland St
Bellard Ln
Knights Ave
Granite St
Stevens Dr
Dupaw Ave
Northview Ter
Manor Dr
Blackwater Dr
University Dr
Crawford Ln
Water Precinct Access Rd
Fire House Access Rd
Cate Rd
Snow Hill Rd
Palluzzi Rd
Almeda Ln
Roy Rd
Mountain View Rd
Grandview Dr
South Bow Rd
Viewpoint Dr
Orchard Dr
Mason Ave
Hilltop Cir
Quimby Mountain Rd
Pearl Dr
Morningside Dr
Brown Rd
Goffstown Rd
Valley View Dr
Corriveau Dr
Morse Dr
Mallory Ln
Dale Rd
Westwood Cir
Memorial Dr
Shannon Rd
Dove Rd
Tay Rd
Trent Rd
Thames Rd
Maidstone Rd
Meadowcrest Rd
Scout Ave
Green St
Lehoux Dr
Industrial Park Dr
Peters Brook Dr
Oak Hill Rd
Sunrise Blvd
Westview Terr
Julia Dr
Stirling Ave
Burbank Way
Virginia Ct
Nancy Ln
Legends Dr
Hidden Ranch Dr
Gosselin Ave
Technology Dr
Quality Dr
Kimball Dr
Central Park Dr
Groonan Rd
Bemis Savoie Rd
W Riverbank Rd
Poore Rd
Hacker Hill Rd
Briar Ct
Depot Rd
N River Rd
Martins Ferry Rd
McAllister St
Whitehall Rd
Benton Rd
Clough Ave
Harvest Dr
Memphis Dr
Jefferson Dr
Sherwood Dr
Lancelot Dr
Camelot Dr
Gary Ave
Marlette Ave
Dartmouth St
Hewlett Ave
Hunt St
Kent Ln
Avon Rd

Legend

- Junction
- Water Main
- High Service Area

Link Map
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
March 2021

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
0	6	AC	2004	130	691	Gravel/Sand	0	31
1	6	PVC	2008	130	256	Gravel/Sand	0	16
2	1	Plastic		130	271	Gravel/Sand	0	0
3	8	AC	1966	130	302	Gravel/Sand	0	42
4	8	AC	1966	130	521	Gravel/Sand	1	61
6	8	AC	1978	95	783	Gravel/Sand	2	35
7	8	DI	2030	95	994	Gravel/Sand	0	36
8	8	PVC	2002	130	2027	Gravel/Sand	0	36
9	8	PVC	2002	130	244	Gravel/Sand	0	8
10	8	PVC	2003	130	558	Gravel/Sand	0	8
11	12	DIP	2001	120	628	Gravel/Sand	0	8
12	8	PVC	2006	130	1410	Gravel/Sand	0	11
13	12	DIP	1990	100	2103	Gravel/Sand	0	8
14	8	DIP	1990	90	1816	Gravel/Sand	0	16
15	6	DI	2030	105	641	Gravel/Sand	0	20
17	12	PVC	1982	115	693	Gravel/Sand	1	0
18	12	DI	1990	120	925	Gravel/Sand	0	50
19	12	HDPE	2018	130	1348	Potentially Corrosive	1	32
20	6	PVC	2002	130	1365	Potentially Corrosive	1	44
21	4	PVC	2002	130	490	Potentially Corrosive	0	19
22	6	DI	2030	105	601	Gravel/Sand	0	22
23	6	AC	1963	105	496	Gravel/Sand	0	26
24	8	DI	2030	130	1718	Gravel/Sand	0	43
25	6	AC	1963	105	460	Gravel/Sand	0	44
26	6	AC	1965	130	696	Gravel/Sand	0	36
27	6	PVC	1992	110	1401	Gravel/Sand	0	44
28	6	AC	1957	105	642	Gravel/Sand	0	44
29	12	DIP	2018	120	665	Gravel/Sand	0	21
30	8	DI	1986	110	781	Gravel/Sand	0	44

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
31	12	PVC	1982	130	2076	Gravel/Sand	0	4
32	12	DIP	1992	120	410	Gravel/Sand	0	21
33	8	AC	1950	130	11745	Potentially Corrosive	0	34
34	8	PVC	2030	130	1511	Gravel/Sand	0	16
35	12	DIP	2006	120	445	Gravel/Sand	1	61
36	12	DIP	1985	120	2867	Gravel/Sand	0	36
37	6	AC	1958	130	2607	Gravel/Sand	0	11
38	8	AC	1963	130	3042	Gravel/Sand	0	17
39	8	AC	1962	90	688	Gravel/Sand	0	44
40	6	AC	1962	90	2085	Gravel/Sand	0	36
41	6	AC	1963	90	597	Gravel/Sand	0	36
42	6	AC	1962	130	591	Gravel/Sand	0	44
43	6	AC	1962	130	671	Gravel/Sand	0	44
44	8	PVC	2030	90	1244	Gravel/Sand	0	44
45	6	PVC	2030	130	390	Gravel/Sand	0	44
46	10	DIP		120	883	Gravel/Sand	0	36
47	12	DI	1996	120	3917	Gravel/Sand	0	44
48	12	PVC	2016	130	654	Gravel/Sand	0	0
49	8	PVC	2016	130	2276	Gravel/Sand	0	10
50	12	PVC	2006	130	424	Gravel/Sand	0	11
51	12	PVC	2006	130	668	Gravel/Sand	0	17
52	8	PVC	2006	130	1645	Gravel/Sand	0	12
53	8	PVC	2016	130	741	Gravel/Sand	0	10
54	8	PVC	2006	130	1602	Gravel/Sand	0	8
55	8	PVC	2015	130	854	Gravel/Sand	0	7
56	8	PVC	2015	130	617	Gravel/Sand	0	14
57	12	PVC	2012	130	183	Gravel/Sand	0	15
58	12	PVC	2012	130	1611	Gravel/Sand	0	13
59	12	PVC	2012	130	1063	Gravel/Sand	0	3

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
60	12	PVC	2006	130	227	Gravel/Sand	0	3
61	8	PVC	2007	130	460	Gravel/Sand	0	3
62	12	PVC	2004	130	3608	Gravel/Sand	0	14
63	16	PVC	2007	130	891	Gravel/Sand	0	18
64	8	PVC	2007	130	2704	Gravel/Sand	0	14
65	16	PVC	2006	130	1193	Gravel/Sand	0	3
66	8	PVC	2005	130	826	Gravel/Sand	0	8
67	8	AC	1950	130	4997	Gravel/Sand	0	13
68	2	Plastic	1950	130	877	Gravel/Sand	0	14
69	6	AC	1955	115	1077	Potentially Corrosive	0	52
70	6	HDPE/PVC?	1968	105	437	Gravel/Sand	1	72
71	6	AC	1968	130	2732	Gravel/Sand	1	63
72	8	AC	1960	130	1513	Known Corrosive Soil	0	40
73	8	DIP	1986	110	696	Known Corrosive Soil	0	54
74	8	DIP	1986	110	455	Gravel/Sand	0	36
75	6	AC	1960	130	1788	Gravel/Sand	0	21
76	12	Ductile Iron	1996	120	319	Gravel/Sand	0	21
78	8	DIP	2005	110	1433	Gravel/Sand	0	44
79	8	DIP	1996	110	239	Gravel/Sand	0	10
80	8	DIP	1996	110	169	Gravel/Sand	0	10
81	8	DIP	2005	110	792	Gravel/Sand	0	9
82	8	DIP	2005	110	385	Gravel/Sand	0	14
83	12	PVC	1998	130	183	Gravel/Sand	0	14
84	6	PVC	1982	130	915	Gravel/Sand	0	9
85	8	DIP	1988	110	234	Gravel/Sand	0	9
86	6	PVC	1982	130	1833	Gravel/Sand	0	17
87	8	PVC	1992	130	1866	Known Corrosive Soil	1	57
88	10	PVC	1998	130	438	Gravel/Sand	0	27
89	8	PVC	1995	130	651	Known Corrosive Soil	1	57

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
90	8	PVC	1995	130	371	Gravel/Sand	0	21
91	8	PVC	1995	130	1012	Gravel/Sand	0	11
92	8	PVC	1983	68	1246	Gravel/Sand	0	21
93	6	AC	1968	130	444	Gravel/Sand	0	13
94	12	DIP	1985	120	505	Gravel/Sand	0	21
95	8	PVC	1985	130	2295	Gravel/Sand	1	45
96	6	PVC	1986	130	2843	Gravel/Sand	0	44
97	8	PVC	1985	105	671	Gravel/Sand	0	17
98	8	AC	1960	130	675	Gravel/Sand	0	20
99	6	PVC	1981	130	735	Potentially Corrosive	0	38
100	6	AC	1960	130	4815	Gravel/Sand	1	45
101	6	AC	1950	130	323	Gravel/Sand	1	55
102	8	AC	1950	130	409	Gravel/Sand	0	28
103	6	AC	1963	130	499	Gravel/Sand	0	50
104	6	DI	2030	130	225	Gravel/Sand	0	50
105	6	AC	1965	130	529	Potentially Corrosive	0	52
106	12	DIP	2018	120	689	Gravel/Sand	0	44
107	12	DIP	2006	120	819	Gravel/Sand	2	0
108	8	PVC	2006	130	181	Gravel/Sand	0	44
109	1	Copper	1985	100	6	Gravel/Sand	0	10
110	10	DI		120	125	Gravel/Sand	0	15
111	8	PVC	2019	130	420	Gravel/Sand	0	14
112	8	PVC	2019	130	173	Gravel/Sand	0	37
113	8	PVC	2019	130	72	Gravel/Sand	0	0
114	12	PVC	2006	130	476	Gravel/Sand	0	7
115	2	PVC	1986	130	512	Gravel/Sand	0	13
116	2	PVC	1986	130	1160	Gravel/Sand	0	7
117	2	PVC	1986	130	49	Gravel/Sand	0	14
118	8	PVC	2002	130	426	Gravel/Sand	0	34

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
119	8	PVC	2003	130	179	Gravel/Sand	0	34
120	6	PVC	2003	130	199	Gravel/Sand	0	34
121	6	PVC	2003	130	268	Gravel/Sand	0	8
122	4	PVC	2003	130	127	Gravel/Sand	0	8
123	4	PVC	2003	130	244	Gravel/Sand	0	16
124	4	PVC	2003	130	158	Gravel/Sand	0	16
125	4	PVC	2003	130	157	Gravel/Sand	0	20
126	4	PVC	2003	130	38	Gravel/Sand	0	20
127	4	PVC	2003	130	33	Gravel/Sand	0	20
128	4	PVC	2003	130	119	Gravel/Sand	0	20
129	4	PVC	2003	130	15	Gravel/Sand	0	20
130	4	PVC	2003	130	20	Gravel/Sand	0	20
131	4	Plastic	2002	130	13	Gravel/Sand	0	20
132	4	Plastic	2002	130	48	Gravel/Sand	0	20
133	4	Plastic	2002	130	66	Gravel/Sand	0	20
134	4	Plastic	2002	130	47	Gravel/Sand	0	32
135	4	Plastic	2002	130	112	Gravel/Sand	0	32
136	4	Plastic	2002	130	63	Gravel/Sand	0	32
137	4	Plastic	2002	130	161	Gravel/Sand	0	32
138	8	PVC	1996	130	39	Gravel/Sand	0	32
139	8	PVC	2006	130	37	Gravel/Sand	0	32
140	6	PVC	2015	130	80	Gravel/Sand	0	32
141	12	DIP	2018	120	899	Gravel/Sand	0	21
142	6	DI	2016	110	428	Gravel/Sand	0	14
143	6	AC	1962	130	582	Gravel/Sand	0	23
144	6	PVC	1995	130	385	Gravel/Sand	0	41
145	6	Plastic		130	142	Gravel/Sand	0	0
146	8	PVC	1982	130	58	Gravel/Sand	0	44
147	2	Plastic	1955	130	82	Gravel/Sand	0	29

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
148	6	AC		130	123	Gravel/Sand	0	0
149	12	DIP	2018	120	4	Gravel/Sand	0	20
150	12	DIP	2018	120	632	Gravel/Sand	1	66
151	8	DI	1990	110	31	Gravel/Sand	0	0
152	8	PVC	1985	105	254	Gravel/Sand	0	10
153	6	AC	1957	105	67	Gravel/Sand	0	10
154	16	PVC	2006	130	145	Gravel/Sand	0	20
155	12	DIP	1985	120	4815	Gravel/Sand	1	39
156	12	DIP	1985	120	1401	Gravel/Sand	1	44
157	8	DI	2030	95	4997	Potentially Corrosive	0	23
158	12	PVC	1982	130	3042	Potentially Corrosive	0	27
159	12	PVC	1982	130	3042	Gravel/Sand	0	17
160	12	PVC	1982	130	2027	Potentially Corrosive	0	46
161	12	PVC	1982	130	11745	Potentially Corrosive	0	34
162	12	PVC	1982	130	11745	Potentially Corrosive	0	34
163	12	DIP	1990	90	11745	Potentially Corrosive	0	32
164	6	PVC	2030	115	11745	Potentially Corrosive	0	32
165	8	PVC	2030	90	11745	Potentially Corrosive	0	32
166	8	PVC	2030	90	1816	Gravel/Sand	1	34
171	12	DIP	2001	120	3917	Gravel/Sand	2	69
P11	8	PVC	2003	130	2867	Gravel/Sand	2	61
P13	8	PVC	2003	130	2867	Gravel/Sand	0	36
P15	8	PVC	2003	130			0	0
P17	8	PVC	2003	130			0	0
P19	8	PVC	2003	130			0	0
P21	8	PVC	2003	130	225848		0	0
P23	8	PVC	2002	130	42.77		0	11
P25	12	PVC	2002	110			0	0
P27	6	PVC	2030	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P29	6	AC	2004	130				
P33	6	PVC	2030	130				
P35	8	PVC	2006	130				
P37	12	PVC	2006	130				
P39	12	PVC	2006	130				
P41	12	DIP	1990	100				
P43	12	DIP	1990	100				
P45	12	DI	1990	120				
P47	8	AC	1981	130				
P49	6	DI	2016	110				
P53	12	DIP	1996	120				
P55	6	AC	1955	130				
P57	6	AC	1955	130				
P59	6	AC	1955	115				
P61	6	AC	1955	130				
P63	6	HDPE/PVC?	1968	105				
P65	16	PVC	2007	130				
P67	12	PVC	2004	130				
P69	12	DI	1990	120				
P71	12	DIP	2006	120				
P73	8	PVC	2019	130				
P75	6	DI	2030	105				
P77	6	DI	2030	105				
P79	6	DI	2030	105				
P83	6	PVC	2015	130				
P85	6	PVC	2015	130				
P87	6	PVC	2015	130				
P89	8	PVC	2006	130				
P91	12	PVC	1982	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P93	16	PVC	2006	130				
P95	16	PVC	2006	130				
P99	16	PVC	2007	130				
P101	16	PVC	2007	130				
P103	12	PVC	2004	130				
P105	12	PVC	2004	130				
P107	12	PVC	2004	130				
P109	12	PVC	2006	130				
P111	12	PVC	2006	130				
P113	12	PVC	2006	130				
P115	12	PVC	2006	130				
P117	12	PVC	2006	130				
P119	8	PVC	2006	130				
P121	8	PVC	2006	130				
P123	12	PVC	2012	130				
P125	12	PVC	2006	130				
P127	12	PVC	2012	130				
P129	12	PVC	2012	130				
P131	12	PVC	2016	130				
P133	12	DIP	2006	120				
P135	12	DIP	1985	120				
P137	12	DIP	1985	120				
P139	12	DIP	1985	120				
P141	12	DI	1996	120				
P143	12	DIP	2006	120				
P145	12	DI	1990	120				
P147	12	DIP	2018	120				
P149	6	PVC	2002	130				
P151	6	PVC	2002	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P153	8	PVC	2030	130				
P155	8	PVC	2030	130				
P157	8	PVC	2030	130				
P159	8	PVC	2030	130				
P161	12	DIP	1985	120				
P163	8	AC	1963	130				
P165	8	AC	1963	130				
P167	12	DIP	1985	120				
P169	6	AC	1963	130				
P171	8	AC	1963	130				
P173	8	AC	1963	130				
P175	8	AC	1962	100				
P177	6	AC	1962	130				
P179	8	AC	1963	130				
P181	6	AC	1962	130				
P183	8	AC	1963	130				
P185	8	PVC	2030	130				
P187	8	PVC	2030	90				
P189	6	AC	1963	130				
P191	6	AC	1962	90				
P193	8	PVC	2002	130				
P195	8	PVC	2002	130				
P197	8	PVC	2002	130				
P199	8	PVC	2002	130				
P201	8	PVC	2002	130				
P203	8	PVC	2002	130				
P205	8	PVC	2002	130				
P207	8	PVC	2002	130				
P209	8	PVC	2003	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P211	8	PVC	2003	130				
P213	6	PVC	2003	130				
P215	6	PVC	2003	130				
P217	6	AC	2004	130				
P219	6	AC	2004	130				
P221	12	DIP	1990	100				
P223	6	DI	2030	105				
P225	6	DI	2030	105				
P227	6	DI	2030	105				
P229	6	AC	1957	105				
P231	12	DIP	2018	100				
P233	8	DI	1986	110				
P235	8	DI	1986	110				
P237	12	DIP	2018	100				
P239	12	DIP	2018	120				
P241	6	DI	2030	105				
P243	6	AC	1963	105				
P245	8	DI	2030	130				
P247	12	PVC	1982	130				
P249	12	DIP	1990	100				
P251	8	AC	1950	115				
P253	8	AC	1950	130				
P255	12	DIP	1992	120				
P257	6	AC	1950	130				
P259	6	AC	1960	130				
P261	6	AC	1955	115				
P263	6	AC	1955	115				
P265	6	AC	1955	115				
P269	8	AC	1960	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P271	8	DIP	1986	110				
P273	8	DIP	1986	110				
P275	8	DIP	1986	110				
P277	6	AC	1960	130				
P279	12	Ductile Iron	1996	120				
P281	8	DIP	2005	110				
P283	8	DIP	1996	110				
P285	8	DIP	1996	110				
P287	8	DIP	2005	110				
P289	8	DIP	2005	110				
P291	8	PVC	1995	130				
P293	12	PVC	1995	130				
P295	12	PVC	1995	130				
P297	12	PVC	1982	130				
P299	6	PVC	1982	130				
P301	6	PVC	1982	130				
P303	6	PVC	1982	130				
P305	12	PVC	1982	130				
P307	12	PVC	1982	130				
P309	8	PVC	1983	68				
P311	12	PVC	1982	85				
P313	8	PVC	1996	130				
P315	8	PVC	1985	130				
P317	6	PVC	2030	130				
P319	6	PVC	2030	130				
P321	6	AC	1968	130				
P323	8	PVC	1985	105				
P325	6	PVC	2030	130				
P327	12	PVC	1982	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P329	16	PVC	2006	130				
P331	8	DI	2030	130				
P333	12	DIP	1992	120				
P335	12	DIP	2006	120				
P337	12	DIP	2006	120				
P339	12	DIP	2006	120				
P341	12	DIP	1990	120				
P343	12	DIP	1990	90				
P345	12	DIP	1990	90				
P347	6	PVC	1992	130				
P349	8	PVC	2005	130				
P351	8	PVC	2016	130				
P353	8	PVC	2016	130				
P355	8	PVC	2015	130				
P357	8	PVC	1985	130				
P359	8	PVC	1985	125				
P361	8	PVC	1985	110				
P363	6	PVC	1986	130				
P365	6	PVC	1986	120				
P367	8	PVC	1983	130				
P369	8	PVC	1983	130				
P371	8	PVC	1995	110				
P373	8	PVC	1995	130				
P375	8	DI	2030	130				
P377	8	AC	1960	130				
P379	8	PVC	1992	130				
P381	8	DI	1986	110				
P383	12	DI	1996	120				
P385	4	Plastic	2002	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P387	8	PVC	2002	130				
P389	6	HDPE/PVC?	1968	105				
P391	8	PVC	2030	90				
P393	8	PVC	2030	130				
P395	8	PVC	2030	90				
P397	16	PVC	2007	130				
P399	12	PVC	1982	130				
P401	12	PVC	2006	130				
P403	6	AC	1958	130				
P405	6	AC	1962	130				
P407	6	PVC	1999	130				
P409	6	AC	1962	130				
P411	8		1983	100				
P413	8	PVC	2019	130				
P415	12	PVC	2012	130				
P417	8	PVC	2020	130				
P419	8	PVC	2020	130				
P421	2	Copper	2001	100				
P423	12			100				
P425	2	Copper	2001	100				
P427	12	DI	1996	120				
P429	12	DIP	1996	120				
P431	12	DIP	1996	120				
P433	12	DIP	1996	120				
P435	8	DIP	2005	110				
P437	8	DIP	2005	110				
P439	8	DIP	1986	110				
P441	8	DIP	1986	110				
P443	12	DIP	1990	100				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P445	12	DIP	1990	100				
P447	12	PVC	1982	130				
P449	12	DIP	2018	120				
P451	8	AC	1981	130				
P453	12	PVC	1982	130				
P455	8	PVC	1987	120				
P457	8	PVC	1987	120				
P459	12	DIP	2006	120				
P461	8	DI	2030	95				
P463	8	AC	1978	95				
P465	12	DIP	1990	100				
P467	8	PVC	2007	130				
P469	8	PVC	2030	90				
P471	8	PVC	1985	130				
P473	4	PVC	2002	130				
P475	8	PVC	2012	130				
P477	12	PVC	2006	130				
P479	8	DIP	1990	90				
P481	8	PVC	2003	130				
P483	6	DI	2016	110				
P485	6	PVC	2030	130				
P487	8	PVC	1985	130				
P489	8	PVC	1996	130				
P491	8	PVC	1996	130				
P493	8	PVC	2020	130				
P495	12	DI	1996	120				
P497	12	PVC	2030	130				
P499	12	PVC	2030	130				
P501	12	PVC	2030	130				

Pipe Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (in)	Material	Installation Year	Hazen-Williams C	Length (ft)	Soil Code	Breaks	Asset Management Score
P503	8	PVC	1985	130				
P505	12	PVC	2030	130				
P507	12	DI	1996	120				

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J14	297.29	0.15	72.29
J18	299.26	0.3	71.22
J20	273.00	1.35	82.03
J22	274.53	0.6	81.37
J24	276.90	1.05	80.23
J26	272.00	0.75	82.36
J30	246.43	0.45	79.49
J32	257.84	0	74.54
J34	290.69	0	60.3
J36	289.24	0.3	60.93
J40	263.00	0	72.3
J42	259.00	0	74.03
J44	265.99	0	71
J46	244.31	0	80.4
J52	225.11	0.15	87.79
J60	220.55	1.2	89.33
J64	206.95	0.3	94.98
J72	179.82	0	106.66
J74	181.88	0	105.7
J78	214.98	0	90.72
J92	263.39	0.6	70.53
J94	260.88	0.3	71.62
J98	300.73	1.05	54.37
J100	260.51	1.2	71.79
J102	286.25	1.2	60.64
J104	303.00	0	53.39
J106	313.65	0.6	48.78
J114	197.98	0	98.87
J116	193.66	0	100.73
J120	198.93	0.6	98.03
J124	191.82	1.05	101.31
J126	210.81	0.3	92.9
J128	261.04	0.15	70.27
J132	314.00	0	47.59
J134	298.82	0.15	53.92
J136	325.22	0.45	42.23
J138	306.93	0.45	50.06
J140	323.00	0.75	43.1
J144	244.14	0.75	77.61
J154	266.21	0.3	68.01
J156	299.86	0.6	53.45

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J168	288.05	1.05	58.41
J170	271.98	0	65.37
J172	317.04	0	46.28
J174	366.00	0	25.06
J178	312.10	0.75	48.41
J180	356.88	0	110.17
J182	392.44	0	94.76
J186	338.57	0	118.1
J188	397.06	0	92.76
J192	431.31	0	77.92
J196	511.85	0	43.02
J198	474.46	0.15	59.22
J200	523.39	0.3	38.02
J206	408.16	0.3	87.95
J208	450.13	0	69.76
J212	487.00	0	53.79
J216	478.99	0	57.26
J228	333.00	0.3	120.52
J232	317.00	0	46.28
J236	571.00	0	17.33
J238	485.00	0.45	54.6
J240	491.88	0	51.62
J242	467.25	0.15	62.29
J244	328.98	0	122.21
J248	428.91	0.6	78.91
J252	230.63	0.45	84.27
J254	264.55	0.6	69.57
J256	203.33	0.3	96.14
J266	271.00	1.35	66.46
J270	278.43	0.3	63.18
J272	293.82	0	56.51
J274	308.96	0	49.95
J276	275.70	1.5	64.36
J282	316.25	0	46.61
J286	301.31	0.75	53.14
J290	315.00	0	47.15
J294	309.00	0.3	49.81
J298	301.16	0.75	53.21
J300	306.72	0.75	50.8
J302	299.31	0	54.01
J304	231.46	0.75	84.36

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J306	236.00	0.15	82.39
J314	203.38	0.3	96.52
J322	184.49	0.9	104.71
J326	285.77	0.15	60.82
J330	196.31	0	99.59
J332	212.75	0.45	92.46
J334	212.42	0.45	92.61
J336	208.75	0.45	94.19
J340	190.21	0.75	102.23
J344	190.16	0.15	100.82
J346	287.02	0	58.85
J350	261.47	1.8	69.92
J354	258.35	0.3	71.27
J356	228.53	1.65	84.19
J360	297.00	0.3	55.01
J364	276.64	0.45	63.92
J374	191.49	0	101.26
J384	269.73	0.6	67.79
J388	265.87	0	69.46
J394	194.86	0.15	99.73
J398	288.00	0.3	58.38
J400	314.00	0	47.59
J404	541.18	0	30.31
J408	494.70	0	50.45
J414	310.03	0	130.47
J418	317.96	0.3	46.05
J422	289.37	0.15	58.44
J426	295.00	0.15	56
J430	272.46	0.15	68.2
J434	275.00	0	67.1
J436	275.00	0	67.1
J438	272.00	0	68.4
J440	266.86	0	70.63
J442	270.00	0.3	69.27
J444	273.00	0.15	67.97
J446	271.87	0	68.45
J448	273.20	0	67.88
J450	270.79	0	68.92
J452	271.32	0	68.69
J456	273.34	0.15	67.82
J460	272.00	0.15	68.4

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J462	271.00	0	68.83
J466	268.01	0	70.13
J470	265.33	0	71.29
J474	266.96	0.15	70.58
J478	266.09	0.15	70.96
J480	268.85	0.15	69.77
J484	273.00	0.15	67.97
J488	275.04	0.15	67.08
J490	268.90	0	69.74
J494	270.52	0.15	69.04
J498	273.61	0.15	67.71
J504	189.00	0	102.76
J508	243.27	0.15	79.24
J514	199.00	0	98.36
J516	213.63	0	92.13
J520	198.64	0.15	98.51
J522	240.45	0.3	79.21
J526	229.00	0	85.42
J530	190.49	0	102.11
J534	195.63	0	99.89
J536	269.63	0.75	67.05
J538	241.87	0.3	79.07
J544	195.00	0	99.99
J552	326.91	0.3	123.1
J554	298.54	0.15	54.11
J556	311.05	0	48.87
J558	190.00	0.3	102.32
J560	191.76	0.9	101.56
J562	202.04	0.45	97.11
J564	298.59	0.75	53.85
J566	282.52	0.45	60.86
J584	239.73	0	82.38
J590	267.20	0.3	70.48
J592	267.38	0	70.4
J594	273.09	0	67.93
J596	234.26	1.5	84.77
J598	238.71	0.45	83.89
J600	272.77	0.3	82.91
J602	274.99	0.15	81.77
J604	260.37	0.9	86.83
J606	212.91	0	92.47

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J608	213.26	0	92.29
J610	193.00	0	101.01
J612	199.00	0	98.36
J614	199.00	0.15	98.36
J618	314.94	0.45	47.18
J620	301.42	1.35	53.1
J622	281.19	1.35	61.95
J624	268.87	1.65	67.46
J626	276.00	1.2	64.24
J628	270.00	1.8	66.89
J630	469.26	0	61.43
J632	471.19	1.35	60.59
J634	211.25	0.15	92.71
J636	212.14	0.15	92.3
J638	531.80	0	34.38
J640	235.32	0.3	82.76
J642	269.84	0.6	67.78
J644	210.31	0.45	93.53
J648	198.79	0	98.51
J650	212.33	0	92.64
J652	194.66	0	100.3
J654	198.59	0	98.6
J656	190.40	0	102.15
J658	191.00	0	101.89
J660	334.00	1.8	120.03
J662	426.79	2.4	79.83
J668	313.41	0	129.04
J670	365.44	0.45	106.46
J672	366.03	0	106.21
J674	357.85	0.45	109.75
J676	405.51	0.9	89.1
J678	312.22	0	129.52
J680	424.90	0.15	80.7
J682	450.00	0.45	69.82
J684	511.06	0.9	43.36
J686	488.38	0	53.19
J688	429.56	0	78.68
J690	488.82	0	53
J692	482.78	0	55.62
J694	359.07	0	109.22
J696	310.36	0	49.19

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J702	313.62	0	47.71
J704	306.45	0.15	50.88
J706	212.89	0	91.92
J708	222.73	0	87.91
J710	196.00	0.15	99.57
J712	214.73	0.45	90.83
J714	216.58	0.6	90.03
J716	226.92	1.05	85.55
J718	292.84	0.15	56.34
J724	302.00	0	52.52
J726	288.96	0.6	58.18
J728	285.01	1.05	59.89
J730	302.00	1.35	52.52
J732	266.10	0.6	68.08
J734	265.06	0.75	68.54
J736	256.00	0.3	72.47
J738	252.80	0.6	73.86
J740	265.00	0.45	68.57
J742	256.76	0.75	72.14
J744	258.95	1.35	71.19
J746	244.39	1.2	77.5
J748	249.91	0.45	75.14
J752	277.61	0.9	63.09
J754	275.05	0.9	64.21
J756	259.97	0	73.61
J758	268.91	0.15	69.74
J760	262.93	0.15	72.33
J762	259.05	0	74.01
J764	270.45	0.15	69.07
J766	273.04	0	67.95
J768	258.77	0	74.14
J770	260.92	0	73.2
J772	264.87	0	71.49
J774	265.38	0	71.27
J776	272.17	0.15	68.32
J778	272.00	0	68.4
J782	274.79	0.15	81.88
J786	233.32	1.2	83.67
J788	233.41	1.8	83.58
J790	310.00	0.75	50.35
J792	303.00	1.95	53.39

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J794	255.51	0.15	73.95
J802	265.07	0	69.81
J806	292.24	0.9	58.05
J808	259.00	1.2	72.44
J810	193.64	0.15	100.75
J812	198.71	0	98.55
J814	199.22	1.5	97.93
J816	193.11	0.75	100.56
J818	203.88	1.2	95.89
J820	221.69	0.6	88.15
J822	227.00	0.45	85.83
J824	248.70	0.75	76.39
J826	269.39	0.9	67.15
J828	274.08	0.3	65.08
J832	291.36	0.15	57.58
J834	292.00	0	57.3
J836	305.00	0	51.67
J838	297.57	1.65	54.76
J840	312.99	0	48.02
J842	295.16	0	55.81
J844	303.52	0.75	52.18
J846	313.00	0.15	48.08
J854	235.79	0.15	82.48
J856	236.97	0.45	81.97
J858	222.53	0.45	88.22
J860	185.86	1.05	104.12
J862	191.04	0.75	101.87
J864	191.87	1.2	101.51
J866	200.15	0	97.92
J868	194.00	0.15	100.59
J870	186.73	0.45	103.74
J872	199.16	0.6	98.35
J874	188.87	0.15	102.81
J876	268.48	0.3	66.88
J878	278.81	1.2	62.41
J880	273.08	0.3	64.89
J882	201.48	0.15	95.91
J884	287.07	1.8	58.83
J886	291.52	0.75	56.91
J888	195.44	0.15	99.97
J890	330.66	0.15	121.48

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J892	290.76	0.45	60.27
J894	191.86	1.5	101.1
J896	220.73	0	88.48
J898	258.07	0	72.17
J900	279.68	0.15	62.68
J904	225.00	0.6	87.7
J906	237.09	1.2	83.08
J908	305.81	0.9	52.17
J910	427.53	0.75	79.5
J912	346.79	0	114.54
J914	338.41	0	118.17
J916	423.49	0	81.31
J918	219.75	2.4	88
J920	217.27	0.9	89.07
J922	218.66	0.6	88.47
J924	264.55	0.3	68.59
J926	264.07	0.9	68.8
J928	189.00	0.6	102.76
J930	190.00	1.05	102.32
J932	212.34	0.15	92.64
J934	195.61	0.75	99.89
J940	187.87	0.15	103.25
J942	0.00	0	185.42
J946	269.92	0	69.3
J948	258.28	0	74.35
J950	270.31	0.6	66.75
J952	235.99	1.05	81.44
J954	219.68	0.6	88.85
J956	251.79	0	74.32
J958	191.02	0.75	101.88
J960	406.00	0.15	88.89
J962	197.51	0.15	97.63
J964	249.68	0	75.03
J966	0.00	0	183.22
J968	220.60	0.15	87.63
J970	0.00	0.9	183.22
J972	515.23	0	41.56
J974	0.00	0	264.81
J976	0.00	0	264.81
J978	0.00	0	264.81
J980	0.00	0	183.64

Junction Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J982	0.00	0.15	183.64
J984	0.00	0	183.64
J986	0.00	0	183.64
J988	0.00	0.15	183.64
J990	0.00	0.3	183.64
J992	316.24	0.15	46.61
J994	0.00	0	183.7
J998	0.00	0.45	183.7
J1000	295.98	0.3	55.45
J1002	287.17	0	59.39
J1004	288.14	0.15	58.97
J1006	213.47	0.45	92.22
J1008	0.00	0	184.69
J1010	0.00	0	184.69
J1012	198.89	0.6	98.47
J1014	198.97	0	98.37
J1016	0.00	0	184.65
J1018	0.00	0.15	184.66

Pump Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Elevation (ft)	Head (Design) (ft)	Flow (Design) (gpm)
North Well Pump Station	255	330	300
East Well Pump Station	303	385	300
South Wells Pump Station	249	282	350
Booster Pump Station	317	240	130

Tank Input Data - Capital Efficiency Plan™
Hooksett Village Water Precinct

Label	Diameter (ft)	Elevation (Base) (ft)	Level (Maximum) (ft)	Level (Initial) (ft)
West(Quarry) Tank	58.75	385	50	38
Thompson Corner Tank	33	395	30	23
Manor Drive tank	50	568	75	56

Appendix D

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

6. Route 3A
New 12-inch Water Main

5. Pine Street
New 12-inch Water Main

3. Pinnacle Street, West River Road, and Maple Street
New 12-Inch Water Main

1. Vista Drive and Cross Country
New 12-inch Water Main

8. Riverside Street
New 12-inch and
8-inch Water Main

7. Daniel Webster Hwy
New 12-inch Water Main

4. Main Street and Route 3
New 12-inch Water Main

2. River Crossing
New 12-inch Water Main

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1 mg
Overflow Elevation: 435 ft

Booster Pump Station

Manor Drive Tank
Capacity: 1.1 mg
Overflow Elevation: 643 ft

Thompson Corner Tank
Capacity: 0.2 mg
Overflow Elevation: 425 ft

Legend

- Priority 1 Hydraulic Deficiencies
- Priority 2 Hydraulic Deficiencies

Water Main Diameter

- 4-Inch or Smaller
- 6-Inch
- 8-Inch
- 12-Inch
- 16-Inch
- Private Mains
- High Service Area

Hydraulic Deficiencies
Hooksett Village Water Precinct
Hooksett, New Hampshire


TATA & HOWARD

Approximate Scale: 1" = 1,000'
March 2021

Appendix E

TATA & HOWARD

Critical Water Mains
Hooksett Village Water Precinct
Hooksett, New Hampshire


TATA & HOWARD

Approximate Scale: 1" = 1,000'
March 2021

Appendix F

TATA & HOWARD



Asset Management Ratings
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'

March 2021

Appendix G

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1 mg
Overflow Elevation: 435 ft

Booster Pump Station

Manor Drive Tank
Capacity: 1.1 mg
Overflow Elevation: 643 ft

Thompson Corner Tank
Capacity: 0.2 mg
Overflow Elevation: 425 ft

Legend

- Priority I Hydraulic
- Priority II Hydraulic
- Critical Area

Critical Users

- Other
- School

- Private Mains

AM_Score, Proposed

- No Score
- Excellent to Good
- Good to Fair
- Fair to Poor
- High Service Area

Three Circles Integration
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
March 2021

Appendix H

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

3. Route 3A
New 12-inch Water Main

2. Ardon Drive, Well Access Road, and Pine Street
New 12-inch Water Main

7. Riverside Street
New 12-inch and
8-inch Water Main

Booster Pump Station

Manor Drive Tank
Capacity: 1.1 mg
Overflow Elevation: 643 ft

North Pump Station

North Well

East Pump Station

East Well

9. Pinnacle Street and Maple Street
New 12-Inch Water Main

10. Veterans Drive
New 12-inch Water Main

South Well Back-Up

South Pump Station

South Well

8. West River Road
New 12-Inch Water Main

West (Quarry) Tank
Capacity: 1 mg
Overflow Elevation: 435 ft

1. Vista Drive and Cross Country
New 12-inch Water Main

4 Main Street and Route 3
New 12-inch Water Main

Thompson Corner Tank
Capacity: 0.2 mg
Overflow Elevation: 425 ft

5. Daniel Webster Hwy
New 12-inch Water Main

6. River Crossing
New 12-inch Water Main

Merrimack River

West River Rd

Post Rd

Pleasant St

Merrimack St

Hooksett Rd

Main St

Maple St

Veterans Dr

Thompson Ave

Dartmouth St

Maidstone Rd

Lehoux Dr

Industrial Park Dr

Oak Hill Rd

Londonderry Tpke

Whitehall Rd

Martins Ferry Rd

Cross Rd

Meadowcrest Rd

Scott Ave

Gosselin Ave

Technology Dr

Quality Dr

Kimball Dr

Sunrise Blvd

Ridden Ranch Dr

Driveway A159

Driveway A472

Interstate 93 N

Interstate 293 S

I-93 NB Exit 10 Off ramp (I-293 SB)

I-93 SB Exit 11 Off (Hackett Hill Rd)

I-93 NB Exit 11 Off (Hackett Hill Rd)

I-93 Exit 11 (Hackett Hill Rd)

I-93 SB Exit 11 On ramp (I-293 NB)

I-93 NB Exit 10 On ramp (NH 3A)

Legend

- Phase I IImprovements
- Phase II Improvements


Water Main Diameter

- 4-Inch or Smaller
- 6-Inch
- 8-Inch
- 12-Inch
- 16-Inch
- Private Mains
- High Service Area

Phase I and II Improvements
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
March 2021


Phase III Improvements
Hooksett Village Water Precinct
Hooksett, New Hampshire
TATA & HOWARD
Approximate Scale: 1" = 1,000'
March 2021
Legend
Phase III A Improvements
Phase III B Improvements
Water Main Diameter
4-Inch or Smaller
6-Inch
8-Inch
12-Inch
16-Inch
Private Mains
High Service Area
N
Allenstown
Bow
Hooksett Village
Dunbarton
Goffstown
Manchester
Merrimack River
11. Highland Street
New 8-inch Water Main
12. Heather Drive and Cross Country
New 8-inch Water Main
13. Granite Street, Otterson Street, Chase Street
New 8-inch Water Main
14. Merrimack Street
New 12-inch Water Main
15. Scott Avenue and Green Street
New 8-inch Water Main
16. Bullard Drive
New 8-inch Water Main
17. Dale Road
New 8-inch Water Main
18. Bayview Terrace and West Bank Road
New 8-inch Water Main
North Pump Station
North Well
East Pump Station
East Well
South Well Back-Up
South Pump Station
South Well
Booster Pump Station
West (Quarry) Tank
Capacity: 1 mg
Overflow Elevation: 435 ft
Manor Drive Tank
Capacity: 1.1 mg
Overflow Elevation: 643 ft
Thompson Corner Tank
Capacity: 0.2 mg
Overflow Elevation: 425 ft

TATA & HOWARD

OFFICE LOCATIONS:
MA | NH | CT | ME | VT | AZ

800-366-5760
www.tataandhoward.com