Confidential

Master Plan and Capital Improvements Plan
Milford Water Company

Prepared by:

TATA & HOWARD

Water and Wastewater Consultants

December 2010

TATA & HOWARD
Water and Wastewater Consultants

December 29, 2010

Mr. David Condrey
Manager
Milford Water Company
66 Dilla Street
Milford, MA 01757

Subject: Master Plan and Capital Improvements Plan
Milford Water Company
T&H No. 2363

Dear Mr. Condrey,

Tata & Howard is presenting you three copies of the Master Plan and Capital Improvements Plan for the Milford Water Company water distribution system. The analysis and improvements in this report are based on the Three Circle Approach for 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. Analysis of system's supply and storage needs were also evaluated.

Hydraulic recommendations were developed using recommended ISO fire flow requirements, including an estimated residential fire flow of 750 gpm. Areas in which the fire flow could not be met were considered hydraulically deficient. The system was surveyed for critical areas and tested on the hydraulic model for redundancy. Finally, each water main was evaluated based on age, material, diameter, break history, water quality, static pressure and soil conditions to determine its asset management score. 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 their estimated costs is presented in Section 7.

During the course of this project, Ms. Karen Gracey, P.E. served as Project Manager, Ms. Justine Evans, P.E. served as Project Engineer, Mr. Liam Sullivan served as Engineer, and the undersigned provided technical reviews.

This report was prepared to meet the requirements for item 10E of ACOP-CE-09-5D007-EMS, SEP. Two copies of this report have been submitted to the Massachusetts Department of Environmental Protection. Should you have any questions, please feel free to contact our office at (508) 303-9400.

Sincerely,

TATA & HOWARD, INC.

Donald J. Tata, P.E.
President

Enclosure

Tata & Howard
www.tataandhoward.com
67 Forest Street, Marlborough, MA 01752
T 508-303-9400 F 508-303-9500

Other Offices
Lakeville, MA Portland, ME
Meriden, CT Goodyear, AZ Nashua, NH

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

LIST OF TABLES

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

SECTION 1 – Executive Summary

1.1 General

Tata & Howard, Inc. was retained by the Milford Water Company (MWC) to complete a Master Plan and Capital Improvements Plan for the Company's water system. The purpose of the study is to identify areas of the water distribution system in need of rehabilitation, repair or replacement and prioritize improvements to make the most efficient use of the Company's capital budget. The study evaluates the existing water infrastructure including water transmission and distribution piping and appurtenances. In addition, water supply and storage needs are evaluated and prioritized.

1.2 The Three Circle Approach

Tata & Howard evaluated the water distribution system using the Three Circle Approach. The Three Circle Approach includes 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 system component. From each set of criteria, system deficiencies are identified. System deficiencies from each circle are then compared. Any deficiency that falls into more than one circle is given higher priority than one that does not. 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 where an improvement of a deficiency in one circle will eliminate a deficiency in another circle. By integrating all three sets of criteria, the infrastructure improvement decision making process and overall capital efficiency is optimized.

Tasks in this study included the following:

- Evaluated water supply needs based on existing and projected demands and existing source capacity.
- Assessed water storage needs based upon existing and projected demands and fire flow requirements.
- Evaluated improvements needed to meet the most recent Insurance Services Office (ISO) fire flow requirements.
- Reviewed pertinent available asset management data and reports provided by the MWC regarding the water distribution system and transmission mains. Data included installation date of mains, pipe size and material, soil types and other issues that can affect external corrosion, known water quality issues, static pressures and water main break history.
- Created a customized weighted pipe rating system from the asset management data collected, using input from MWC personnel and experience to identify the priority of mains needing rehabilitation or replacement.

- Identified critical facilities and critical customers throughout the distribution system and used the hydraulic model to identify critical water mains through failure simulations.
- Developed a comprehensive prioritized list of recommendations with associated costs based on combined considerations of the system hydraulics, asset management considerations and critical component assessment to correct existing deficiencies and meet future needs.

SECTION 2 – Existing Water Distribution System

2.1 Distribution System

The MWC water distribution system consists of approximately 130 miles of water main ranging in size from two to 24-inches in diameter. A map of the water distribution system can be found in Appendix A. Figure No. 2-1 presents the distribution of water main sizes in the system. The water main is constructed primarily from five common materials. Approximately 35 percent is cement lined ductile iron (CLDI) pipe, 28 percent is cast iron (CI) pipe, 28 percent is asbestos cement (AC) pipe, 8 percent is plastic or polyvinyl chloride (PVC) pipe, and the remaining one percent is galvanized steel or copper pipe. Figure No. 2-2 presents the distribution of pipe materials in the system.

2.2 Service Areas

The exiting water system consists of two service areas, the Low Service Area and the High Service Area, separated by a series of isolation valves. The Low Service Area has a hydraulic grade line (HGL) elevation of approximately 525 feet above Mean Sea Level (MSL). All elevations in this report are above MSL. Ground elevations range from approximately 245 feet to 445 feet. The Low Service Area constitutes approximately 70 percent of the overall system demand. The High Service Area has a HGL of approximately 640 feet. Ground elevations range from approximately 295 feet to 560 feet. The High Service Area constitutes approximately 30 percent of the overall demand.

2.3 Water Supply Sources

The water system is supplied by eight active supply sources and one emergency supply sources. The active supply sources include two surface water supplies, the Charles River and Echo Lake, and six groundwater supplies. The groundwater supplies include two Dilla Street Wells, the Clark's Island Wellfield and five Godfrey Brook Wells. The water from all sources, except the Godfrey Brook Wells, is treated at the Dilla Street Water Treatment Facility (WTF). The WTF supplies the system through two 2,000 gallon per minute (gpm) pumps. The Cedar Swamp Well is the emergency source. An additional emergency surface water supply is Louisa Lake. This source is pending approval.

2.4 Water Storage Facilities

The MWC water distribution system includes three water storage facilities: the Bear Hill and Congress Street Tanks in the Low Service Area, and the Highland Street Tank in the High Service Area.

Bear Hill Tank

The Bear Hill Tank is located off Bear Hill Road. The Welded steel tank was constructed in 1987 and has a capacity of approximately 2.65 million gallons (mg). The tank has a diameter of approximately 50 feet and a height of approximately 95 feet. The tank was constructed to an overflow elevation of approximately 525 feet and has a base elevation of approximately 430 feet.

The interior and exterior of the tank was inspected in 2005 and the interior and exterior of the tank was blasted and painted in 2006.

Congress Street Tank

The Congress Street Tank is located off Congress Street. The Congress Street Tank was constructed in 1925 and has a capacity of approximately 1.1 mg. The tank has a diameter of approximately 48 feet and a height of approximately 84 feet. The tank was constructed to an overflow elevation of approximately 525 feet and has a base elevation of approximately 441 feet. The interior of the tank was inspected in December 2009.

As part of the Administrative Consent Order (ACOPCE-09-5D007-EMS, SEP) resulting from the August 2009 boil order, the MWC was required to repair or replace the Congress Street Tank roof and perform repairs on the tank. These repairs included the incorporation of a mixing system and anchor system. The MWC has since complied with the ACO.

Highland Street Tank

The Highland Street Tank is located off Highland Street. The welded steel tank was constructed in 1964 and has a capacity of approximately 0.271 mg. The tank has a diameter of 24 feet and a height of 80 feet. The tank was constructed to an overflow elevation of approximately 640 feet and has a base elevation of approximately 560 feet. The interior and exterior of the tank was inspected in 2006. The tank inspection report recommends tank rehabilitation including blasting and painting of the interior and exterior of the tank and some structural modifications and site work.

2.5 Booster Pump Station

The High Service Area is served by the Congress Street Booster Pump Station (BPS), the only booster pump station in the distribution system. The station utilizes two 800 gpm pumps.

2.6 Interconnections

MWC maintains five interconnections with four neighboring Towns. There are two interconnections with the Town of Hopedale, one at the end of Williams Street and the other at the end of South Main Street. MWC continuously supplies water to the Town of Hopedale. There is an interconnection with the Town of Bellingham at the end of Beaver Street and an interconnection with the Town of Holliston at the end of East Main Street. Water can be both sold to and purchased from Bellingham and Holliston when necessary. The interconnection with the Town of Medway is at the end of Route 109 (Medway Road).

Table No. 2-1
Water Main Size Distribution
Master Plan and Capital Improvements Plan
Milford Water Company

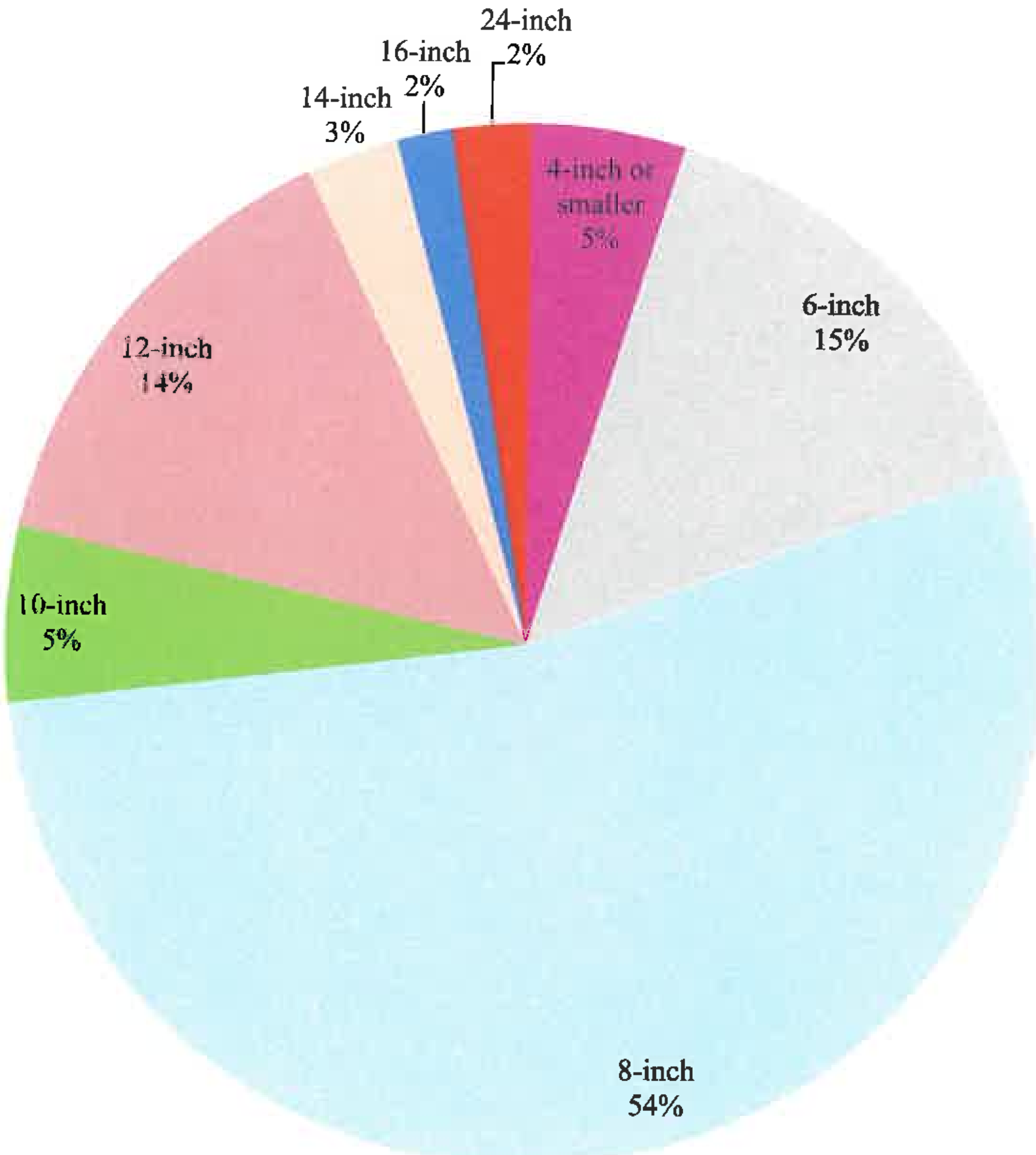
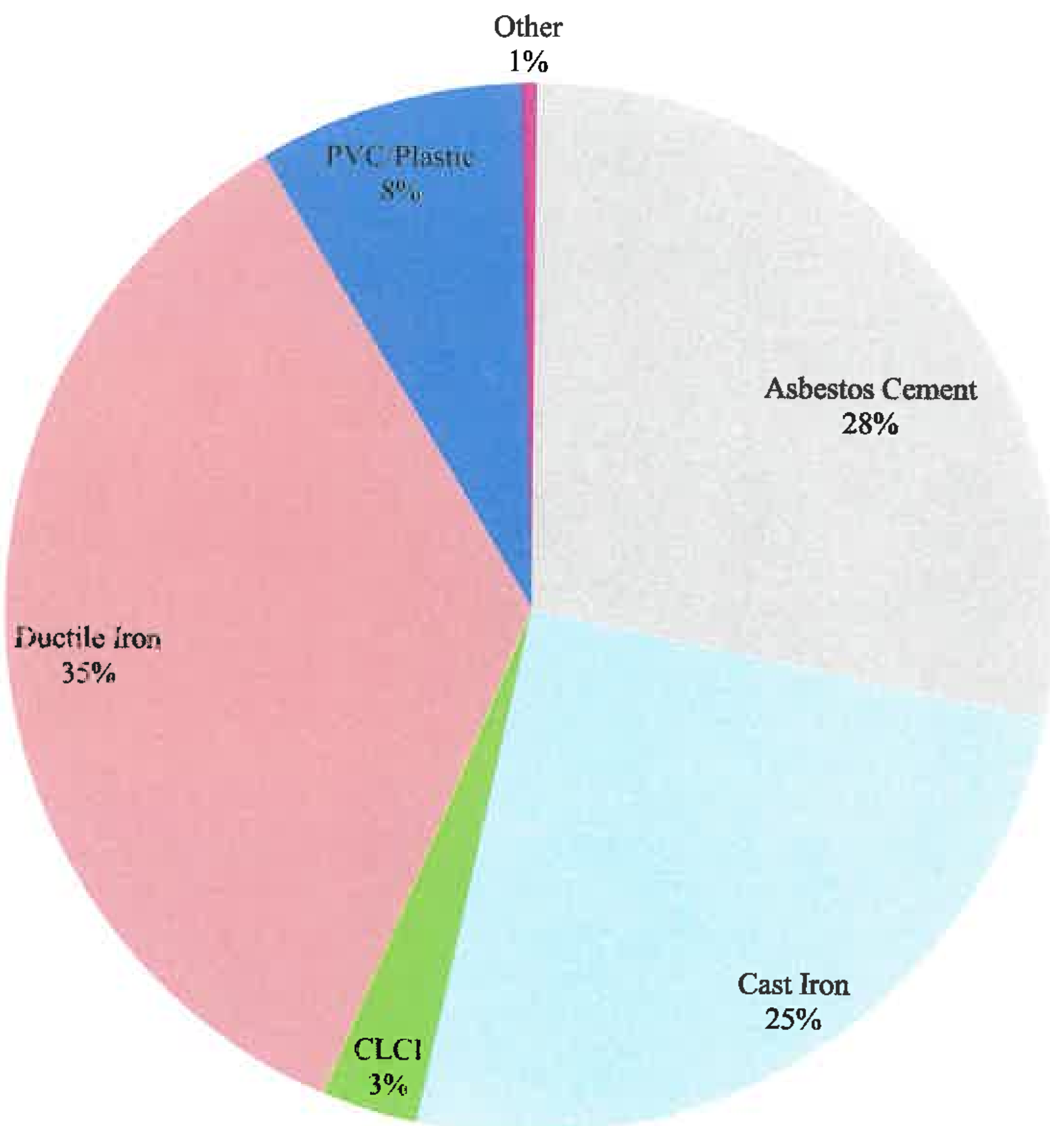


Table No. 2-2
Water Main Material Distribution
Master Plan and Capital Improvements Plan
Milford Water Company



SECTION 3 – Water Supply Evaluation

3.1 General

In accordance with MassDEP requirements, the supply sources of a water system must be capable of meeting existing and projected maximum day demand (MDD) conditions and existing and projected average day demand (ADD) and summer average day demand (SADD) conditions with the largest source out of service. In this section, existing demand conditions were considered and demand projections completed by the Massachusetts Department of Conservation and Recreation (DCR) were summarized and considered. The safe yields of the supplies and permitted withdrawals of the existing supply sources were compared to current and future demand conditions.

3.2 Water System Demands

The DCR follows specific guidelines when projecting the water usage for communities in conjunction with the MassDEP Water Management Act (WMA). These guidelines incorporate trends in the use of water conservation devices in homes and industry, and emphasize the importance of monitoring the distribution system through water audits and leak detection surveys to reduce unaccounted-for water. It is important to note that the DCR has a key role in the water management approval process. Water demand projections through the year 2028 were completed for the MWC by the DCR in November 2008 as part of the WMA permitting process. Any alternative demand projections must be approved by the DCR before the MassDEP will approve development of a new water supply source or authorize the withdrawal of additional volume from existing sources.

Based on recent developments, the Massachusetts Water Resource Commission (MWRC) has adopted new Water Management Standards for all registered and permitted withdrawals. The policy includes performance standards and conditions for all registered and permitted public water suppliers in the following areas:

- Maximum residential consumption of 65 gallons per capita per day (gpcd).
- Maximum of 10 percent unaccounted-for water.

Residential Consumption

Residential consumption is calculated by dividing water supplied to residential connections by the reported population. MassDEP has developed standards for all Public Water Suppliers to meet 65 gpcd. Public Water Suppliers currently meeting 65 gpcd will be required to develop a Seasonal Demand Management Plan to manage non-essential outdoor water usage. Public Water Suppliers who have not consistently met the 65 gpcd will be required to develop and implement MassDEP approved Compliance Plans including the use of Best Management Practices to meet the residential consumption standard. The 2005 through 2009 Annual Statistical Reports indicate that an average residential consumption of approximately 66 gpcd.

Unaccounted-for Water

Unaccounted-for water consists of unmetered water used for street cleaning, water main flushing, meter inaccuracy, unauthorized water uses, fire fighting and leakage in the distribution system.

This term is typically expressed as a percentage of the total water supplied to the system. Unaccounted-for water can be estimated by taking the difference between the total amount of water supplied and the total water billed and dividing by the total water supplied. Historically, unaccounted-for water percentages in the MWC system have averaged approximately 15 percent over the past five years.

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 millions of gallons per day (mgd). This demand includes all water used for domestic (residential), commercial, industrial, agricultural, and municipal purposes. The municipal component includes water used for system maintenance such as hydrant flushing and fire flows. In addition, the ADD includes unaccounted-for water attributed to unmetered water uses and system leakage.

According to the 2005 through 2009 Annual Statistical Reports (ASRs), the ADD for the MWC system ranged from 2.72 mgd to 3.18 mgd. Non-residential usage represents approximately 25 percent of the ADD.

DCR used the following criteria to develop the 2028 ADD:

- Residential consumption of 65 gpcd
- Year 2028 service population of 29,643
- Year 2028 non-residential consumption of approximately 365 million gallons per year (mgy)
- Maximum of 10 percent unaccounted for water.

DCR estimated demand projections for five year time blocks from 2013 to 2028. The 2028 ADD is approximately 3.27 mgd. DCR also increases the volume of the last five year time block by five percent to accommodate uncertainty in growth projections. The 2028 ADD with the five percent buffer is approximately 3.47 mgd. The DCR demand projections were projected to the design year 2030. The 2030 ADD with the five percent buffer is approximately 3.47 mgd.

Summer Average Day Demand

MassDEP guidelines recommend that a system consider a projected SADD. The current SADD is estimated by averaging demands from the three maximum months for the past five years. As shown in Table No. 3-1, the SADD ranged from 3.33 mgd to 3.95 mgd from 2005 to 2009. The SADD peaking factor is determined by dividing the SADD by the annual ADD for each of the past five years. These peaking factors are averaged to estimate the future summer peaking factor. Based on the 2005 through 2009 monthly demand data, the average summer peaking factor is 1.23. Based on the projected ADD of 3.47 mgd, the estimated 2030 SADD is approximately 4.26 mgd.

Table No. 3-1 Historic and Projected Water Use						
Year	**ADD (mgd)**	**SADD (mgd)**	**Peaking Factor (SADD/ADD)**	**MDD (mgd)**	**Peaking Factor (MDD/ADD)**	**Peak Hour (mgd)**
2005	3.18	3.95	1.24	5.55	1.74	*
2006	2.92	3.56	1.22	5.40	1.85	*
2007	2.85	3.54	1.24	4.99	1.74	*
2008	2.74	3.38	1.23	5.26	1.92	*
2009	2.72	3.33	1.22	5.18	1.90	*
-						
2010	3.00	3.69	1.23	5.76	1.92	9.30
2020	3.17	3.90	1.23	6.09	1.92	9.83
2030	3.47	4.26	1.23	6.65	1.92	10.7

*Peak Hour information for 2005 through 2009 is not available.

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.

MDD is a critical factor to be considered when determining the adequacy of a water supply system. The distribution system must be capable of meeting maximum day demands with coincident fire demands at a minimum pressure of 20 psi. Estimates of the projected maximum day demand and an allowance for the required fire flow are used to evaluate or design pumping, transmission and storage facilities.

The projected MDD can be estimated by the MDD/ADD ratio. The MDD/ADD ratio provides a relationship between the two demands which can be used to estimate future demands. As shown on Table No. 3-1, the MDD ranged from 4.99 mgd to 5.55 mgd from 2005 to 2009. Upon comparison of the MDD to the ADD, the ratios range from 1.74 to 1.92. In order to be conservative, the highest historical peaking factor was used to estimate future MDD. The resulting projected MDD for year 2030 is estimated to be 6.65 mgd based on the projected 2030 ADD of 3.47 mgd.

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.

Since system records of peak hourly demands are not available, the peaking factor for the current usage and design year 2030 was estimated based on typical historical consumption for communities of similar size. The MDD/ADD ratio for a community can be used to estimate the peak hour/ADD peaking factor. Using a MDD/ADD ratio of 1.92, the corresponding peak hour peaking factor for the system is approximately 3.1. Using an ADD of 3.47 mgd, the projected peak hour flow for the year 2030 is estimated at 10.7 mgd.

3.3 Adequacy of Existing Water Supply Sources

In 1987, the Water Management Act (WMA) program was implemented by MassDEP to regulate withdrawal of water from the state's watershed basins. Under this program, all new sources withdrawing more than 100,000 gpd and existing sources exceeding their registered withdrawal volume by 100,000 gpd are required to obtain a withdrawal permit under the WMA. When first implemented, the registered withdrawal volume for a public water system was based on that system's historical pumping rate of the water supply source(s) between 1981 and 1985. However, permits can be renewed and amended as system demands increase and additional supply sources are utilized. The WMA program considers the need for the withdrawal, the impact of the withdrawal on other hydraulically connected water suppliers, the environmental impacts of the withdrawal and the water available in the river basin or subbasin (the basin safe yield) prior to issuing a permit. It is important to note that the basin safe yield is different from the safe yield of a supply. In accordance with the WMA permit application instruction, the basin safe yield is the total water available to be withdrawn from a river basin or subbasin, whereas the safe yield of a well is the volume of water the well is capable of pumping under the most severe pumping and recharge conditions that can be realistically anticipated.

The current system is comprised of eight active groundwater supply sources and two active surface water supplies to meet system demands. Table No. 3-2 provides the MassDEP approved withdrawal rates for each of the supply sources. The maximum daily withdrawal volume from the existing sources is approximately 8.57 mgd.

It should be noted that water from the surface water supplies, Clarks Island Wellfield and the Dilla Street Wells, must be treated at the Dilla Street Water Treatment Plant. The treatment plant slow sand filters have a capacity of 2.3 mgd, and the diatomaceous earth filters have a capacity of 2 mgd when treating groundwater or 4 mgd when treating surface water. The maximum capacity of the treatment plant is 6.3 mgd. Based on the approved maximum withdrawal volume of the Godfrey Brook Wells and the capacity of the Dilla Street Water Treatment Plant, the total approved maximum withdrawal volume is 7.09 mgd.

MassDEP guidelines recommend that a system have adequate supply to meet (1) the projected MDD and (2) the projected SADD with the largest source offline. The surface water supply is the largest source, however, if one of the surface water supplies was offline, the water could be withdrawn from the other supply. Also, the next largest users must be treated through the WTP. As long as the WTP is online, MWC can theoretically provide 7.09 mgd with a source offline.

While the approved maximum withdrawal volume of the surface water supplies is 6.3 mgd, the firm yield for the Charles River and Echo Lake is a combined volume of 1.57 mgd. These two sources combined cannot exceed 1.57 mgd as an annual daily average. This annual average and the potential for drought conditions restrict the amount of water the MWC can withdraw from the surface water supplies. Louisa Lake can be used as an emergency supply. According to the MWC's Draft Water Management Act Permit, if the MWC decides to pursue Louisa Lake as an active surface water supply, a firm yield study must be completed within two years of the issuance of the WMA Permit.

Table No. 3-2
Approved Maximum Withdrawal Volumes

Source Name	Approved Withdrawal Rate (mgd)	Available Withdrawal Rate
Charles River		
Echo Lake	6.3*	1.57
Louisa Lake (Emergency)		
Clarks Island Wellfield	0.80*	0.80
Godfrey Brook Well 1		
Godfrey Brook Well 1A		
Godfrey Brook Well 2	0.79	0.50
Godfrey Brook Well 2A		
Godfrey Brook Well 4		
Dilla Street Well No. 1	0.675*	0.20
Dilla Street Well No. 2		
Total	**7.09**	**3.07**

*Treated at Dilla Street Water Treatment Plant.
Maximum reported capacity of plant is 6.3 mgd.

Also, the MWC is reportedly unable to utilize all of the groundwater sources to their approved maximum withdrawal volumes. The pumping capacity of the Godfrey Brook Wells is approximately 0.5 mgd and the Dilla Street Wells can supply approximately 0.20 mgd. The MWC should consider rehabilitating the existing wells or installing replacement wells to utilize the approved maximum withdrawal volumes of the groundwater supplies.

Based on the available withdrawal rates, the total available maximum withdrawal volume is 3.07 mgd. Based on the existing MDD, there is an existing supply deficit of approximately 2.11 mgd. Based on the 2030 MDD, there would be a supply deficit of approximately 3.58 mgd.

3.4 Adequacy of Existing Storage Facilities

Distribution storage is provided to meet peak consumer demands such as peak hour demands and to provide a reserve for fire fighting. Storage also serves 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.

Equalization storage provides water from the tanks during peak hourly demands in the system. Typically, this quantity is a percentage of the maximum day demands. The percentages can range from fifteen to twenty-five percent, with fifteen percent used for a large system, twenty percent for a mid sized system and twenty five 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. The MWC system would be considered a medium size system. As a result, twenty percent of maximum day demand was used for the equalization storage calculations.

The fire flow storage component is based on the basic 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 flow. Within the system, a basic fire flow of 2,500 gpm for two hours was used for the storage evaluation.

The emergency storage component is typically equivalent to an ADD. However, if there is emergency power available at the sources, capable of supplying at least an ADD, the emergency storage component can be waived. The only emergency power is available at the Dilla Street WTF. The surface water would be the only available component. The emergency storage component for the MWC is equivalent to the ADD minus the 1.57 mgd available from the surface water supplies.

The three components of the storage evaluation were calculated under current and future demand conditions for the LSA and HSA. Based on 2009 pumping and usage data, the LSA used an average of 70 percent of the total water pumped. The HSA used an average of 30 percent of the total water pumped. The current and future demands for each service area were calculated using 70 percent in the LSA and 30 percent in the HSA. Because the only emergency power is available at the Dilla Street WTF, the emergency storage component for the LSA is equivalent to the LSA ADD minus the 1.47 mgd available from the surface water supplies. Because the Congress Street BPS does not have emergency power, the emergency storage component for the HSA is equivalent to the HSA ADD.

Low Service Area

1. Equalization
- Mid sized system = 20 percent of the Maximum Day Demand
- LSA Maximum Day Demand in year 2009 = 3.63 mgd
- LSA Estimated Maximum Day Demand in year 2030 = 4.66 mgd

- Equalization (2009) = 0.20 x 3.63 = 0.73 million gallons (mg)
- Equalization (2030) = 0.20 x 4.66 = 0.93 mg

2. Basic Fire Flow Requirement
- Representative fire flow for MWC = 2,500 gpm

- Duration of 2 hours or 120 minutes
- Basic Fire Flow Requirement = 2,500 gpm x 120 min = 0.30 mg

3. Emergency
- LSA Average Day Demand in year 2009 = 1.90 mg
- LSA Estimated Average Day Demand in year 2030 = 2.43 mg

- Emergency (2009) = 1.90 – 1.57 = 0.33 mg
- Emergency (2030) = 2.43 – 1.57 = 0.86 mg

The total required storage for any given year is the equalization component plus the basic fire flow requirement. Therefore, the current (year 2009) and projected (year 2030) total required storage for the LSA is as follows:

- Total LSA Required Storage (2009) = 0.73 + 0.30 + 0.33 = 1.36 mg
- Total LSA Required Storage (2030) = 0.93 + 0.30 + 0.86 = 2.09 mg

High Service Area

1. Equalization
- Mid sized system = 20 percent of the Maximum Day Demand
- HSA Maximum Day Demand in year 2009 = 1.55 mgd
- HSA Estimated Maximum Day Demand in year 2030 = 2.00 mgd

- Equalization (2009) = 0.20 x 1.55 = 0.31 mg
- Equalization (2030) = 0.20 x 2.00 = 0.40 mg

2. Basic Fire Flow Requirement
- Representative fire flow for MWC = 2,500 gpm
- Duration of 2 hours or 120 minutes
- Basic Fire Flow Requirement = 2,500 gpm x 120 min = 0.30 mg

3. Emergency
- HSA Average Day Demand in year 2009 = 0.82 mg
- HSA Estimated Average Day Demand in year 2030 = 1.04 mg

The total required storage for any given year is the equalization component plus the basic fire flow requirement plus the emergency component. Therefore, the current (year 2009) and projected (year 2030) total required storage for the HSA is as follows:

- Total HSA Required Storage (2009) = 0.31 + 0.30 + 0.82 = 1.43 mg
- Total HSA Required Storage (2030) = 0.40 + 0.30 + 1.04 = 1.74 mg

Under existing and projected ADD, MDD and peak hour demands, a minimum pressure of 20 psi should be maintained throughout the distribution system. The highest customer in the Low Service Area is at an elevation of approximately 430 feet above MSL. The Congress Street Tank and the Bear Hill Tank control the grade line in the LSA. In order to maintain a pressure of 20 psi in the LSA, the tanks can drop to an elevation of approximately 476 feet above MSL. Based on this scenario, there is approximately 0.72 mg of usable storage in the Bear Hill Tank and approximately 0.66 mg of usable storage in the Congress Street Tank. The total usable storage in the LSA is approximately 1.38 mg.

The total projected required storage for the design year in the LSA is approximately 2.09 mg. The MWC will have an estimated LSA storage deficit of 0.71 mg. If emergency power was available at all of the groundwater sources, the MWC would have approximately 0.15 mg of surplus storage in the LSA.

The highest customer in the High Service Area is at an elevation of approximately 561 feet above MSL. The Highland Street Tank controls the grade line in the HSA. In order to maintain a pressure of 20 psi in the HSA, the tank can drop to an elevation of approximately 607 feet above MSL. Based on this scenario, there is approximately 0.11 mg of usable storage in the Highland Street Tank.

The total projected required storage for the design year in the HSA is approximately 1.74 mg. Therefore, the MWC will have approximately 1.63 mg of storage deficit in the HSA. If emergency power was available at the Congress Street BPS, the emergency component would be waived. In this case, the total projected effective storage required for the design year in the HSA would be 0.59 mg. The required effective storage volume could be reduced if additional pumping capacity was added to the Congress Street Booster Pump Station to provide inherent fire flows.

SECTION 4 – Hydraulic Evaluation

4.1 General

In May 2010, Tata & Howard completed a hydraulic model development and calibration project for the MWC. The hydraulic model was verified under steady state conditions and over an extended period. Looking at the system under an extended period simulations (EPS) allows the hydraulic model to account for changes in the distribution system over time. The model was verified based on fire flow testing and information provided by MWC pertaining to the sources, storage facilities and pumping stations. The hydraulic model can be used as a planning tool to assess the potential impact of proposed developments and system improvements. It can also be used to review flow, pressure and potential water quality concerns such as water age and chlorine residuals. The computer model is represented by the node, pipe, tank and pump information provided in Appendix B. A link map of the water distribution system can be found in Appendix B.

As part of this study, the model was updated to include improvements to the system since May 2010. Once the model was updated, recommendations set forth by the Insurance Services Office (ISO) for water storage necessary for fire protection, fire flows, and peak demands were utilized in the analysis of the distribution system.

4.2 Evaluation Criteria

The Hydraulic Evaluation evaluates the system's ability to meet varying demand conditions. In general, a minimum pressure of 35 pounds per square inch (psi) at ground level is required during average day, maximum day, and peak hour demand conditions. During fire flow conditions, a minimum pressure of 20 psi is required at ground level throughout the system. In order to evaluate the system's ability to meet these criteria, the following hydraulic simulations were run in the model:

Minimum/Maximum Pressures

During a projected year 2030 average day, maximum day and peak hour demand condition (no coincident fire flow), a minimum pressure of 35 psi is recommended through the distribution system at street level. 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 water use from fixtures and also increased leakage throughout the distribution system. Also, plumbing code states that water heaters in homes can be affected when pressures exceed 80 psi.

Under projected ADD, MDD and PH conditions, the only areas currently served by the distribution system that have model pressures less than 35 psi in the HSA are in the vicinity of the Highland Street Tank and have a ground elevation greater than 550 feet USGS. The only area currently served by the distribution system that has a model pressures less than 35 psi in the LSA is at the end of William Street and has a ground elevation greater than 422 feet USGS. This is the location of the interconnection with Hopedale. Customers in these areas should have individual booster pumps.

Based on the overflow elevation of the water storage tanks, any building or structure in the HSA with a ground elevation less than approximately 363 feet USGS could experience pressures greater than 120 psi. Based on the overflow elevation of the water storage tanks, any building or structure in the LSA with a ground elevation less than approximately 248 feet USGS could experience pressures greater than 120 psi. Pressure reducing valves should be recommended to any customers with ground elevations below 363 feet USGS in the HSA and below 248 feet USGS in the LSA.

Insurance Services Office (ISO) Fire Flow Guidelines

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, the building contents, and the availability of fire suppression systems. In general, the flows recommended for proper fire protection are based on maintaining a residual pressure of 20 psi. This residual pressure is considered necessary to maintain a positive pressure in the system to allow continued service to the customers and avoid negative pressures that could introduce groundwater into the system. The estimated needed fire flows, as determined by the ISO, were simulated on the computer model. Certain assumptions were used when running the model. All scenarios were run using maximum day demand (MDD) conditions and typical tank operating levels. Areas where the available fire flows did not meet the ISO estimated needed fire flow were considered hydraulically deficient. Recommended improvements were developed to alleviate these deficiencies.

The MWC system was last inspected for fire insurance ratings by the ISO in 1998. The results of the ISO inspections and fire flow testing are shown in Table No. 4-1. The test results indicate the available flow and estimated needed fire flow in various sections of the distribution system. The estimated needed fire flows established by ISO varied from 750 to 3,500 gpm, depending on the location and the structure. The available flows are based on maintaining a residual pressure of 20 psi throughout the distribution system under 2030 MDD conditions.

Basic Fire Flows Requirements

According to AWWA, the minimum recommended fire flow in residential areas where homes are between 31 feet and 100 feet apart is approximately 750 gpm. Based on a review of the system, the MWC system generally falls within this category. An estimated fire flow of 750 gpm at all nodes was simulated on the computer model. Some areas of the system could not meet the minimum recommended fire flow. These areas were considered hydraulically deficient and improvements were developed to meet the recommended fire flow.

A review of the system was completed to identify areas where larger buildings exist that were not identified in the latest ISO evaluation. Examples include condominiums, apartment complexes, schools and other commercial or industrial buildings. These additional buildings were evaluated based on the ability to provide the representative fire flow for the MWC of 2,500 gpm. If the representative fire flow could not be met at these larger buildings, the areas were considered hydraulically deficient and improvements were developed to meet the recommended fire flow.

Table No. 4-1
ISO Fire Flow Data – October 1998

Test No.	Location of Flowing Hydrant	Static Pressure (psi)	Residual Pressure (psi)	Needed Flow at 20 psi (gpm)	Available Flow at 20 psi (gpm)
1	Tina Road at Briar Drive	108	74	750	1,100
2	Purchase Street at Northbrook Circle	120	36	750	650*
3	Cedar Street at Deer Street	86	76	2,500	2,600
4	Fortune Boulevard at Cedar Street	94	82	3,500	3,500
5	N. Vine Street at Redwood Drive	52	50	3,000	3,500
6	Quarry Drive at East Charles Street	70	54	3,500	3,500
7	West Fountain Street at Princeton Drive	82	74	3,500	3,500
8	Sumner Street at Chester Lane	100	98	3,500	3,500
9	Fortune Boulevard at Route 16	112	108	3,500	3,500
10	Medway Road at Victor Drive	112	41	2,500	1,350*
11	Maple Street at Beaver Street	86	64	1,750	2,200
12	Front Street at Central Street	115	112	3,500	3,500
13	Main Street at Water Street	94	58	3,500	2,500*
14	Reagan Road at West Street	80	60	2,500	2,500
15	South Main Street at Courtland Street	98	44	2,500	1,400*

*Does not meet needed fire flows based on 2030 MDD conditions.

4.3 Hydraulically Deficient Areas

Areas in the system that do not meet the ISO needed fire flows or basic recommended fire flows are considered hydraulically deficient. The following improvements include recommendations that the MWC should complete. These improvements are intended to meet transmission needs, mitigate the latest ISO fire flow deficiencies and improve areas which currently do not meet the recommended basic or residential fire flow. A map depicting areas with hydraulic deficiencies can be found in Appendix C. Estimated costs are presented in Section 7.

ISO Fire Flow Improvements

1. In order to provide the inherent capacity for the ISO recommended fire flow on Main Street at Water Street, Memory Lane should be included in the HSA. To accomplish this, a new 8-inch diameter water main is recommended on West Street from Union Street to the 8-inch diameter water main connecting West Street to Water Street. This water main would allow for a redundant water main to the interconnection with Hopedale located on Williams Street. The valves on the new water main would have to be configured so that the appropriate valves can be closed to serve South Richard Street, Memory Lane and Madden Avenue from the existing water main in the HSA, with the new 8-inch diameter water main in the LSA.

2. In order to provide the inherent capacity for the ISO recommended fire flow on Purchase Street at Northbrook Circle, as well as to meet residential fire flow requirements in the eastern portion of the HSA, the 8-inch diameter water main should be cleaned and lined from the HSA boundary to Tanglewood Drive. Also, the water main on Purchase Street should loop through to the HSA via Silver Hill Road and Claridge Circle. This will also eliminate a system dead end. This improvement was originally recommended as part of the 1994 Report on Water Distribution System Zone 1 and Zone 2 Evaluation and is a result of the Purchase Street booster pump station being removed when Zone 1 and Zone 2 were combined. Prior to implementing this improvement, pipe coupons should be taken from the water main to confirm the poor interior condition of the water main.

3. The existing water main on Central Street from Depot Street to Main Street and Main Street between Central Street and South Bow Street should be replaced with 12-inch diameter ductile iron water main. This improvement will improve transmission from the Bear Hill Tank to the center of Town and provide the inherent capacity to meet the representative fire flow at the Milford Regional Medical Center and the Dana Farber Cancer Institute and Women's Cancer Center.

4. The 8-inch diameter cast iron water main on South Main Street should be cleaned and lined from Depot Street to the end in order to provide the inherent capacity for the ISO recommended fire flow on South Main Street at Courtland Street. Prior to implementing this improvement, pipe coupons should be taken from the water main to confirm the poor interior condition of the main.

5. To provide the inherent capacity for the ISO recommended fire flow on Medway Road at Victor Drive, a 12-inch diameter water main is recommended on Medway Road from the 10-inch diameter water main from Beaver Street to Victor Drive.

Basic Fire Flow Improvements

6. The existing 6-inch diameter water main on Green Street needs to be replaced with 8-inch diameter ductile iron water main to meet the representative fire flow at the Blackstone Valley Dialysis Center. This improvement will also provide the recommended residential fire flow requirement along Green Street.

7. In order to provide the representative fire flow at the Brookside Elementary School, the existing 8-inch diameter water main on Congress Street from Fountain Street to the school should be replaced with a 12-inch diameter ductile iron water main.

8. An estimated fire flow of 3,500 gpm is needed at the intersection of Spruce Street and School Street due to numerous schools in the area. In order to provide the recommended fire flow, a new 12-inch diameter water main is needed on School Street from Main Street to Spruce Street.

9. The water main on Purchase Street from Dilla Street to Shadow Brook Lane should be cleaned and lined to provide the representative fire flow at the Shadow Brook Condominiums. Prior to implementing this improvement, it is recommended that pipe coupons be taken from the water main to confirm the poor interior condition of the water main.

10. To provide the representative fire flow at the intersection of Freedom Street and West Street, a new 8-inch diameter water main is recommended on Highland Street from Glennon Drive to West Street.

11. The existing 6-inch diameter water main on West Street from Highland Street to Iadarola Avenue should be replaced with 8-inch diameter ductile iron water main to provide the recommended residential fire flow requirement in the southern portion of the HSA.

12. In order to provide the representative fire flow at the intersection of Genoa Street and Meade Street, a new 8-inch diameter water main is needed on Meade Street from East Main Street to Columbus Avenue.

13. A new 8-inch diameter water main is recommended on Prairie Avenue and Sulmone Street to provide the recommended residential fire flow requirement along these streets.

14. In order to provide the recommended residential fire flow requirement on Hale Avenue and Walker Avenue, it is recommended that the existing water main on Walker Avenue connect to the existing water main on Hale Avenue with 8-inch diameter ductile iron water main.

15. To provide the recommended residential fire flow requirement on Plain Street and Cook Street, a new 8-inch diameter ductile iron water main is recommended on Cook Street from East Main Street to Plain Street and on Plain Street from East Main Street to Cook Street.

16. The 8-inch diameter water main on Purchase Street should be cleaned and lined from Tanglewood Drive to the Town line to provide the recommended fire flow requirement on Purchase Street. Prior to implementing this improvement, pipe coupons should be taken from the water main to confirm the poor interior condition of the water main.

17. Table No. 4-2 identifies the water mains, which would need to be replaced with 8-inch diameter ductile iron water mains to provide the recommended residential fire flow requirement.

Table No. 4-2
Water Main Replacements

	Location	Existing Diameter
1.	Chapin Street	4-inch
2.	Church Street	4-inch
3.	Della Street and Grace Street	2-inch
4.	Fruit Street	4-inch
5.	John Street and Balian Way	2-inch or less
6.	Legion Street	6-inch
7.	Leonard Street	6-inch
8.	Luby Avenue	6-inch
9.	Mitchell Road	6-inch
10.	Parker Hill Avenue	6-inch
11.	Parkhurst Street	2-inch
12.	Pine Street	4-inch
13.	Pleasant Street	6-inch
14.	Short Street	4-inch
15.	Williams Center	4-inch

18. There are water mains throughout the distribution system that are not looped and create a dead end. All dead end water mains 6-inch and larger, should have a fire hydrant for flushing purposes and fire protection. Dead end water mains are more susceptible to water quality concerns. Many water quality concerns can be eliminated with regular flushing. The proposed hydrants are identified in Table No. 4-3 and shown on the Hydraulic Deficiencies Map located in Appendix C.

Table No. 4-3
Proposed Hydrant Locations

Branch Street	Hayward Field	Rogers Street
Briar Drive	Huntoon Slip	Rosebud Lane
Brook Hollow Road	Isiah Circle	Sanclemente Circle
Brookside Lane	Julie Circle	Senate Road
Carven Road	Kalen Circle	Sidney Road
Cedarview Circle	Lena Lane	Silva Street
Celestial Circle	Manella Avenue	South Richard Street
Christina Road	Manguso Avenue	South Union Street
Cricket Lane	Manoodian Circle	Stub Toe Lane
Dell-Ann Circle	Memory Lane	Till Rock Lanes
Diantonio Drive	Mike Circle	Tomaso Road
Dogwood Lane	Nelson Heights	Ryler Street
East Wood Street	Oak Tree Lane	Union Street
East View Drive	Off Country Club Lane	Virginia Drive
Eugene Circle	Off of Green Street	Walker Avenue
Farmer Circle	Pine Needle Circle	Washington Street
Fern Street	Ramble Road	Western Avenue
Fox Lane	Reagan Road	Wildwood Drive
Freedom Street	Rich Road	Winterberry Lane
Gritte Lane	Richard Street	Wyeth Circle
Hamel Circle	Roger Avenue	

SECTION 5 – Critical Component Assessment

5.1 General

A critical component assessment was performed for the water distribution system in order to evaluate the impact of potential water main failures on the water distribution system. 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 hospitals, nursing homes, schools, and business districts. All water mains within 500 feet of a critical area are considered a critical component. Because water storage tanks, booster pump stations and sources provide water and maintain pressure to critical service areas, tanks and primary sources are also considered critical areas. Therefore, any water main within 500 feet of a water storage tank, booster pump station or primary source is considered a critical component.

Critical water mains are those mains that are the sole transmission main from a source or tank. In addition, main transmission lines that do not have a redundant main are considered critical. 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 MWC water system based on the criteria described above. The following provides a listing of the areas that are considered critical components.

Critical Areas Served

A system-wide review of critical areas served such as hospitals, health care facilities, and schools was completed. Other critical areas were identified during a meeting with MWC staff. Forty four critical areas were identified. Table No. 5-1 presents a list of all critical areas served including critical services 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. In addition, primary distribution system water mains that do not have a redundant main are considered critical.

Critical water mains were identified based on a review of the distribution system model, and by using the WaterGEMS criticality feature. The criticality feature runs simulations that "break" 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, but would no longer be able to serve customers if one of the mains were taken out of service.

Table No. 5-1
Critical Customers

Critical Area		Location
1	Dilla Street Water Treatment Facility	Dilla Street
2	Godfrey Brook Wells	South Cedar Street
3	Bear Hill Tank	Bear Hill Road
4	Congress Street Tank	Congress Street
5	Highland Street Tank	Highland Street
6	Congress Street Booster Pump Station	Congress Street
7	Hopedale Interconnection	Williams Street
8	Hopedale Interconnection	South Main Street
9	Bellingham Interconnection	Beaver Street
10	Holliston Interconnection	East Main Street
11	Medway Interconnection	Medway Road
12	Milford Regional Medical Center	115 Water Street
13	Milford-Whitinsville Regional Hospital	145 Prospect Street
14	Braintree Rehabilitation Hospital Outpatient Clinic at Milford	25 Birch Street
15	Dana Farber Cancer Institute and Woman's Medical Center	20 Prospect Street
16	Blackstone Valley Dialysis Center	42 Cape Road
17	Walk in Medical Center	14 Asylum Street
18	SunBridge Healthcare	10 Veterans Memorial Drive
19	Fallen Clinic – Internal Medicine	176 West Street
20	Fallen Clinic – Pediatric and Adolescent Medicine	221 East Main Street
21	Fallen Clinic - Optical	118 Prospect Street
22	Milford High School	31 West Fountain Street
23	Milford Middle School East	45 Main Street
24	Stacy Middle School	66 School Street
25	Brookside Elementary School	110 Congress Street
26	Memorial Elementary School	12 Walnut Street
27	Milford Catholic Elementary School	11 East Main Street
28	Woodland Elementary School	10 North Vine Street
29	Evergreen Center	245 Fortune Boulevard
30	Children's Corner	2 Cunniff Avenue
31	Criterion Child Enrichment	375 Fortune Boulevard
32	Kids & Co.	96 Medway Road
33	Kindercare Learning	235 Congress Street
34	Mother Hubbards	76 School Street
35	Mother Hubbards	229 Purchase Street
36	Shining Star Early Childhood Center	31 West Fountain Street
37	Blair House of Milford	20 Claflin Street
38	Whitcomb House	245 West Street

Table No. 5-1 (continued) Critical Customers		
39	The Geriatric Authority of Milford	1 Countryside Drive
40	ANP Operations Company	109 National Street
41	Double Tree Hotel	11 Beaver Street
42	Fafard	120 Quarry Drive
43	Saint-Gobain Containers Inc.	1 National Street
44	Water Corporation	34 Maple Street

The Dilla Street WTF treats water from Charles River and Echo Lake surface water supplies and the Dilla Street Wells and the Clark's Island Wellfield. The raw water mains that connect the supplies to the WTF would be considered critical.

The water mains on Bear Hill Road from the tank to South Central Street, South Central Street from Bear Hill Road to Central Street and on Central Street from South Central Street to Main Street would also be considered critical. This is the primary transmission main route from the Bear Hill Tank to Main Street and the downtown area.

The water mains on Camp Street from Geneseo Circle to Pine Island Road, Pine Island Road from Camp Street to Tina Road, Tina Road and Briar Drive from Tina Road to Tanglewood Drive are considered critical because it is the only line to the northeastern part of the HSA. A main failure along this water main route could affect approximately four percent of the distribution system.

Also, the water main on Main Street from Prospect Street to Water Street is considered critical because of the amount of businesses and the amount of traffic on this street on a daily basis.

Water mains that cross major highways, major rivers or active railroad tracks are also considered critical because of the difficulty in construction and permitting involved in replacing or rehabilitation the water main. The water main on Dilla Street near the WTF is considered critical because it crosses under the Charles River. Critical mains are highlighted on Critical Components Map found in Appendix D.

SECTION 6 – Asset Management Considerations

6.1 General

The MWC water distribution system includes approximately 130 miles of water main varying in size and material. A number of factors including age, material, break history, soil conditions, pressure and water quality affect the decision to replace or rehabilitate a water main. Using an Asset Management approach, each water main in the system was assigned a grade based on these factors. The grades were then used to establish a prioritized schedule for water main replacement or rehabilitation.

6.2 Data Collection

Information regarding the water main diameters and material were obtained from existing water distribution system maps and information from MWC personnel as part of the 2010 hydraulic model development. Information regarding pipe age was obtained from system records and information provided by the MWC. Information about break history, water quality and soil conditions was obtained through information provided by the MWC.

6.3 Evaluation Criteria

In order to prioritize water main replacement or rehabilitation, a water main grading system has been established. The grading system uses the water main characteristics such as age, material, break history, water quality, diameter, pressure and soil characteristics to assign point values to each pipe in the system. Each pipe is assigned a rating between zero and 100. Those pipes with the highest grade are most in need of replacement or rehabilitation.

In order to establish a rating system specific to the MWC water system, discussions were held with system management and operators. During the discussion, it was determined that water main diameter and material is of primary concern to the MWC.

Age/Material

The water industry in the United States followed certain trends over the last century. The installation date of a water main correlates with a specific pipe material that was used during that time as shown on Table No. 6-2. For example, until about the year 1958, unlined cast iron water mains were the predominant pipe material installed in water systems. Factory cement lined cast iron mains were manufactured from the early 1950's to about 1970, when pipe manufacturers switched primarily to factory cement lined ductile iron pipe. Cast iron water mains consist of two types; pit cast and sand spun. Pit cast mains were generally manufactured up to the year 1930 while sand spun mains were generally manufactured between 1930 and 1970. Pit cast mains with diameters between 4-inch and 12-inch do not have a uniform wall thickness and may have "air inclusions" as a result of the manufacturing process. This reduces the overall strength of the main, which makes it more prone to leaks and breaks. Although sand spun mains have a uniform wall thickness, the overall wall thickness was thinner than the pit cast mains. The uniformity provided added strength, however, the thin wall thickness made it more susceptible to corrosion and breaks. Pit cast mains 16-inch diameter and larger have very thick pipe walls and are generally stronger than the thinner walled sand spun cast mains. Prior to the early 1950's, cast iron water mains that were manufactured were unlined, which increased the potential for

Table No. 6-1
Pipe Material by Installation Year

Installation Year	Length (ft)						
	Cast Iron	Cement Lined Cast Iron	Asbestos Cement	Plastic/PVC	Ductile Iron	Other	Grand Total
Pre 1900	67,119						67,119
1900-1909	32,453						32,453
1910-1919	35,857						35,857
1920-1929	6,336					302	6,638
1930-1939	6,746	4,252					10,998
1940-1949	19,812						19,812
1950-1958	3,375		402			290	4,067
1959-1969		15,746	85,095			959	101,800
1970-1979			102,020	2,443	1,505	719	106,687
1980-1989			4,959	41,845	89,575	387	136,766
1990-2010			802	11,328	149,079	561	161,770
Grand Total	171,698	19,998	193,278	55,616	240,159	3,218	683,967

internal corrosion. In the case of the MWC water system, the changeover to factory cement lined cast iron pipe occurred about 1958. Therefore, the asset rating is higher for water mains manufactured before 1958 in the MWC system as opposed to water mains manufactured after this time. Factory lined cast iron mains were manufactured and installed up until about 1973. Overlapping this period, factory cement lined ductile iron main was manufactured from the 1950's, and continues to be manufactured today, although most New England water utilities did not begin to install ductile iron pipe until the late 1960's. In the MWC water system, factory cement lined cast iron water main were installed between 1958 and 1968, and cement lined ductile iron pipe began about 1975. Factory cement lined cast iron and ductile iron pipe provided increased protection against internal corrosion. Unlined cast iron (CI) water mains make up approximately 25 percent of the MWC water system. The MWC has also field cement lined some of the water mains. Approximately three percent of the system consists of water mains that are factory or field cement lined cast iron water main (CLCI).

Between the 1930's and 1970's, the water industry also utilized asbestos cement (AC) pipe for their expanding water systems. An advantage of AC pipe is that it resists tuberculation build up, resulting in less system head loss. However, based on the water quality, the structural integrity of AC mains can deteriorate over time, thereby becoming sensitive to pressure fluctuations and/or nearby construction activities. In addition, external influences such as soil type and high groundwater can corrode AC mains, thus reducing the strength further.

The MWC has identified a specific manufacturer for much of the AC pipe in the system. The Ring Tite AC water mains are short pipe segments that have a coupling surrounding the joints. The MWC has not experienced any particular issues with any of the AC pipe. Approximately 28 percent of the system consists of AC water mains, approximately 14 percent of which is Ring Tite AC.

Polyvinyl Chloride (PVC) pipe was first used in the United States in the early 1960s. Due to its resistance to both chemical and electrochemical corrosion, PVC pipe is not damaged by aggressive water or corrosive soils. In addition, the smooth interior of PVC pipe is resistant to tuberculation. The 1994 "Evaluation of Polyvinyl Chloride (PVC) Pipe Performance" by the AWWA Research Foundation, found that utilities have experienced minimal long term problems with PVC pipe. Generally, problems with PVC occurred when the area surrounding the pipe was disturbed after installation of the pipe, indicating that PVC pipe is not as strong as ductile iron when hit by excavation equipment after installation. It should be noted that PVC is a permeable material. Low molecular weight petroleum products and organic solvents can permeate PVC pipe if the contaminants are found in high concentrations in the soil surrounding the pipe. Approximately eight percent of the system is PVC.

Approximately 35 percent of the system is cement lined ductile iron water main. This material was introduced in the United States in 1950's, however, was not widely used until the 1970's. According to the Ductile Iron Pipe Research Association (DIPRA), ductile iron pipe retains all of cast iron's qualities such as machinability and corrosion resistance, but also provides additional strength, toughness, and ductility.

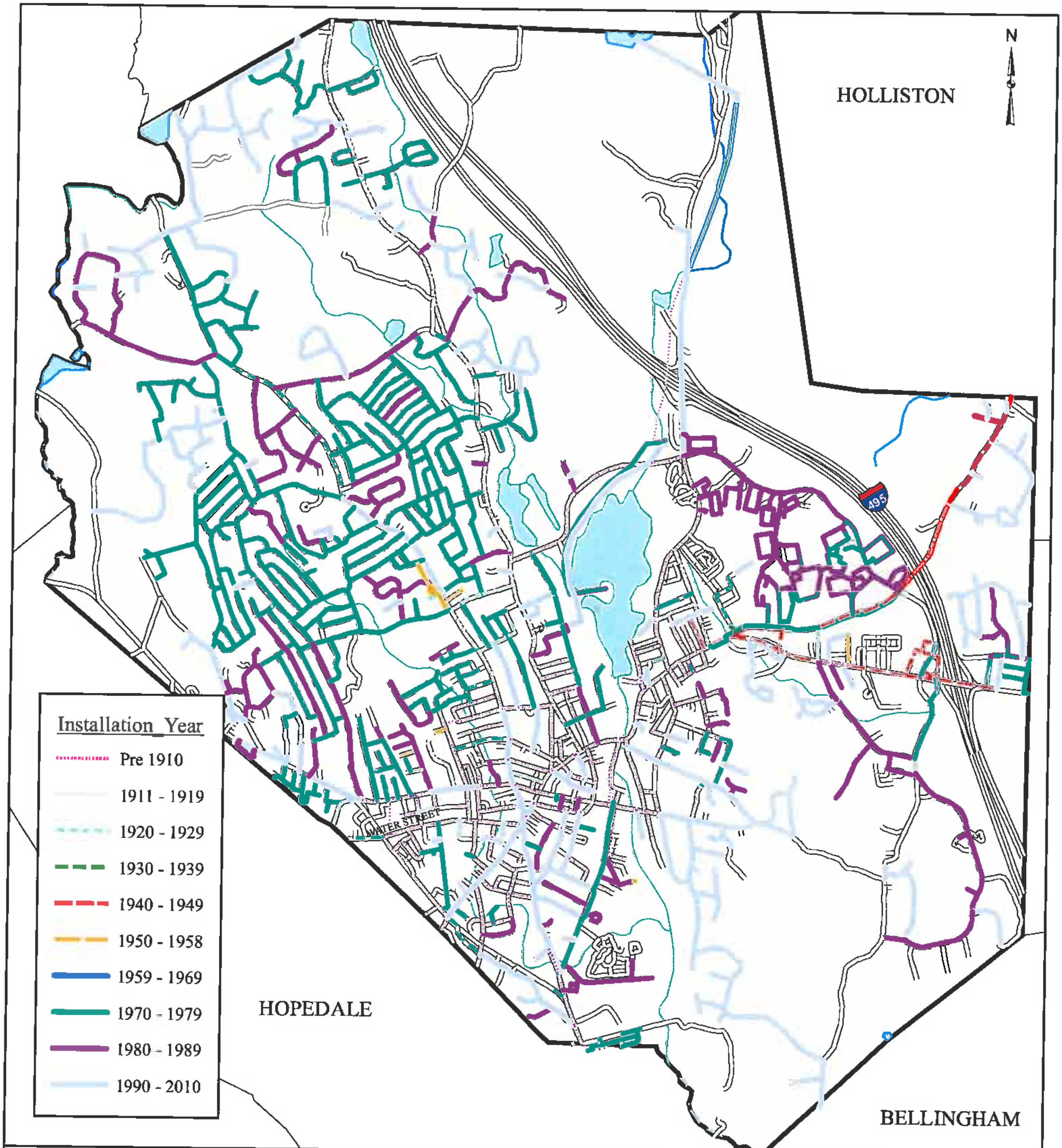
In general, the oldest water mains in the system received the most points, while the newest received no points for water main age. The water mains installed from 1930 to 1958 are given higher ratings based on the sand spun cast iron water mains versus the stronger pit cast mains installed prior to the 1930s. A significant rating decrease occurs around 1958, which represents the timeframe when factory lining was introduced into the system. Figure No. 6-1 and 6-2 present the installation year of the water mains and the materials, respectively.

Diameter

The MWC water distribution system consists of distribution system water mains ranging in diameter from one to 16 inches and 24-inch diameter raw water mains. Approximately 54 percent of the system is comprised of 8-inch diameter pipes and approximately 16 percent is 6-inch diameter pipes.

In general, as the diameter of a pipe increases, the strength increases. In most cases, failure occurs in the form of ring cracks. This is primarily the result of bending forces on the pipe. Pipes that are 6-inch in diameter are more likely to deflect or bend than a larger diameter main. Pipes that are 8-inch in diameter are less likely to break from bending forces due to their increased wall thickness and increased moment of inertia. Pipes that are 16-inches in diameter and larger have significantly thicker walls than 12-inch diameter pipe and smaller, such that in addition to superior bending resistance, they also are much more resistant to failure from pipe wall corrosion.

The rating system for the diameter of the water mains follows the concept that 4-inch diameter water mains are not as strong as 20-inch diameter water mains. Therefore, more points were given to 4-inch diameter and smaller water mains and a no points were given to the 24-inch diameter water mains. There is a significant drop in the number of points assigned to a 6-inch



TATA & HOWARD
Water and Wastewater Consultants

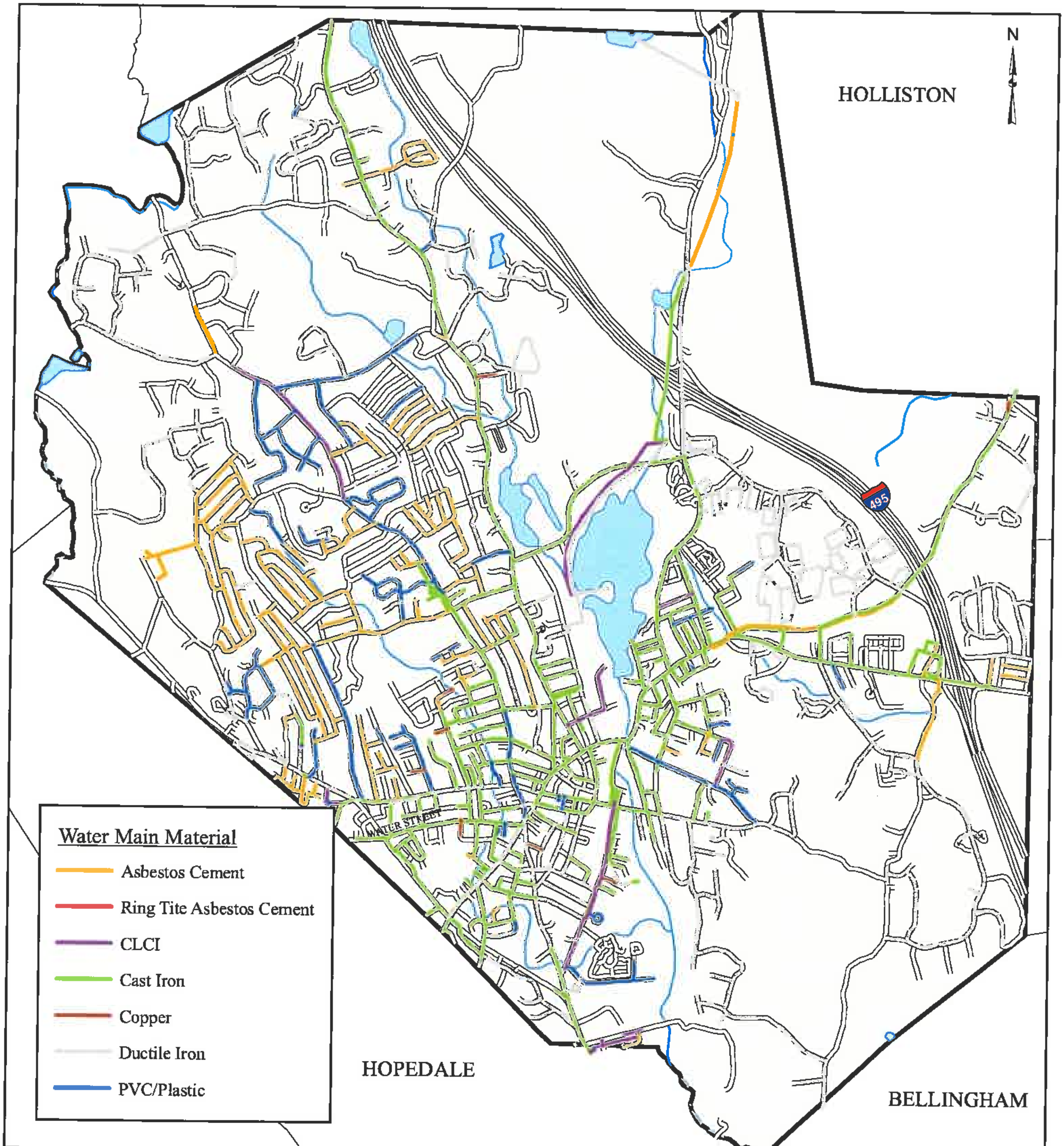
Date: December 2010 Scale: 1:36,000

Water Main Installation Years

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.

6-1



TATA & HOWARD

Water and Wastewater Consultants

Date: December 2010 Scale: 1:36,000

Water Main Materials

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.

6-2

diameter water main than an 8-inch diameter water main. This is due to wall thickness and field experience. An 8-inch diameter water main has proven to have nearly twice the bending strength of a 6-inch diameter water main. In general, 8-inch diameter water mains are stronger and less likely to break than 6-inch diameter pipes. Figure No. 6-3 presents the various diameter sizes throughout the distribution system.

Break History

Based on conversations with MWC personnel, mail failures are not recorded in a database. The system experiences approximately three breaks per year on average, however, the location and information on these failures was not recorded or known. In relation to the total miles of water main in the system, this equates to approximately two breaks per 100 miles per year. In comparison to the national average of 25 breaks per 100 miles per year, the system has a reported low historical break rate. Each water main break costs the system time and labor. They also cause disruption to the public and water consumers. At some point, it becomes more efficient to replace the main then to continue repairing it. Based on areas identified by MWC personnel, there are several areas in the system that have experienced frequent breaks. These areas are given more points while areas with no known breaks received a rating of zero. Figure No. 6-4 presents areas with a history of breaks.

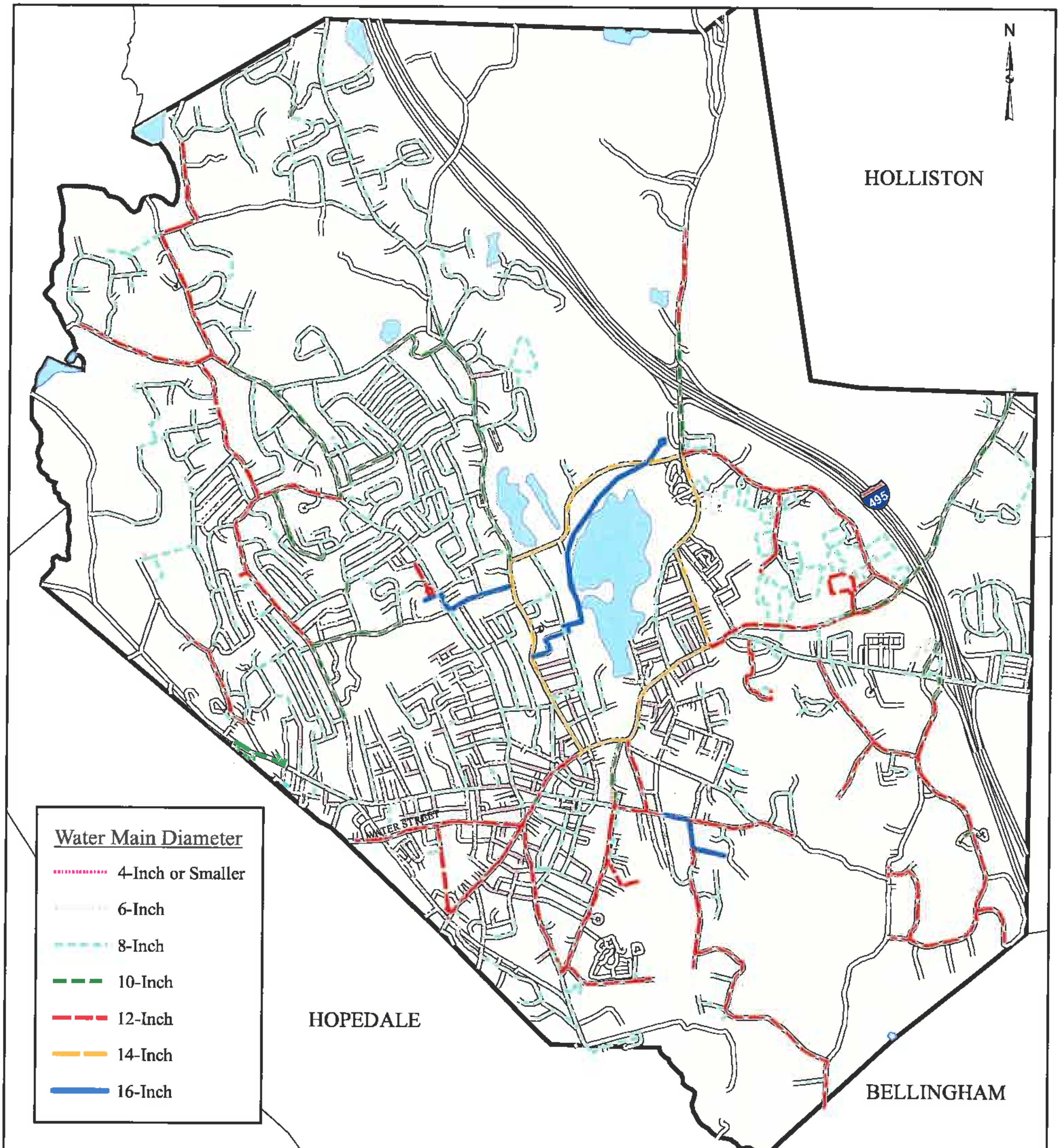
Water Quality

In general, the water quality in the MWC water system meets or exceeds state and federal water quality standards. However, based on conversations with MWC personnel, there are areas that experience poor water quality. These areas include Dynasty Drive and Governors Way, Country Club Lane, Zain Circle, Wildwood Drive, Whispering Pine Drive, Deluca Road and Tomaso Road. Figure No. 6-5 represents the areas with distribution system water quality concerns.

In August 2009 the MWC was issued a Boil Order because of samples confirmed positive for total coliform and E. coli. An unidentified blow off prohibited the MWC from adequately flushing Branch Street. Based on MassDEP guidelines, dead end water mains shall be provided with a fire hydrant if flow and pressure are sufficient or with an approved flushing hydrant or blow-off for flushing purposes. Dead end water mains without a hydrant or blowoff have been identified as potential water quality concerns.

Soils

Water main degradation can occur both internally and externally. Factors that increase the rate of external corrosion include high groundwater, clay soils, contaminated soils, soils with low calcium carbonate, or soils with high acidity or sulphate. Wetlands areas have greater potential to cause external corrosion of water main than other soil conditions. As shown on Figure No. 6-6, wetlands areas are scattered throughout Milford. Areas where the water system and the wetlands coincide were considered areas of potential exterior corrosion. There were also areas identified by the MWC where there are known poor soils and areas where corrosion has been an issue. These areas were given the highest number of points because they were known areas of potential corrosion. Areas identified as wetlands through soils maps were given points. All other pipe was assigned a rating of zero.



TATA & HOWARD

Water and Wastewater Consultants

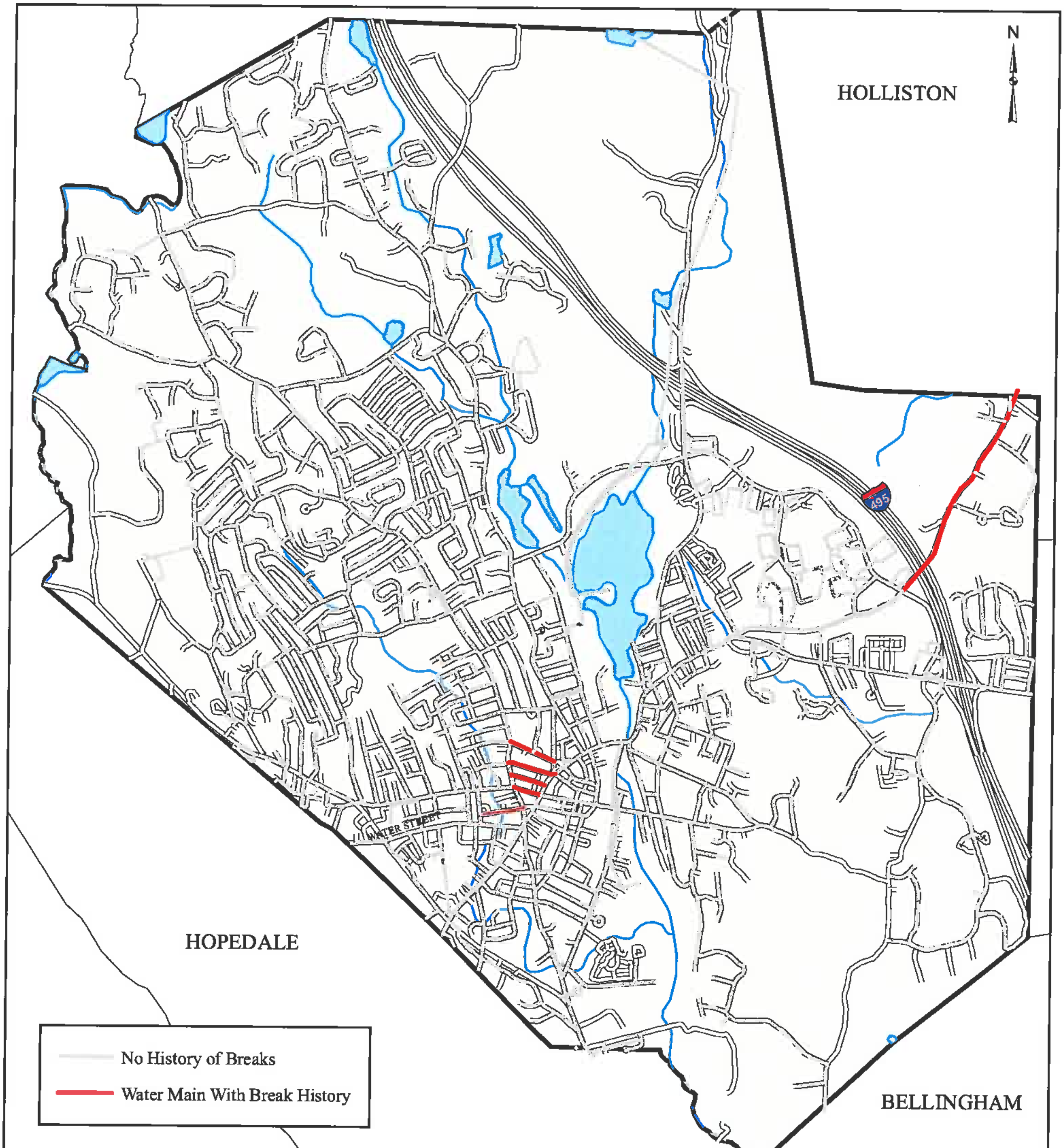
Date: December 2010 Scale: 1:36,000

Water Main Diameter

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.

6-3



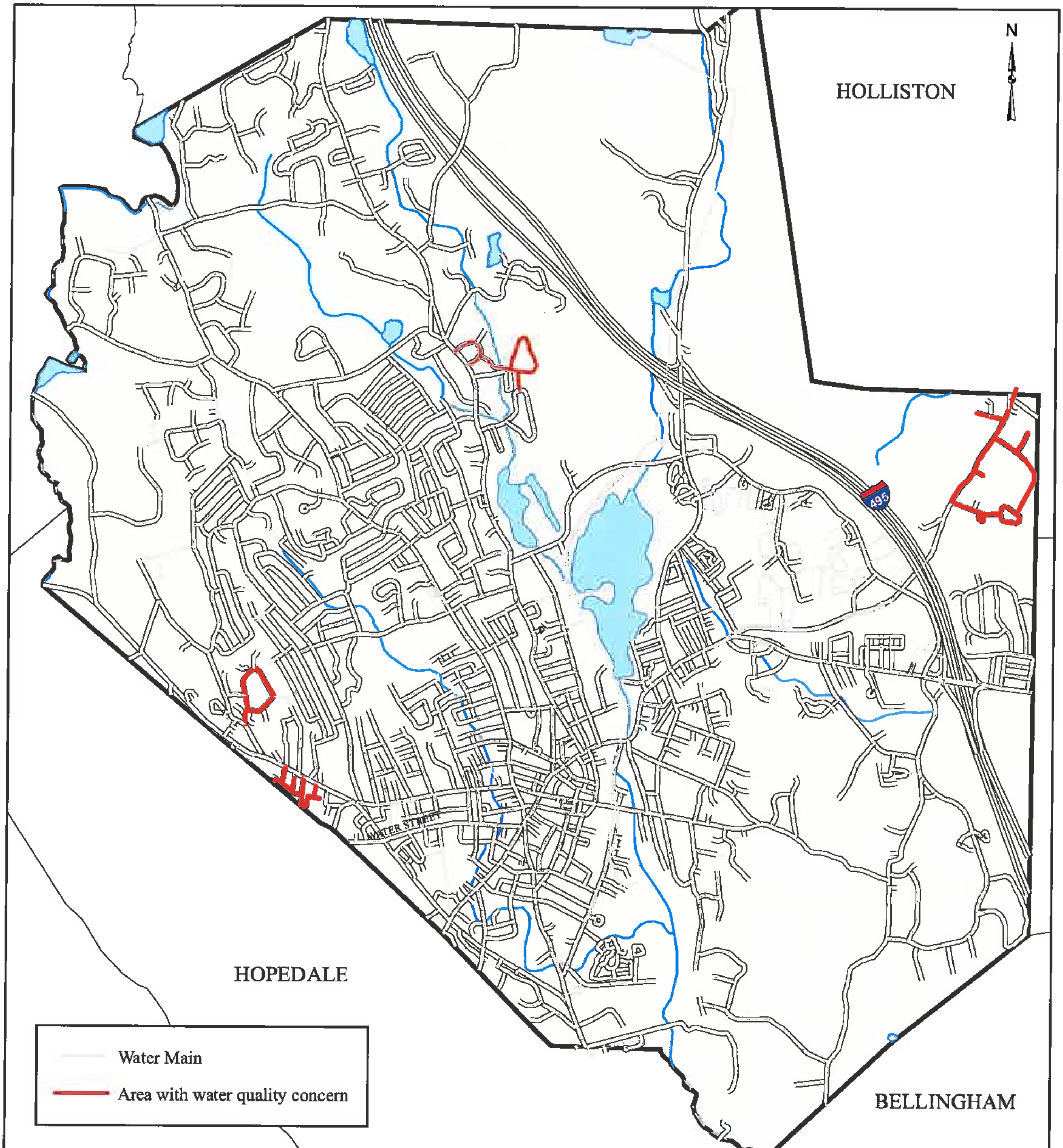
TATA & HOWARD
Water and Wastewater Consultants

Date: December 2010 Scale: 1:36,000

Water Main Break History

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.
6-4



TATA & HOWARD
Water and Wastewater Consultants

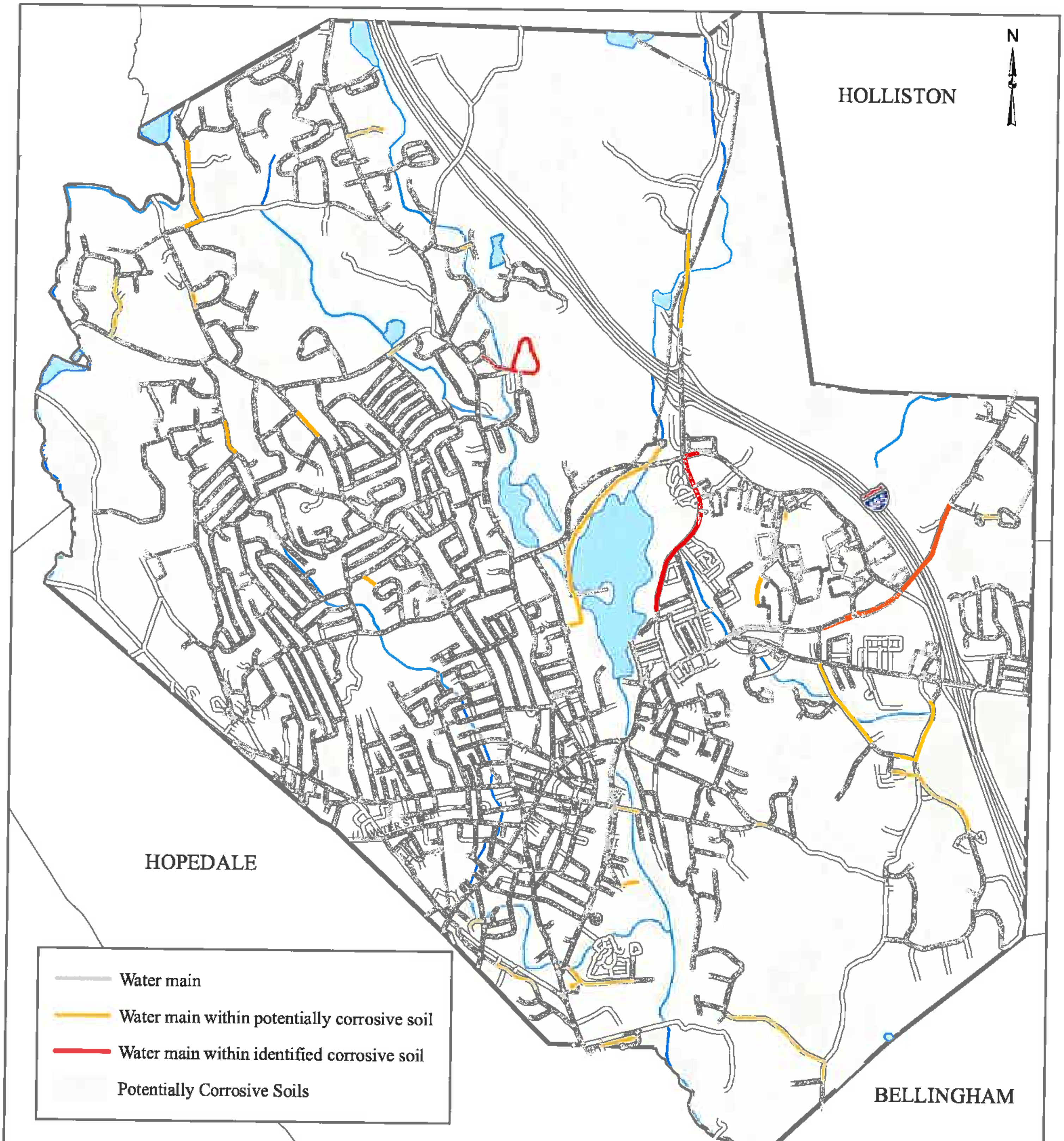
Date: December 2010 Scale: 1:36,000

Areas With Water Quality Concerns

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.

6-5



TATA & HOWARD
Water and Wastewater Consultants

Date: December 2010 Scale: 1:36,000

Potentially Corrosive Soils

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.

6-6

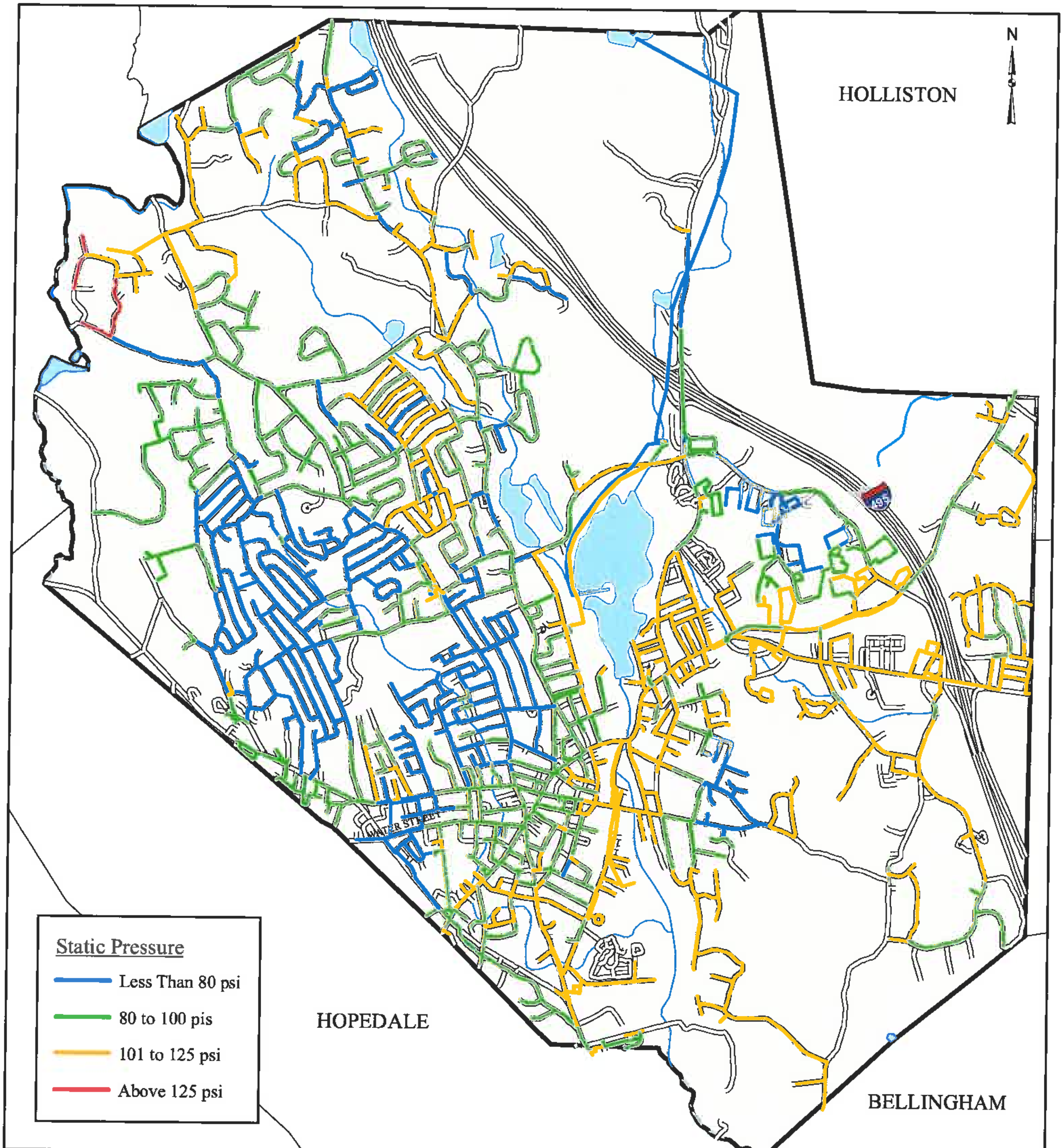
Pressures

Approximately 72 percent of the MWC water system has a pressure above 80 psi. Plumbing code states that water heaters can be affected when pressures exceed 80 psi. Pressures above 100 psi can result in increased water use from fixtures and also increased leakage throughout the distribution system. MassDEP Guidelines and Policies for Public Water System states that normal working pressures should be approximately 60 psi and not less than 35 psi. Areas with pressures exceeding 125 psi are required to have pressure reducing valves on the water mains. These areas are more susceptible to water main breaks. In addition, main failures in areas of higher pressures typically cause more disruption, and result in more costly repairs for damages. All areas with pressures above 125 psi received the most points for static pressures, while pipes with pressures under 80 psi were given a pressure rating of zero. Figure No. 6-7 presents pressures in the system.

Pressure Range	Percentage in System
Less than 80 psi	28
80 – 100 psi	37
100 – 125 psi	34
Greater than 125 psi	1

6.4 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 between zero and 33 are considered to be in good to excellent condition. Areas with a total rating between 33 and 66 are considered to be in fair to good condition, and areas with a total rating of 66 or more are considered to be in poor to fair condition. Asset Management ratings are presented graphically in Appendix E. Asset management input data for each pipe is included with the hydraulic input data in Appendix B.



TATA & HOWARD
Water and Wastewater Consultants

Date: December 2010 Scale: 1:36,000

Static Pressure in Water Main

Master Plan and Capital Improvements
Milford Water Company
Milford, Massachusetts

Figure No.

6-7

SECTION 7 – Recommendations and Conclusions

7.1 General

The following 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 the December 2010 Engineering News Record (ENR) construction cost index for Boston, MA of 11590.38, and include a 25 percent allowance for engineering and contingencies and costs associated with water services, hydrants and permanent and temporary trench pavement. Estimates do not include costs for land acquisition, easement or legal fees.

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

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 the 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 included 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 the failure event.

Rehabilitation or 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 MWC distribution system, this would equate to approximately 6,800 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. Also, rehabilitation or replacement of water mains that are inadequately sized to provide needed fire protection will improve public safety.

7.2 General Recommendations

In order to establish a comprehensive database of the condition of the system, it is recommended that the MWC create a water main failure database. Currently the MWC does not maintain written records of water main breaks. The database should include the location of each break recorded with the nearest street address and the properties of the failed main such as diameter, material, joint type, and type of lining. In addition, the MWC should record the type of failure such as ring crack, lateral split, hole in the pipe, "punky" AC pipe failure, or joint leak. If possible, the MWC should include the apparent cause of the failure such as frost load, traffic load, direct contractor damage, settlement, water hammer, external soil corrosion or stray current. This data should then be inputted into the hydraulic model to create a Water Main

Failure Map for identifying problem areas in the future. The map can be used to easily identify break locations and determine if any streets or areas have a higher frequency of failures and to view any patterns in the location of type of failure. The water main failure database will aid the MWC in making water main replacement decisions in the future.

In addition, it is recommended that the MWC create a database of new or replacement water mains. The database should include water main diameter, material, lining, joint type, soil conditions, date of installation, and as-built schematic drawings. This data can be added to the existing database, created for this study, to maintain a comprehensive water main database.

It is recommended that prior to installation of all new ductile iron water mains, the MWC test the soils in the area of the new main to determine if it has high corrosion potential. If the soil is found to be potentially corrosive, the MWC should consider wrapping the main with polyethylene to protect against external corrosion. Wrapping is a relatively inexpensive practice that can extend the life of new ductile iron pipe. In addition, wrapping helps to protect the pipe from stray currents that may develop near the main.

7.3 Prioritization of Improvements

Based on the Three Circles Approach, a prioritized list of improvements was created. Improvements were separated into three phases. The Phase I and Phase II Improvements are prioritized based on hydraulic needs, location in the distribution system and the condition of the water main. Phase I Improvements have been organized into two categories, storage and supply recommendations and water distribution system improvements. In general, the Phase I Improvements for the water distribution system include water mains that fall into all three of the circles. Phase II Improvements include water mains that fall into two of the three circles. These improvements strengthen the transmission grid, eliminate potential asset management concerns and provide redundancy. Phase III Improvements generally include areas that fall into one circle. These improvements include the remaining hydraulic recommendations from Section 4 and areas with high asset management ratings. Phase III Improvements should be completed as funds become available and considered when reviewing road paving schedules. The hydraulically deficient areas, critical component considerations and asset management ratings are combined on one Three Circles Integration Map included in Appendix F.

It should be noted that due to the nature of this Master Plan and Capital Improvements Plan, the list of improvements is extensive. This results in a high associated cost if all of the suggested improvements were constructed. The intent of the prioritization, therefore, is to serve as a guide for implementation from the most needed to the least needed improvements based on the weighted criteria established jointly by the MWC and Tata & Howard. These improvements would most logically be constructed over an extended period of time.

Table No. 7-1, at the end of this section, includes a prioritized list of Phase I Improvements for storage and supply and the estimated costs of each Phase I Improvement. Table No. 7-2, at the end of this section, includes a prioritized list of Phase I Improvements for the water distribution system and the hydraulic, critical component and asset management status of each improvement. Table No. 7-3 includes the linear footage and estimated cost of each Phase I Improvement for the water distribution system. Table No. 7-4 includes a prioritized list of Phase II Improvements and Table No. 7-5 includes the linear footage and estimated cost of each Phase II Improvement. The recommended improvements maps are included in Appendix G. It should be noted that paving schedules or highway department improvements were not evaluated as part of this study. The MWC may reprioritize the recommendations if paving or road work is scheduled on any of the roads recommended for water main improvements.

Phase I Improvements – Storage and Supply

1. As discussed in Section 3, the MWC has an existing supply deficit of approximately 2.11 mgd and a projected supply deficit of 3.58 mg. The supply deficit is based on the available withdrawal rates from the surface and groundwater supply sources. It is recommended that the MWC pursue Louisa Lake as an active water supply source. A firm yield study must be completed to use Louisa Lake as an active supply source. The estimated cost of the firm yield study and additional permitting is approximately $50,000.

2. According to the MWC, the pumping capacity of the Godfrey Wells and the Dilla Street Wells has decreased. The MWC can pump approximately 65 percent of the approved withdrawal volume for the Godfrey Brook Wells and approximately 30 percent of the approved withdrawal volume for the Dilla Street Wells. These wells should be rehabilitated and/or replacement wells should be installed so the MWC can maximize existing sources. The estimated probable construction cost to rehabilitate a well is approximately $20,000 per well. The estimated cost for a test well exploration program at one site is approximately $20,000.

3. As discussed in Section 3, there is a projected storage deficit of approximately 0.71 mg in the LSA and 1.63 mg in the HSA. If emergency generators were installed at the groundwater supplies and the Congress Street BPS, there would be surplus storage in the LSA and a project storage deficit of approximately 0.70 mg in the HSA. The MWC should purchase two portable emergency generators that can be truck mounted and taken to the well sites or BPS in an emergency situation. The well sites and the BPS should be equipped with an exterior portable generator outlet for connection to the emergency generator when necessary. The estimated cost for two portable generators along with the modifications at the stations for connection to the generator is approximately $120,000.

4. As discussed in Section 3, the projected required effective storage in the HSA is 0.59 mg. A new water storage tank is recommended in the HSA. The estimated probable construction cost the water storage tank is $600,000. This estimate includes the tank, foundation, limited water main installation and engineering and contingencies. This cost does not include costs associated with land acquisition, legal or site work. The required effective storage volume could be reduced if the pumping capacity at the Congress Street Booster Pump Station was increased to provide additional inherent fire flows.

5. According to the 2006 tank inspection report, the Highland Street Tank should be rehabilitated, including blasting and painting of the interior and exterior of the tank and some structural modifications and site work. The estimated probable construction cost of rehabilitating the Highland Street Tank is approximately $300,000.

6. Due to water quality problems that resulted in a Boil Order in August 2009, it is recommended that the MWC complete a system wide unidirectional flushing program twice a year. A unidirectional flushing program starts at a point of origin, usually a source or tank, and works outward flushing each portion of water main through clean water mains. The costs associated with developing a unidirectional flushing program is approximately $22,000.

Phase I Improvements –Water Distribution System

7. The existing water main on Central Street from Depot Street to Main Street and on Main Street between Central Street and South Bow Street should be replaced with 12-inch diameter ductile iron water main. This improvement will improve transmission from the Bear Hill Tank to the center of Town and provide the inherent capacity to meet the representative fire flow at the Milford Regional Medical Center and the Dana Farber Cancer Institute and Women's Cancer Center. The water main on Central Street is considered a critical transmission main and the water main on Main Street is considered critical because of the medical facilities and the amount of businesses and traffic in the area. The asset management ratings of these water mains 45 to 60, which are considered good to fair and fair to poor condition. The high asset management rating can be attributed to the water main size, material and age. The estimated probable construction cost of approximately 2,100 linear feet of 12-inch diameter water main is $454,000.

8. As discussed in Section 4, the portion of the HSA along Purchase Street cannot meet the recommended residential fire flow requirement. To meet the recommended residential fire flow, the water main on Purchase Street would need to be cleaned and lined from the HSA to Tanglewood Drive. This water main has an asset management rating of 52 to 58 and is considered fair to poor. The high asset management rating is due to material and static pressure. Also, in order to provide the recommended fire flow and eliminate a system dead end, the water main on Purchase Street should loop through to the HSA via Silver Hill Road and Claridge Circle. Currently the water mains on Camp Street, Pine Island Road and Briar Drive are considered critical because they are the only water mains that supply this entire area. By eliminating the dead end this will provide redundancy and eliminate the criticality of the water main. The water main on Purchase Street is also considered critical because of a critical user in the area. The estimated probable construction cost of cleaning and lining approximately 6,300 linear feet of 8-inch diameter water main is $749,000. Prior to implementing this improvement, pipe coupons should be taken from the water main to confirm the poor interior condition of the water main.

9. In order to provide the inherent capacity for the ISO recommended fire flow on South Main Street at Courtland Street, the existing water main should be cleaned and lined from Depot Street to the end. This water main is considered critical because of the interconnection with Hopedale and the critical users in this area. The asset management rating ranges from 58 to 60 and is considered fair to poor. The high asset management rating is due to the water main diameter, material, installation year and static pressure. Based on the poor condition of the water main, it is recommended that the water main be replaced with 12-inch diameter ductile iron water main. The estimated probable construction cost of approximately 2,300 linear feet of 12-inch diameter water main is $496,000.

10. To provide the estimated needed fire flow at the intersection of Spruce Street and School Street, a new 12-inch diameter water main is needed on School Street from Main Street to Spruce Street. This water main is considered critical because of all of the schools in the area. The water main has an asset management rating of 58, which is considered fair to poor. The estimated probable construction cost of approximately 1,550 linear feet of 12-inch diameter water main is $335,000.

Phase II Improvements

11. The water main on Medway Road from the 10-inch diameter water main from Beaver Street to Victor Drive should be replaced with a 12-inch diameter ductile iron water main to provide the inherent capacity for the ISO recommended fire flow on Medway Road at Victor Drive. The water main also has an asset management rating of 62. The estimated probable construction cost of approximately 1,850 linear feet of 12-inch diameter water main is $347,000.

12. As discussed in Section 4, Memory Lane should be included in the HSA. To accomplish this and provide the inherent capacity to meet the ISO recommended fire flow on Main Street at Water Street and to provide the recommended residential fire flow requirement in the southern portion of the HSA, a new 8-inch diameter water main is recommended on West Street from Union Street to Highland Street. The water main would connect to the 8-inch diameter water main connecting West Street to Water Street and valves would be configured so the appropriate valves can be closed to serve South Richard Street, Memory Lane and Madden Avenue from the HSA while providing a redundant LSA water main to the interconnection with Hopedale on Williams Street. The water main on West Street has an asset management rating of 64 to 70 and is considered fair to poor. The high asset management score is due to the water main diameter, material, installation year and static pressures. The estimated probable construction cost of approximately 1,700 linear feet of 8-inch diameter ductile iron water main is $318.000.

13. The existing water main on Green Street needs to be replaced with an 8-inch diameter ductile iron water main to meet the representative fire flow at the Blackstone Valley Dialysis Center. This improvement will also provide the recommended residential fire flow requirement along Green Street. This water main has an asset management rating of 70 to 72 and is considered fair to poor. The high asset management rating is due to the water main diameter, material and installation year. The estimated probable construction cost of approximately 1,900 linear feet of 8-inch diameter ductile iron water main is $356,000.

14. A 12-inch diameter water main is needed on Congress Street from Fountain Street to the Brookside Elementary School to provide the representative fire flow at the school. This water main is considered critical because of the school. The estimated probable construction cost of approximately 750 linear feet of 12-inch diameter ductile iron water main is $162,000.

15. In order to provide the representative fire flow at the intersection of Genoa Street and Meade Street, a new 8-inch diameter water main is needed on Meade Street from East Main Street to Columbus Avenue. This water main has an asset management rating of 71 and is considered fair to poor. The estimated probable construction cost of approximately 1,200 linear feet of 8-inch diameter ductile iron water main is $195,000.

16. The existing water main on Prairie Avenue and Sulmone Street should be replaced with an 8-inch diameter water main to provide the recommended residential fire flow requirement in this area. The water mains have an asset management score of 75 and are considered poor to fair. This water main feeds Gillon Street and East Charles Street. The water main on these streets also has an asset management rating of 75. These water mains should also be replaced as part of this project. The high asset management rating is due to water main diameter, material, installation year and static pressure. The estimated probable construction cost of approximately 2,300 linear feet of 8-inch diameter ductile iron water main is $376,000.

17. To provide the recommended residential fire flow requirement on Plain Street and Cook Street, a new 8-inch diameter water main is recommended on Cook Street from East Main Street to Plain Street and on Plain Street from East Main Street to Cook Street. These water mains have an asset management rating of 74 to 75, which is considered fair to poor. The high asset management rating is due to water main diameter, material and installation year. The estimated probable construction cost of approximately 950 linear feet of 8-inch diameter ductile iron water main is $155,000.

18. The 8-inch diameter water main on Purchase Street from Tanglewood Drive to the Town line should be cleaned and lined to provide the recommended residential fire flow requirement in this area. The water main has an asset management score of 56 to 58 and is considered fair to poor. The estimated probable construction cost of cleaning and lining approximately 1,600 linear feet of 8-inch diameter water main is $190,000. Prior to implementing this improvement, pipe coupons should be taken from the water main to confirm the poor interior condition of the water main.

19. The 10-inch diameter water main on East Main Street from Fortune Boulevard to the Town line has an asset management rating of 62. This is considered fair to poor. The high asset management score is due to the water main material, history of breaks in the area and water quality issues in this area. This water main is also considered critical because of the interconnection with Holliston. This water main should be replaced with 12-inch diameter water main. The estimated probable construction cost of this improvement is approximately $1,238,000. This water main improvement is located on a state highway. An additional 20 percent was added to the cost to account for the additional permitting and paving requirements associated with a state road project.

20. The water main on West Street from Reagan Road to Cunniff Avenue is considered critical because of critical users in the area. This water main has an asset management score of 70 and is considered fair to poor. The estimated probable construction cost of approximately 300 linear feet of 8-inch ductile iron water main is $49,000.

21. The water main on Prospect Street and Prospect Circle from Water Street to Main Street is a critical water main because of the Milford Regional Medical Center and the Dana Farber Cancer Institute and Women's Cancer Center. This water main has an asset management rating of 64 to 70 and is considered fair to poor. This water main should be replaced with new 8-inch diameter water main. The estimated probable construction cost of approximately 2,600 linear feet of 8-inch diameter ductile iron water main is $507,000. This water main improvement is located on a state highway. An additional 20 percent was added to the cost to account for the additional permitting and paving requirements associated with a state road project.

22. A new 12-inch diameter water main is recommended on Franklin Street from Main Street to Claflin Street. This water main is considered critical because of a critical user in the area. This water main has an asset management rating of 58 to 60 and is considered fair to poor. The estimated probable construction cost of approximately 1,200 linear feet of 12-inch diameter ductile iron water main is $225,000.

23. The water mains on Spruce Street from Congress Street to School Street, State Street from Purchase Street to Prentice Avenue and Prentice Avenue from State Street to Spruce Street are considered critical because of the numerous schools in the area. The water mains also have asset management ratings of 72 to 74 and are considered fair to poor. The water mains should be replaced with new 8-inch diameter water main. The estimated probable construction cost of approximately 1,900 linear feet of 8-inch diameter ductile iron water main is $357,000.

24. The cast iron water mains in the area off of Medway Road that serve the plaza with the Double Tree Hotel and the Kmart are considered critical because the hotel is a critical user. The water mains have an asset management score of 62 to 74 and are considered fair to poor. These water mains should be replaced with new 8-inch diameter water main. The estimated probable construction cost of approximately 1,400 linear feet of 8-inch diameter ductile iron water main is $302,000.

25. As discussed in Section 4, there are areas of the system that cannot meet a recommended residential fire flow due to water main size. Many of these water mains also have a high asset management rating and are considered in fair to poor condition due to water main diameter, material and installation year. These water mains are identified in Table No. 7-3 and the linear footage and estimated costs for these water mains are presented in Table No. 7-4.

Phase III Improvements

Phase III Improvements have been divided into two sections (Phase III a and b). Phase IIIa Improvements include recommendations that represent the remaining hydraulic improvements from Section 4 as well as water mains that have high asset management ratings that should be replaced and looped to eliminate a potential water quality concern. Phase IIIb Improvements include the water mains that have high asset management ratings and should be replaced when funding becomes available. Table No. 7-6 includes a list of Phase IIIa Improvements and the hydraulic, critical component and asset management status of each improvement. Table No. 7-7 includes the linear footage and estimated cost of each Phase IIIa Improvement.

Phase IIIa Improvements

26. To provide the representative fire flow at the intersection of Freedom Street and West Street, a new 8-inch diameter water main is recommended on Highland Street from Glennon Drive to West Street. The estimated probable construction cost of approximately 2,100 linear feet of 8-inch diameter ductile iron water main is $393,000.

27. The water main on Purchase Street from Dilla Street to Shadow Brook Lane should be cleaned and lined to provide the representative fire flow at the Shadow Brook Condominiums. Prior to implementing this improvement, it is recommended that pipe coupons be taken from the water main to confirm the poor interior condition of the water main. The estimated probable construction cost to clean and line approximately 3,250 feet of water main is $386,000.

28. In order to provide the recommended residential fire flow requirement on Hale Avenue and Walker Avenue, it is recommended that the existing water main on Walker Avenue connect to the existing water main on Hale Avenue with an 8-inch diameter ductile iron water main. The estimated probable construction of approximately 650 linear feet of 8-inch ductile iron water main is $106,000.

29. As discussed in Section 4, there are areas of the system that cannot meet a recommended residential fire flow due to water main size. The existing water mains on John Street, Ballian Way, Della Street, Grace Street and Mitchell Road should be replaced with 8-inch diameter water main. The linear footage and estimated costs for these water mains are presented in Table No. 7-6.

30. The existing water main on Naples Street has an asset management rating of 61 to 63 and is considered fair to poor. The high asset management rating is due to the water main diameter, material, installation year and static pressure. A new 8-inch diameter ductile iron water main is recommended. The estimated probable construction cost of approximately 900 linear feet of 8-inch diameter water main is $147,000.

31. The cast iron water main on Lawrence Street has an asset management rating of 67 to 73 and is considered fair to poor. The high asset management rating is due to the water main diameter, material, installation year and static pressure. A new 8-inch diameter ductile iron water main is recommended on Lawrence Street from High Street to the ductile iron water main and from Lee Street to the end. The estimated probable construction cost of approximately 1,250 linear feet of 8-inch diameter ductile iron water main is $204,000.

Phase IIIb Improvements

32. There are numerous water mains that are considered to be in fair to poor condition based on an asset management rating of 58 or greater. These water mains should be replaced based on available funding. Table No. 7-8 includes a list of these improvements and the linear footage and estimated cost.

33. There are water mains throughout the distribution system that are not looped and create a dead end. All water mains that are 6-inch and larger, that are dead ends should have a fire hydrant for flushing purposes and fire protection. Dead end water mains are more susceptible to water quality concerns. Many water quality concerns can be eliminated with regular flushing. The proposed hydrants are identified in Table No. 7-9. The estimated probable construction cost is approximately $2,500 per hydrant.

Table No. 7-1 Phase I Improvements – Storage and Supply		
1	Louisa Lake Firm Yield Study	$ 50,000
2	Well Rehabilitation at Godfrey Brook and Dilla Street (4 wells)	$ 80,000
3	Two portable emergency generators	$ 120,000
4	New HSA tank	$ 600,000
5	Highland Street Tank rehabilitation	$ 300,000
6	Unidirectional Flushing Program	$ 22,000
	Total Estimated Phase I Cost:	**$1,172,000**

Table No. 7-2
Prioritization of Improvements - Phase I Water Distribution System

Item No.	Location	From	To	Hydraulically Deficient?	Critical Area?	Asset Management Rating
7	Central Street	Main Street	Depot Street	Yes	Yes	58 thru 60
	Main Street	Central Street	South Bow Street	Yes	No	45 thru 47
8	Purchase Street	HSA boundary	Tanglewood Drive	Yes	Yes	52 thru 58
9	South Main Street	Depot Street	End	Yes	Yes	58 thru 60
10	School Street	Main Street	Walnut Street	Yes	No	58

Table No. 7-3
Estimated Improvement Costs - Phase I Water Distribution System

Item No.	Location	From	To	Water Main Diameter (in)	Length (LF)	Estimated Cost
7	Central Street	Main Street	Depot Street	12	1,800	$ 389,000
	Main Street	Central Street	South Bow Street	12	300	$ 65,000
8	Purchase Street	HSA boundary	Tanglewood Drive	C&L	6,300	$ 749,000
9	South Main Street	Depot Street	End	12	2,300	$ 496,000
10	School Street	Main Street	Walnut Street	12	1,550	$ 335,000
				Total Estimated Phase I Cost:		**$2,034,000**

Table No. 7-4
Prioritization of Improvements - Phase II Water Distribution System

Item No.	Location	From	To	Hydraulically Deficient?	Critical Area?	Asset Management Rating
11	Medway Road	Victor Drive	Beaver Street	Yes	Yes	62
12	West Street	Highland Street	Union Street	Yes	No	64 &70
13	Green Street	Green Street	Main Street	Yes	No	70 & 72
14	Congress Street	Fountain Street	Brookside Elementary School	Yes	Yes	50
15	Meade Street	East Main Street	Columbus Avenue	Yes	No	71
16	Prairie Avenue	East Main Street	Sulmone Street	Yes	No	75
	Sulmone Street	Prairie Avenue	Gillon Street	Yes	No	75
	Gillon Street	Sulmone Street	East Charles Street	Yes	No	75
	East Charles Street	Gillon Street	End	Yes	No	75 & 38
17	Plain Street	Cook Street	East Main Street	Yes	No	74
	Cook Street	Plain Street	East Main Street	Yes	No	75
18	Purchase Street	Tanglewood Drive	Town line	Yes	No	56-58
19	East Main Street	Fortune Boulevard	Town line	No	Yes	62
20	West Street	Cunniff Avenue	Reagan Road	No	Yes	70
21	Prospect Street	Main Street	Water Street	No	Yes	64-70
22	Franklin Street	Claflin Street	Main Street	No	Yes	58 & 60
23	Spruce Street	School Street	Congress Street	No	Yes	74
	State Street	Prentice Avenue	Purchase Street	No	Yes	72
	Prentice Avenue	State Street	Spruce Street	No	Yes	72

Table No. 7-4 (continued)
Prioritization of Improvements - Phase II Water Distribution System

Item No.	Location	From	To	Hydraulically Deficient?	Critical Area?	Asset Management Rating
24	Beaver Street	at the Double Tree Hotel and Kmart		No	Yes	62-74
25	Chapin Street	Chapin Street	Main Street	Yes	No	73
	Church Street	Bancroft Avenue	Congress Street	Yes	No	32 & 83
	Fruit Street	South Main Street	Main Street	Yes	No	75
	Legion Street	Congress Street	End	Yes	No	65
	Leonard Street	Leonard Street	Fruit Street	Yes	No	72
	Luby Avenue	West Street	End	Yes	No	68
	Parker Hill Avenue	West Street	End	Yes	No	68 & 62
	Parkhurst Street	Parkhurst Street	Hayward Street	Yes	No	74
	Pine Street	Congress Street	Main Street	Yes	No	82
	Pleasant Street	Congress Street	End	Yes	No	64, 67 & 73
	Short Street	Main Street	End	Yes	No	75
	Williams Center	Prospect Street	End	Yes	No	70

Table No. 7-5
Estimated Improvement Costs - Phase II Water Distribution System

Item No.	Location	From	To	Water Main Diameter (in)	Length (LF)	Estimated Cost
11	Medway Road	Beaver Street	Victor Drive	12	1,850	$ 347,000
12	West Street	Union Street	Highland Street	8	1,700	$ 318,000
13	Green Street	Main Street	End of Main	8	1,900	$ 356,000
15	Congress Street	Fountain Street	Brookside Elementary School	12	750	$ 162,000
15	Meade Street	Main Street	End of Main	8	1,200	$ 195,000
16	Prairie Avenue	Main Street	Sulmone Street	8	1,000	$ 163,000
	Sulmone Street	Prairie Avenue	Gillon Street	8	450	$ 74,000
	Gillon Street	Sulmone Street	East Charles Street	8	200	$ 33,000
	East Charles Street	Gillon Street	End of Main	8	650	$ 106,000
17	Plain Street	Main Street	Cook Street	8	550	$ 90,000
	Cook Street	Main Street	Jackson Street	8	400	$ 65,000
18	Purchase Street	Tanglewood Drive	Town line	C&L	1,600	$ 190,000
19	East Main Street	Fortune Boulevard	Town line	12	5,500	$1,238,000
20	West Street	Reagan Road	Cunniff Avenue	8	300	$ 49,000
21	Prospect Street	Water Street	Main Street	8	2,600	$ 507,000
22	Franklin Street	Main Street	Claflin Street	12	1,200	$ 225,000
23	Spruce Street	Congress Street	School Street	8	1,100	$ 206,000
	State Street	Purchase Street	Prentice Avenue	8	300	$ 57,000
	Prentice Avenue	State Street	Spruce Street	8	500	$ 94,000

Table No. 7-5 (continued)
Estimated Improvement Costs - Phase II Water Distribution System

Item No.	Location	From	To	Water Main Diameter (in)	Length (LF)	Estimated Cost
24	Beaver Street	at the Double Tree Hotel and Kmart		12	1,400	$ 302,000
	Chapin Street	Main Street	End of Main	8	600	$ 113,000
	Church Street	Congress Street	Bancroft Avenue	8	1,050	$ 197,000
	Fruit Street	Main Street	South Main Street	8	1,400	$ 262,000
	Legion Street	Congress Street	End of Main	8	600	$ 98,000
	Leonard Street	Fruit Street	End of Main	8	300	$ 49,000
	Luby Avenue	West Street	Dead End	8	1,400	$ 228,000
25	Parker Hill Avenue	West Street	Dead End	8	850	$ 139,000
	Parkhurst Street	Hayward Street	End of Main	8	1,000	$ 163,000
	Pine Street	Main Street	Congress Street	8	1,250	$ 234,000
	Pleasant Street	Congress Street	Dead End	8	1,200	$ 195,000
	Short Street	Main Street	End of Main	8	750	$ 122,000
	Williams Center	Prospect Street	End of Main	8	350	$ 57,000
				Total Estimated Phase II Cost:		**$6,634,000**

Table No. 7-6
Prioritization of Improvements - Phase IIIa Water Distribution System

Item No.	Location	From	To	Hydraulically Deficient?	Critical Area?	Asset Management Rating
26	Highland Street	Glennon Avenue	West Street	Yes	No	46 & 52
27	Purchase Street	Dilla Street	Shadow Brook Road	Yes	No	
28	Hale Avenue	Existing water main	Congress Street	Yes	No	n/a
	Walker Avenue	Hale Avenue	Existing 8-inch	Yes	No	n/a
29	John Street and Balian Way	West Street	Freedom Street	Yes	No	56
	Mitchell Road	Blanchard Road	Packard Road	Yes	No	45
	Della Street and Grace Street			Yes	No	
30	Naples Street	Cedar Street	Hamilton Street	No	No	61-63
31	Lawrence Street			No	No	67 & 73

Table No. 7-7
Estimated Improvement Costs - Phase IIIa Water Distribution System

Item No.	Location	From	To	Water Main Diameter (in)	Length (LF)	Estimated Cost
26	Highland Street	Glennon Avenue	West Street	8	2,100	$ 393,000
27	Purchase Street	Dilla Street	Shadow Brook Road	C&L	3,250	$ 386,000
28	Hale Avenue	Existing water main	Congress Street	8	300	$ 49,000
	Walker Avenue	Hale Avenue	Existing 8-inch	8	350	$ 57,000
	John Street and Balian Way	West Street	Freedom Street	8	750	$ 122,000
29	Mitchell Road	Blnachard Road	Packard Road	8	250	$ 41,000
	Della Street and Grace Street			8	600	$ 98,000
30	Naples Street	Cedar Street	Hamilton Street	8	900	$ 147,000
31	Lawrence Street			8	1,250	$ 204,000
				Total Estimated Phase I Cost:		**$1,497,000**

Table No. 7-8
Phase IIIb Estimated Improvement Costs

Item No.	Location	Water Main Diameter (in)	Length (LF)	Estimated Cost
32	Cunniff Avenue	2	800	$130,000
	Prospect Heights	6	1950	$317,000
	South High Street	6	8000	$1,300,000
	Bancroft Avenue	4 & 6	800	$130,000
	Quinlan Street	4	450	$74,000
	Oliver Street	6	1450	$236,000
	Thayer Street	6	1050	$171,000
	Oliver Court	4	250	$41,000
	Bacon Slip	4	250	$41,000
	Orrin Slip	4	300	$49,000
	Hollis Street	4	400	$65,000
	Hollis Court	2	150	$25,000
	Leonard Street	6	450	$74,000
	Orange Street	4 & 6	1200	$195,000
	Vine Street	6	700	$114,000
	Off Green Street	8	400	$65,000
	Elm Street	6	850	$139,000
	Daniels Street	8	200	$33,000
	Cape Road	8	450	$74,000
	South Main Street	8	700	$114,000
	Depot Street	8	750	$141,000
	South Union Street	6	450	$74,000
	Charles Street	6 & 8	1800	$293,000
	Charles River Road	8	500	$82,000
	Poplar Street	4 & 6	900	$147,000
	Cemetery Street	2	400	$65,000
	South Bow Street	8	1550	$290,000

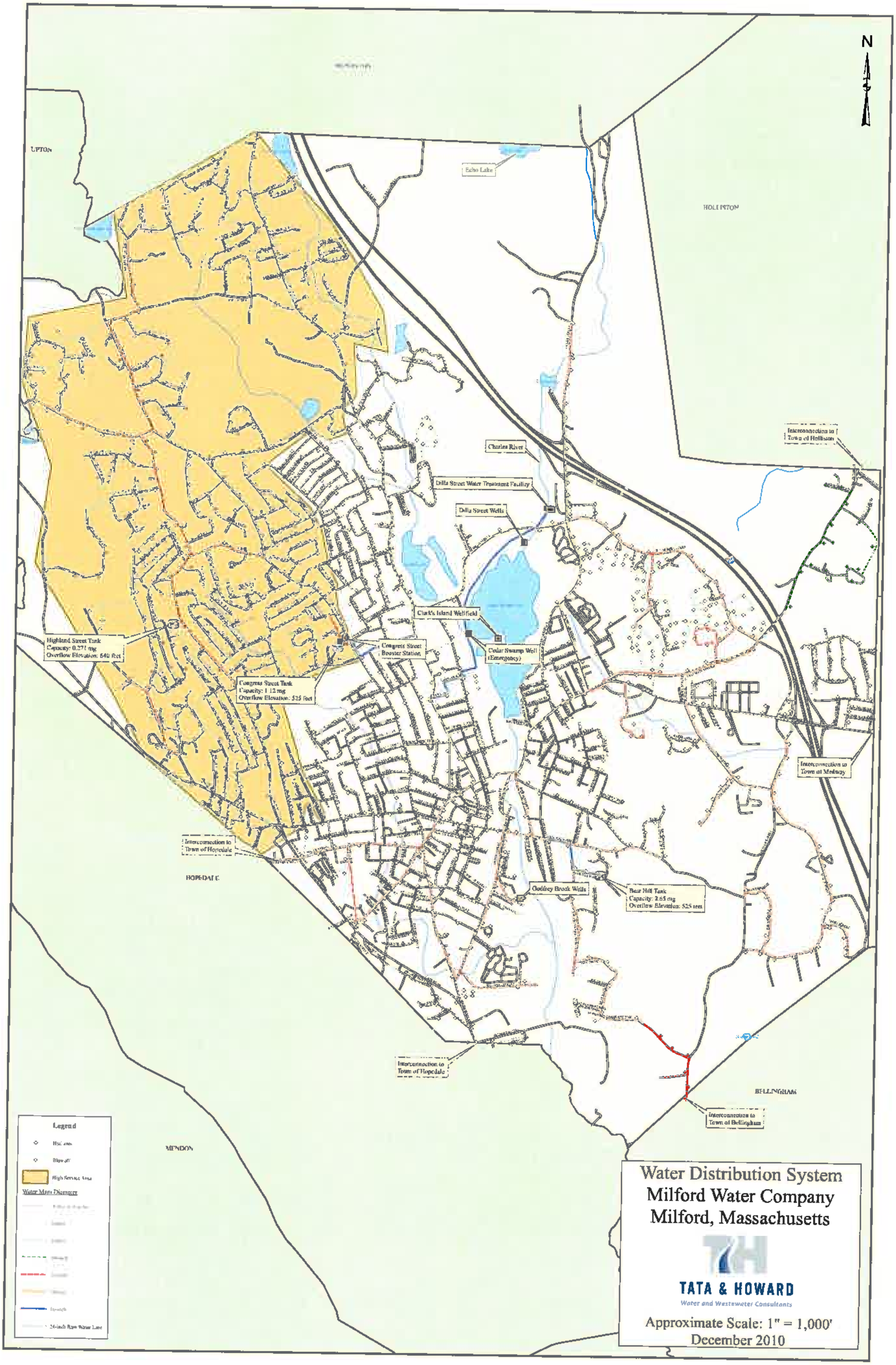
Table No. 7-8 (continued) Phase IIIb Estimated Improvement Costs				
Item No.	**Location**	**Water Main Diameter (in)**	**Length (LF)**	**Estimated Cost**
32	Bragg Slip	2	300	$49,000
	Park Terrace	6	200	$33,000
	Cherry Street	6	700	$114,000
	Exchange Street	4	1450	$271,000
	Clark Street	4	300	$49,000
	Fayette Street	6	850	$139,000
	West Pine Street	6	800	$130,000
	West Spruce Street	8	600	$98,000
	Gibbon Avenue	4	550	$90,000
	West Walnut Street	6	1050	$171,000
	Westbrook Street	6	1400	$228,000
	Lavoie Avenue	6	350	$57,000
	Richmond Avenue	6	700	$114,000
	Ackerly Street	2	300	$49,000
	Fells Avenue	4	850	$139,000
	Glines Avenue	4	850	$139,000
	Mechanic Street	4, 6 & 8	750	$122,000
	Winter Street	4	1050	$171,000
	Spring Street	4	800	$130,000
	North Bow Street	6	1300	$243,000
	Goodrich Court	6	300	$49,000
	Pond Street	4 & 6	1600	$260,000
	Front Street	6	400	$65,000
	Beach Street Ext.	6	700	$114,000
	East Street	6	850	$139,000
	Alden Street	6	850	$139,000
	Hillside Avenue	4	250	$41,000
	Hayward Street	1.5 & 6	2400	$449,000

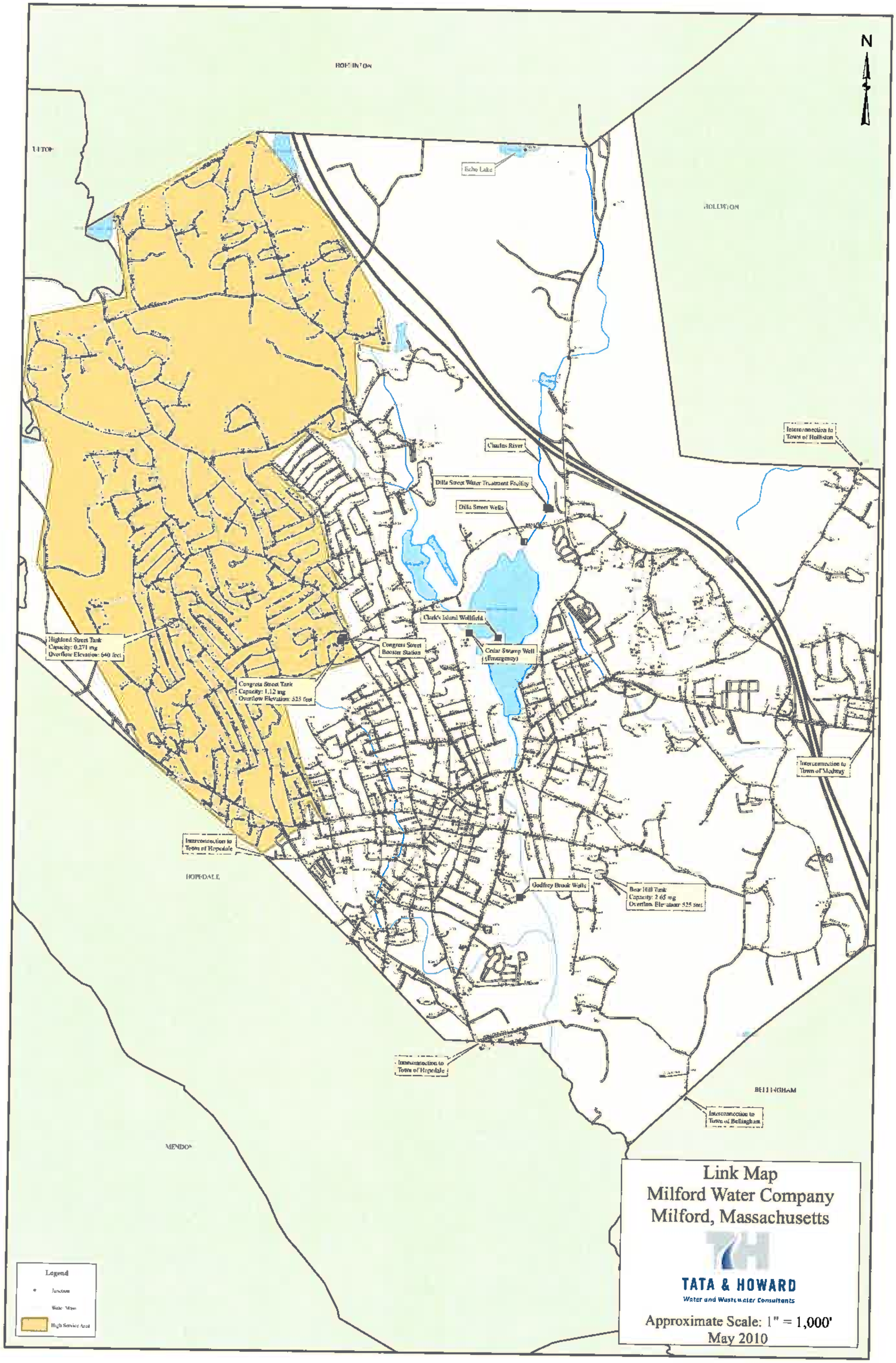
Table No. 7-8 (continued)
Phase IIIb Estimated Improvement Costs

Item No.	Location	Water Main Diameter (in)	Length (LF)	Estimated Cost
32	Altieri Court	2	250	$41,000
	Jackson Street	4	350	$57,000
	East Walnut Street	6	1200	$195,000
	Fairview Road	6	900	$147,000
	North Terrace	4	300	$49,000
	Carroll Street	6	1150	$187,000
	Hayward Field	6	350	$57,000
	Cedar Street	8	2950	$480,000
	Columbus Avenue	6	650	$106,000
	Genoa Avenue	4	650	$106,000
	Como Court	2	300	$49,000
	Ravena Street	2, 4 & 6	1000	$163,000
	North Street	8	1150	$187,000
	Free Street	6	850	$139,000
	Middleton Street	6	350	$57,000
	Dominick Street	4 & 6	450	$74,000
	Dominick Street	4	200	$33,000
	South Free Street	6	350	$57,000
	Reade Street	4	400	$65,000
	Medway Road	8	4650	$756,000
	Bay Road	6 & 8	750	$122,000
	Branch Street	6	300	$49,000
		Total Estimated Phase IIIb Cost:		**$11,447,000**

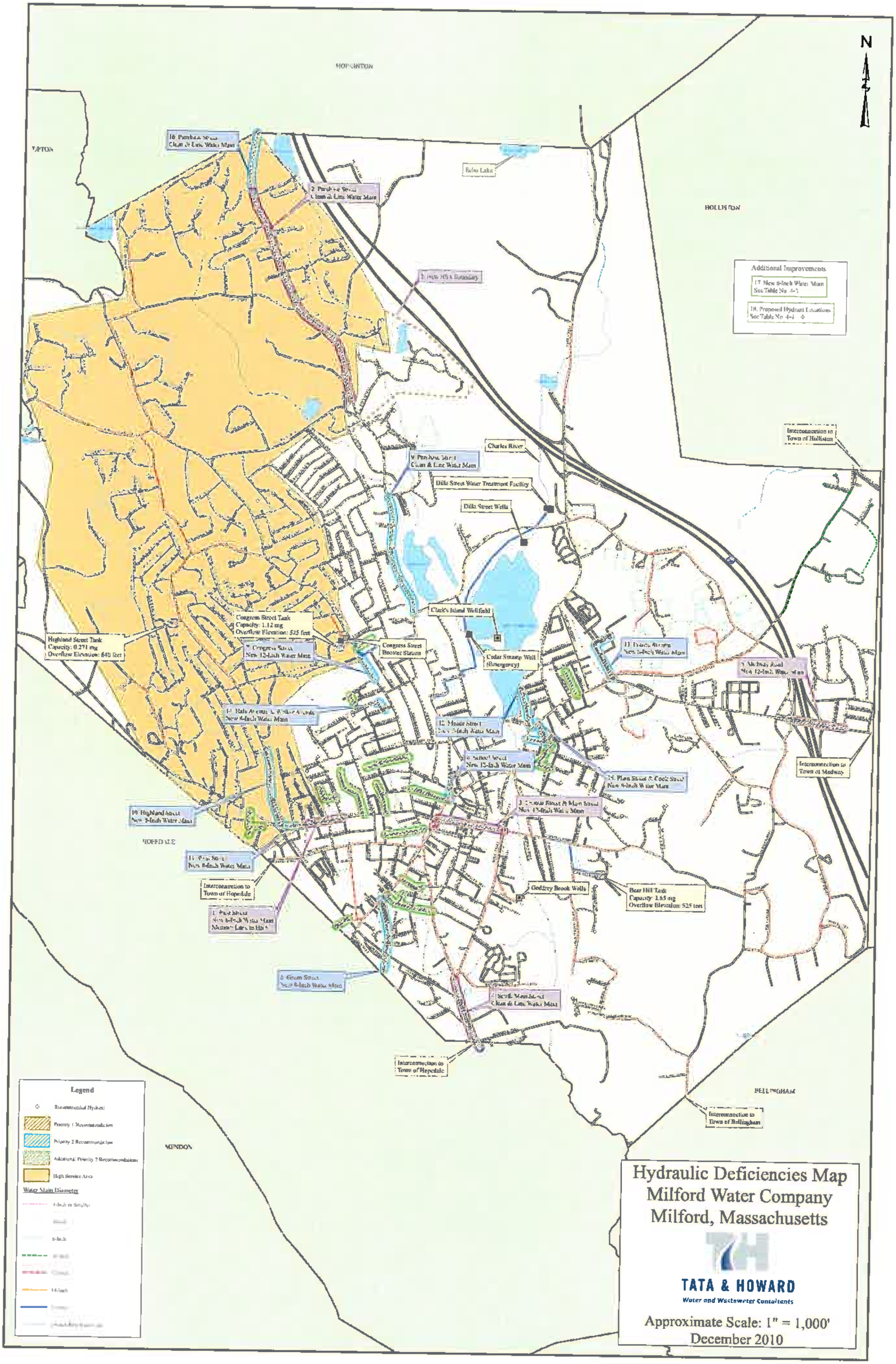
Table No. 7-9
Proposed Hydrant Locations

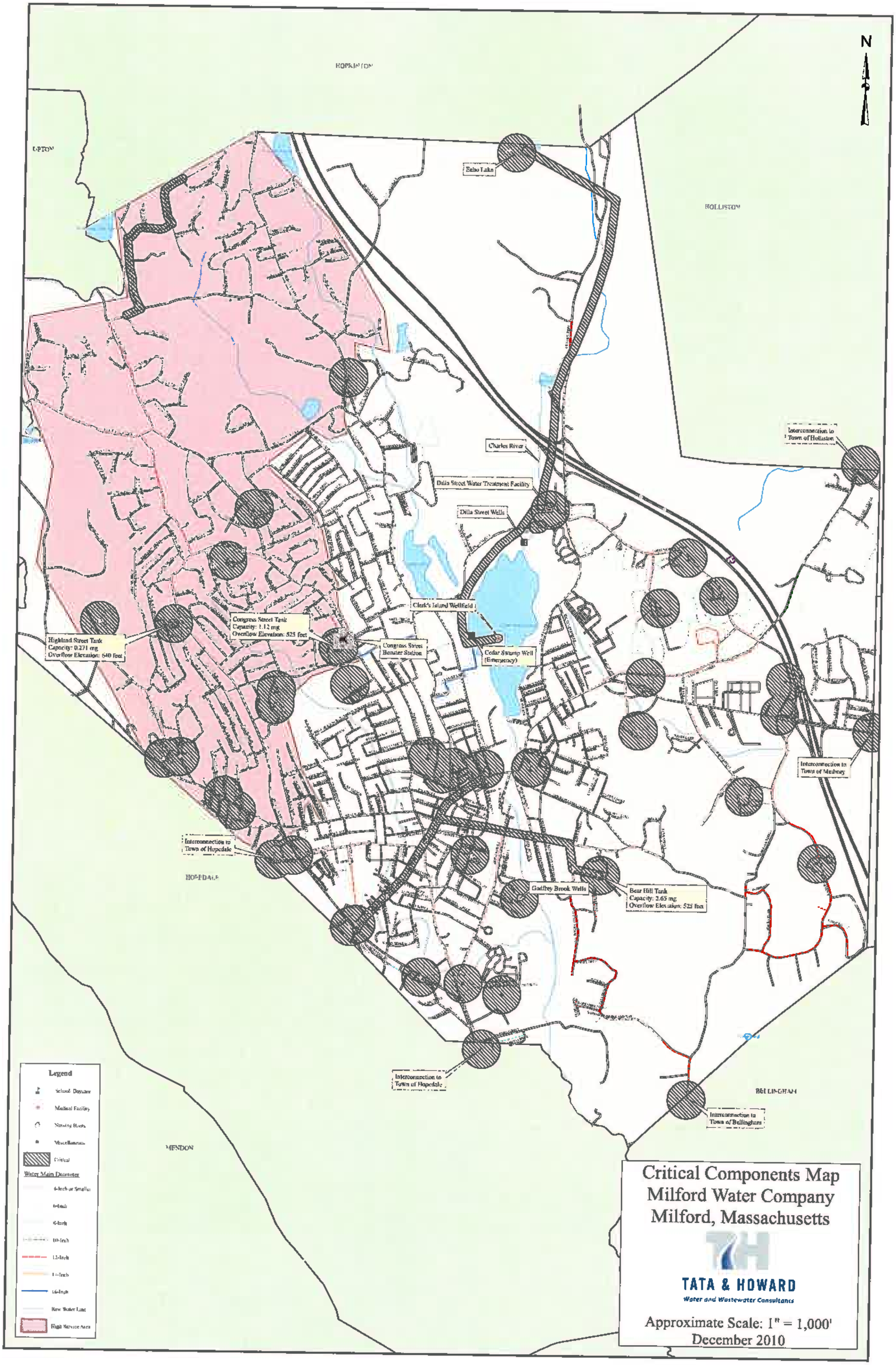
Briar Drive	Huntoon Slip	Rosebud Lane
Brook Hollow Road	Isiah Circle	Sanclemente Circle
Brookside Lane	Julie Circle	Senate Road
Carven Road	Kalen Circle	Sidney Road
Cedarview Circle	Lena Lane	Silva Street
Celestial Circle	Manella Avenue	South Richard Street
Christina Road	Manguso Avenue	Stub Toe Lane
Cricket Lane	Manoodian Circle	Till Rock Lanes
Dell-Ann Circle	Memory Lane	Tomaso Road
Diantonio Drive	Mike Circle	Ryler Street
Dogwood Lane	Nelson Heights	Union Street
East Wood Street	Oak Tree Lane	Virginia Drive
East View Drive	Off Country Club Lane	Walker Avenue
Eugene Circle	Pine Needle Circle	Washington Street
Farmer Circle	Ramble Road	Western Avenue
Fern Street	Reagan Road	Wildwood Drive
Fox Lane	Rich Road	Winterberry Lane
Freedom Street	Richard Street	Wyeth Circle
Gritte Lane	Roger Avenue	
Hamel Circle	Rogers Street	

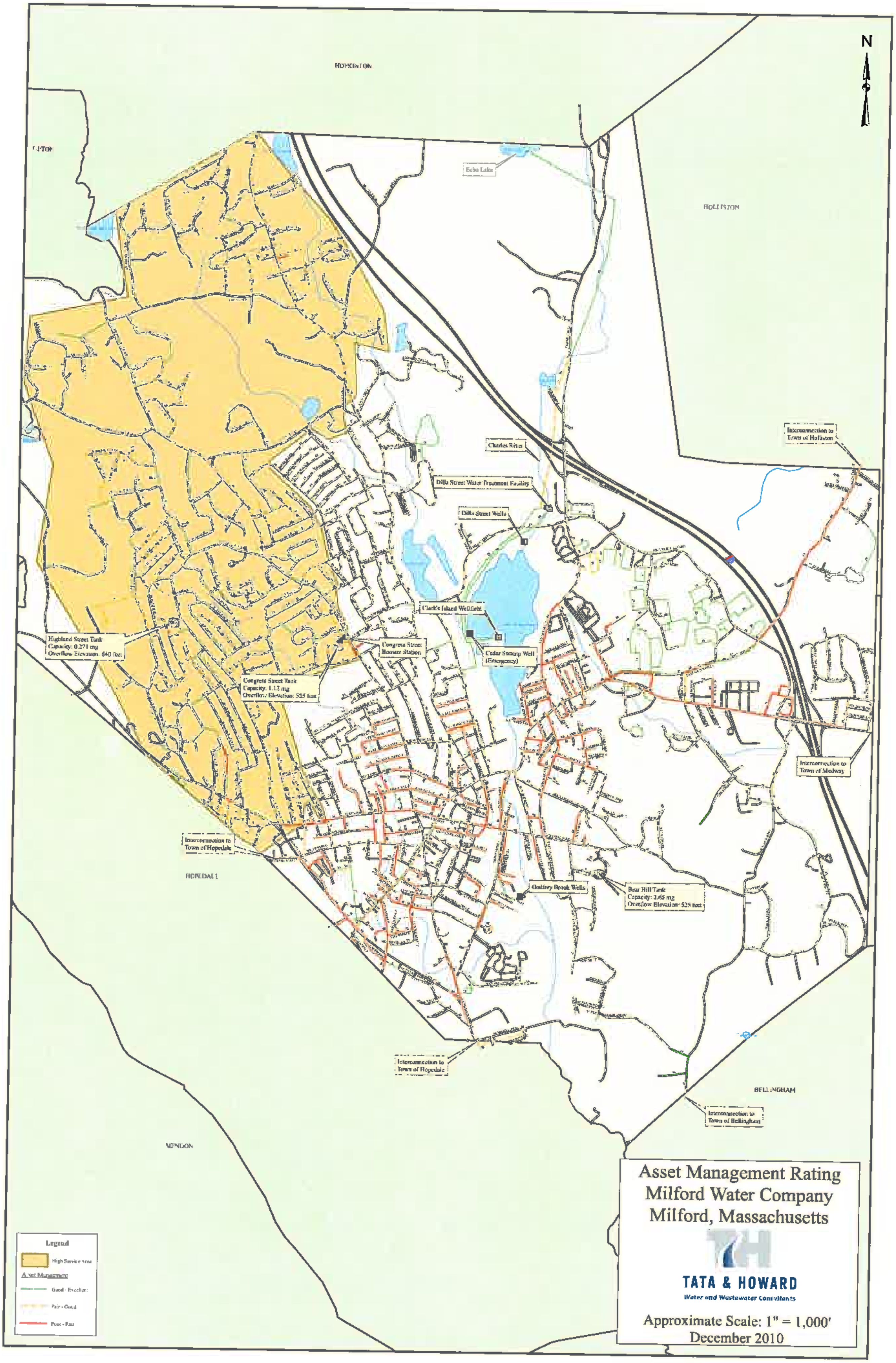

N
UPTON
HOLLISTON
Echo Lake
Charles River
Dilla Street Water Treatment Facility
Dilla Street Wells
Clark's Island Wellfield
Cedar Swamp Well (Emergency)
Congress Street Booster Station
Highland Street Tank
Capacity: 0.271 mg
Overflow Elevation: 640 feet
Congress Street Tank
Capacity: 1.12 mg
Overflow Elevation: 525 feet
Interconnection to Town of Holliston
Interconnection to Town of Medway
Interconnection to Town of Hopedale
HOPEDALE
Godfrey Brook Wells
Bear Hill Tank
Capacity: 2.65 mg
Overflow Elevation: 525 feet
Interconnection to Town of Hopedale
BELLINGHAM
Interconnection to Town of Bellingham
MENDON
Legend
High Service Area
Water Main Diameter
24-inch Raw Water Line
Water Distribution System
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
December 2010

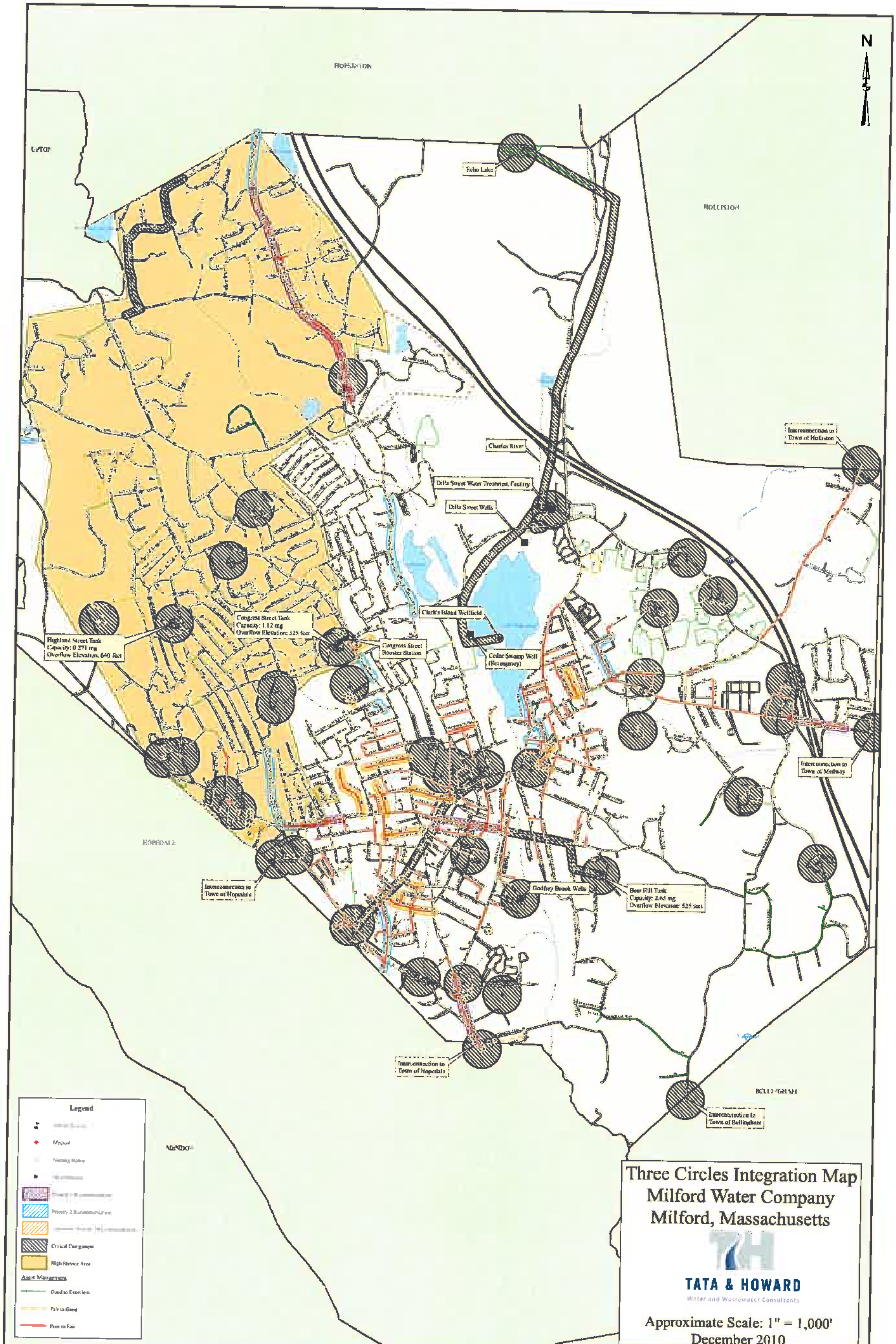


N
HOPKINTON
UPTON
Echo Lake
HOLLISTON
Charles River
Dilla Street Water Treatment Facility
Dilla Street Wells
Interconnection to Town of Holliston
Clark's Island Wellfield
Cedar Swamp Well (Emergency)
Highland Street Tank
Capacity: 0.271 mg
Overflow Elevation: 640 feet
Congress Street Booster Station
Congress Street Tank
Capacity: 1.12 mg
Overflow Elevation: 525 feet
Interconnection to Town of Medway
Interconnection to Town of Hopedale
HOPEDALE
Godfrey Brook Wells
Bear Hill Tank
Capacity: 2.65 mg
Overflow Elevation: 525 feet
Interconnection to Town of Hopedale
BELLINGHAM
Interconnection to Town of Bellingham
MENDON
Legend
Junction
Water Main
High Service Area
Link Map
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
May 2010

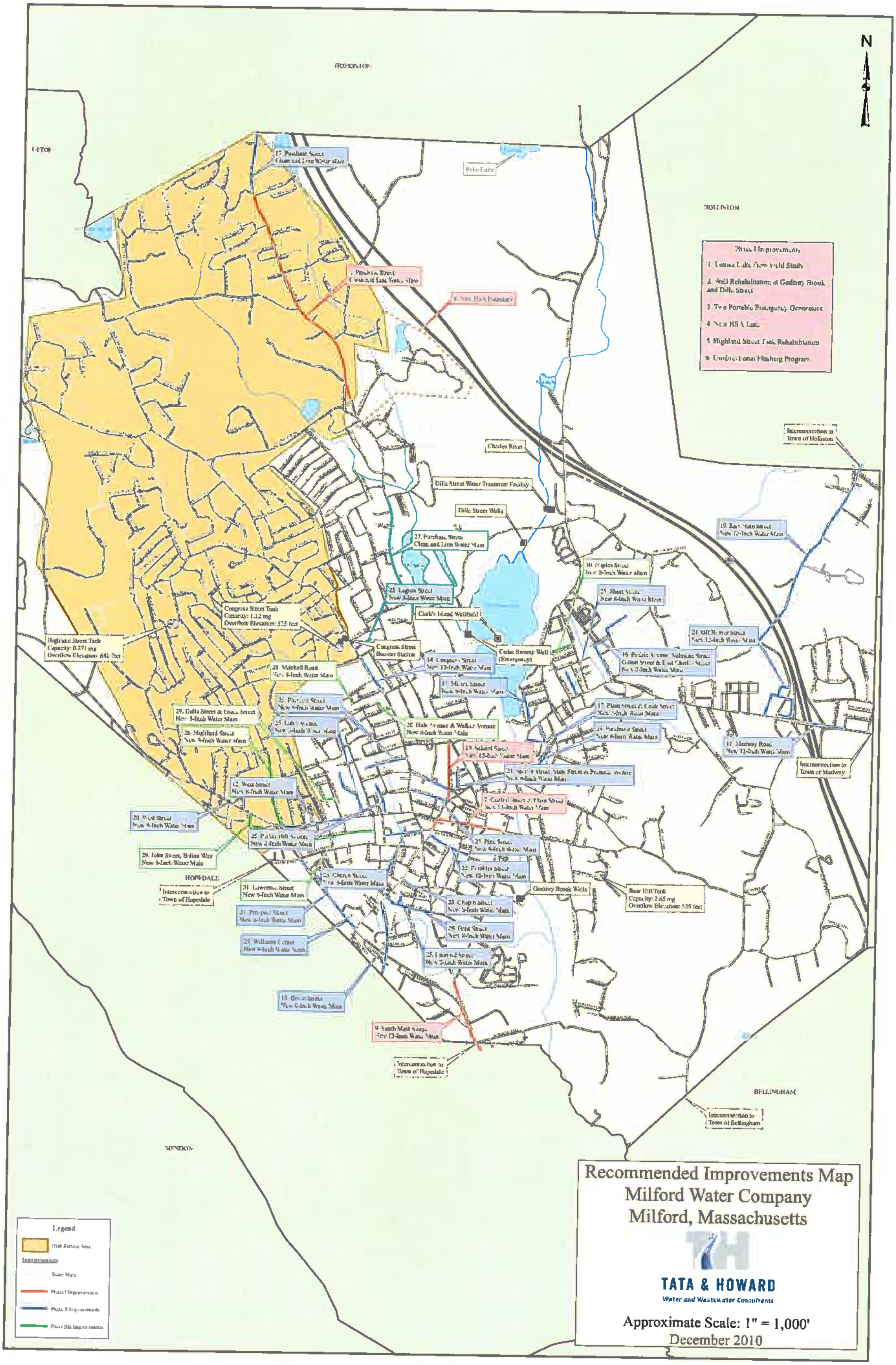

N
HOPKINTON
HOLLISTON
Echo Lake
Additional Improvements
Charles River
Interconnection to Town of Holliston
Dilla Street Water Treatment Facility
Dilla Street Wells
Clark's Island Wellfield
Cedar Swamp Well (Emergency)
Congress Street Tank
Capacity: 1.12 mg
Overflow Elevation: 525 feet
Highland Street Tank
Capacity: 0.271 mg
Overflow Elevation: 640 feet
Congress Street Booster Station
Interconnection to Town of Medway
HOPEDALE
Interconnection to Town of Hopedale
Godfrey Brook Wells
Bear Hill Tank
Capacity: 1.65 mg
Overflow Elevation: 525 feet
Interconnection to Town of Hopedale
BELLINGHAM
Interconnection to Town of Bellingham
MENDON
Legend
High Service Area
Water Main Diameter
Hydraulic Deficiencies Map
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
December 2010


N
HOPKINTON
UPTON
HOLLISTON
Echo Lake
Charles River
Dilla Street Water Treatment Facility
Dilla Street Wells
Interconnection to Town of Holliston
Clark's Island Wellfield
Congress Street Tank
Capacity: 1.12 mg
Overflow Elevation: 525 feet
Highland Street Tank
Capacity: 0.271 mg
Overflow Elevation: 640 feet
Congress Street Booster Station
Cedar Swamp Well (Emergency)
Interconnection to Town of Medway
Interconnection to Town of Hopedale
HOPEDALE
Godfrey Brook Wells
Bear Hill Tank
Capacity: 2.65 mg
Overflow Elevation: 525 feet
Interconnection to Town of Hopedale
BELLINGHAM
Interconnection to Town of Bellingham
MENDON
Legend
Medical Facility
Critical
Water Main Diameter
4-Inch or Smaller
8-Inch
10-Inch
12-Inch
16-Inch
Raw Water Line
High Service Area
Critical Components Map
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
December 2010


N
HOPKINTON
HOLLISTON
Echo Lake
Charles River
Dilla Street Water Treatment Facility
Dilla Street Wells
Clark's Island Wellfield
Cedar Swamp Well (Emergency)
Interconnection to Town of Holliston
Highland Street Tank
Capacity: 0.271 mg
Overflow Elevation: 640 feet
Congress Street Booster Station
Congress Street Tank
Capacity: 1.12 mg
Overflow Elevation: 525 feet
Interconnection to Town of Medway
Interconnection to Town of Hopedale
HOPEDALE
Godfrey Brook Wells
Bear Hill Tank
Capacity: 2.65 mg
Overflow Elevation: 525 feet
Interconnection to Town of Hopedale
BELLINGHAM
Interconnection to Town of Bellingham
MENDON
Legend
High Service Area
Asset Management
Good - Excellent
Fair - Good
Poor - Fair
Asset Management Rating
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
December 2010



N
HOPKINTON
UPTON
HOLLISTON
Echo Lake
Charles River
Dilla Street Water Treatment Facility
Dilla Street Wells
Clark's Island Wellfield
Cedar Swamp Well
(Emergency)
Congress Street Tank
Capacity: 1.12 mg
Overflow Elevation: 525 feet
Highland Street Tank
Capacity: 0.271 mg
Overflow Elevation: 640 feet
Congress Street
Booster Station
Interconnection to
Town of Holliston
Interconnection to
Town of Medway
HOPEDALE
Interconnection to
Town of Hopedale
Godfrey Brook Wells
Bear Hill Tank
Capacity: 2.65 mg
Overflow Elevation: 525 feet
Interconnection to
Town of Hopedale
BELLINGHAM
Interconnection to
Town of Bellingham
MENDON
Legend
Medical
Nursing Home
Priority 2 Recommendation
Critical Component
High Service Area
Asset Management
Good to Excellent
Fair to Good
Poor to Fair
Three Circles Integration Map
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
December 2010


N
HOPKINTON
HOLLISTON
Phase I Improvements
2. Well Rehabilitation at Godfrey Brook and Dilla Street
3. Two Portable Emergency Generators
5. Highland Street Tank Rehabilitation
Echo Lake
Charles River
Dilla Street Water Treatment Facility
Dilla Street Wells
Interconnection to Town of Holliston
27. Purchase Street Clean and Line Water Main
25. Legion Street New 8-Inch Water Main
30. Naples Street New 8-Inch Water Main
25. Short Street New 8-Inch Water Main
Clark's Island Wellfield
Congress Street Tank Capacity: 1.12 mg Overflow Elevation: 525 feet
Highland Street Tank Capacity: 0.271 mg Overflow Elevation: 640 feet
Congress Street Booster Station
Cedar Swamp Well (Emergency)
29. Mitchell Road New 8-Inch Water Main
14. Congress Street New 12-Inch Water Main
29. Dilla Street & Grace Street New 8-Inch Water Main
26. Highland Street New 8-Inch Water Main
26. Hale Avenue & Walker Avenue New 8-Inch Water Main
17. Medway Road New 12-Inch Water Main
Interconnection to Town of Medway
12. West Street New 8-Inch Water Main
30. West Street New 8-Inch Water Main
29. John Street, Bolian Way New 8-Inch Water Main
HOPEDALE
Interconnection to Town of Hopedale
31. Lawrence Street New 8-Inch Water Main
Godfrey Brook Wells
Bear Hill Tank Capacity: 2.65 mg Overflow Elevation: 525 feet
23. Chapin Street New 8-Inch Water Main
13. Green Street New 6-Inch Water Main
9. South Main Street New 12-Inch Water Main
Interconnection to Town of Hopedale
BELLINGHAM
Interconnection to Town of Bellingham
MENDON
Legend
High Service Area
Improvements
Water Main
Phase I Improvements
Phase II Improvements
Phase III Improvements
Recommended Improvements Map
Milford Water Company
Milford, Massachusetts
TATA & HOWARD
Water and Wastewater Consultants
Approximate Scale: 1" = 1,000'
December 2010