Request for Proposals

Town of Ware

Purchase, Upgrade, Maintenance and Operation of the Town's Water and Wastewater Systems and Facilities

Request for Proposals Available: Thursday, March 22, 2023

Proposals Due: Thursday, May 18, 2023, 12:00 noon to the Town Manager's Office, 126 Main Street, Ware, MA 01082

Proposal Opening Info: Proposals shall be opened publicly in the office of the Town Manager on or after Thursday, May 18, 2023, at 12:00 noon

Description of System, Properties, and Interests:

The Town of Ware (the "Town"), acting through its Selectboard (the "Board") serving as Water and Sewer Commissioners has issued this RFP to explore the sale of its water and wastewater assets, properties, and provision of service to the residents of Ware to a private regulated utility and to generate a list of the most qualified utility companies. This RFP is to solicit firms interested in a full ownership model of the Town's utilities, including but not limited to operations of the wastewater treatment plant and wastewater systems, water treatment plant, wells and water systems.

The Town has conducted several master plans and engineering studies and has gathered information regarding the Town's water and wastewater assets in order to allow firms to prepare a response to this RFP. All related documents and data may be found at: http://www.townofware.com/departments/public_works/index.php.

In regard to the wastewater treatment plant and systems, the purchase and sale will include all rights in real property as defined during the bidding period, permits and other related regulatory approvals and documents, and all contract rights relating to the wastewater collection and pumping system identified in the Water Master Plan attached hereto as **Exhibit A**. If awarded, the purchase will include all existing assets and rights thereto, pumping stations, emergency generators, gravity collection mains, force mains, manholes, and appurtenances, but shall exclude personal property, equipment, supplies, cash, securities, and accounts receivable of the wastewater system up to and including the Closing Date.

In regard to the water treatment plant, wells and water systems, the purchase and sale will include all rights in real property as defined during the bidding period and defined in **Exhibit B**, permits and other related regulatory approvals and documents, and all contract rights relating to the water supply, treatment and distribution system identified in the Wastewater Collection System Operation and Maintenance Plan, attached hereto as **Exhibit C**. If awarded, the purchase will include all transferable water allocation rights, water supply wells, water treatment facilities, pumping stations, emergency generators, water storage facilities, water distribution and transmission mains, fire hydrants, water meters, water service connections, valves, fittings and appurtenances, but shall exclude personal property, supplies, cash, securities and accounts receivable of the water systems up to and including the date of the purchase.

While the Town believes that the information provided in this RFP, including all exhibits and addendums, if any, is accurate, **the Town makes no representation or warranty, express or implied, as to the accuracy and completeness of the information in this RFP**. The proposer assumes all risk in connection with the use of the information and releases the Town from any liability in connection with the use of the information provided by the Town. Further, the Town makes no representation or warranty with respect to the Property, including without limitation, the value, quality or character of the Property or its fitness or suitability for any particular use and/or the physical and environmental condition of the Property. The Property will be sold in its "AS-IS" condition.

Qualifications:
Due consideration will be given to a proposer's experience, references, service, ability to respond promptly to requests, past performance, and other criteria relevant to the Town's interests, including compliance with the procedural requirements stated in this RFP.

Minimum criteria for interested utility companies:

1. Currently operate as a public service company focused on water and/or wastewater.
2. Currently regulated by the MA Department of Public Utilities
3. Attend the mandatory pre-proposal in person conference and site visit of the utility assets April 11, 2023, beginning at the Ware Town Hall at 10:00 a.m.
4. Proposer must have demonstrated experience and expertise in the past five (5) years in maintenance and operation of water and wastewater systems serving similarly sized Massachusetts towns, cities, prudential districts, and governmental organizations.
5. Proposer must be familiar with, qualified, and properly licensed in the Commonwealth of Massachusetts to perform its obligations under this proposal in compliance with all applicable Federal and Commonwealth of Massachusetts laws

and regulations, statutes, and policies.

6. The Town will not award the proposal to any business that is in arrears or in default to any Town, City, the Commonwealth of Massachusetts or the United States of America obligations.
7. The proposer must present documentation that clearly explains their audited internal control environment.
8. Proposer must have a business continuity plan that details the ability to maintain water and wastewater operations/services during natural disasters, disruption of business operations, and loss of critical systems and technologies due to internal failures or external attacks/disruptions.

All questions shall be submitted in writing by emailing Stuart Beckley, Town Manager, sbeckley@townofware.com.

All questions shall be submitted by Wednesday, May 11, 2023, via email only. Answers to questions will be published in an Addendum and shall be published on the Town's website.

Anticipated Benefits to the Town of Ware, its Businesses and Residents

The Town's water and wastewater systems require investment to comply with existing and pending licenses and orders from the Commonwealth of Massachusetts and the United States Environmental Protection Agency. When reviewing the responses to this request for proposal the Town shall review the possible benefits to the Town and its Citizens which may include:

Rate stabilization: The increase in regulation and technical support needed to operate water and wastewater treatment systems leaves the ratepayers of the systems at risk of rate fluctuations and increases. Ownership of the system by a firm with more technical and financial resources could result in long term rate stabilization for system users.

Reduced risk: Operating water and wastewater systems have become increasingly technical and regulated. Ownership of the system by a firm with more technical and financial resources than the Town will minimize the risk to the Town and potentially assist in its financial status and bonding capabilities and could result in rate stability over the long term, and reduced risk for the Town.

Reduce Debt and Eliminate Future Municipal Borrowing: A sale would eliminate the need for future borrowing by the Town for water and wastewater infrastructure needs and sale proceeds could retire existing debt which allows the Town to reduce spending and/or invest in further economic development.

Fund Other Projects: Sale proceeds could also be used to fund other Town capital projects without additional borrowing.

Provisions for the Contractual Relationship with the Selected Firm

1. After review of the responses to this RFP and the price proposals, the Board will determine the most advantageous proposal to bring forward to Town Meeting for approval.
2. The most advantageous firm will have a 90-day period after Town Meeting to finalize an Asset Purchase Agreement with the Town. This Agreement shall be negotiated to the satisfaction of the Board and the firm's counsel. This period may be extended by mutual agreement of both the Board and the selected firm.
3. If the Board is unable to reach an agreement with the most qualified company, the Board may at its discretion, decide to work with next most qualified company or the Board may abandon the water and wastewater asset sale process entirely.

Proposal

The following items shall be included in the submitted proposals:

1. Cover Letter - Key contact(s) for your response to the RFP; contact information shall include email address and telephone contact numbers; and pronouncement of the contact(s) that are authorized to commit your organization to contractual obligations.
2. Executive Summary – 1 page summary of the firms overall response.
3. Experience
    a. *Company History and Existing Operations:* Provide a summary of your firm's history and summarize existing utility operations. If a subsidiary, identify the parent company and your relationship to it.
    b. *Department of Public Utilities Regulatory Experience:* Any water and wastewater asset sale and proposed rates will ultimately need to be approved by the MA Department of Public Utilities. Provide a summary of the company's history with the Massachusetts Department of Public Utilities.
    c. *Financial capabilities:* Provide a financial summary of the firms operations and demonstrate the financial capabilities to purchase, upgrade, and maintain the Town's water and wastewater assets. If a subsidiary, provide a financial summary of the parent company.
    d. *Capital Program Management:* Provide a history of the firm's last 10 years of capital expenditures and how capital programs are managed and executed.
    e. *Ratemaking*: Provide a recent history of existing rates for customers, an approach to ratemaking, and a comparison to other MA utilities, including current Ware system rates. Based on known and anticipated operating and capital expenses, describe the firm's approach to rate setting and increases.

f. *Customer Service*: Explain how customer service activities are executed and measured for existing customers and how customer satisfaction ratings have compared to existing utilities.

g. *References*: Provide references for each Massachusetts community that are served by the proposer.

4. Ownership and Operations Approach

With the understanding that the firm's overall approach to ownership and operations of the plant would be subject to additional due diligence, please provide an explanation of how the firm would approach ownership of and continued maintenance of the Town's wastewater and water facilities.

a. *Existing Operations*: Provide your understanding of the current Town facilities and a narrative for how existing operations would be transitioned to the utility. Highlight any possible benefits to the Town of Ware and its ratepayers.

b. *Utility Plants upgrade approach*: Provide a conceptual approach to future upgrades to the Town's existing treatment facilities, as well as its distribution and collection systems.

c. *Treatment of Rates:* Explain how the Town's existing water and wastewater rates may change as a result of private ownership and necessary capital investment needs.

d. *Staffing:* Explain how the facilities would be staffed and how existing Town staff would receive employment opportunities.

e. *Customer Service and Billing*: Explain how customer service activities and billing activities would be handled.

f. *Community Relations.* Describe how contact and communication is maintained with the Town.

5. Administrative Orders and EPA Licenses: Explain how privatization will affect any current Administrative Orders or future changes to the USEPA regulator licenses for the Town.

6. Plan and Schedule: a work plan and schedule which reflects timetable for completion of the acquisition of the Town's utility assets.

7. Price Proposal: Utilizing the Price proposal form, include the price proposal for the acquisition of the water and wastewater assets and property, operation, maintenance, and upgrades in a separate envelope labeled: "Price Proposal, Ware Water and Wastewater Assets"

8. Forms 1 through 4. Proposers are required to fill out and sign Forms 1 through 4 (the "Required Forms") attached hereto as Attachment A:

a. Form 1, Certificate of Tax Compliance: required under G.L. c. 62C. §49A, in which the proposer certifies that he or she has complied with all laws of the Commonwealth of Massachusetts relating to taxes.

b. Form 2, Certificate of Non-Collusion: required under G.L. c. 30B, §10, in which the proposer states that this proposal is made in good faith without fraud or collusion or connection with any other person submitting a proposal signed and dated by the proposer.

c. Form 3, Certificate of Authority: in which the proposer, if an entity, identifies the names and addresses of the managers, directors, officers, and/or other parties authorized to act on behalf of the entity.

d. Form 4, Real Property Disclosure Statement: required under G.L. c. 7C, §38, in which the proposer identifies the parties who will have a legal or beneficial interest in the Property and whether any such party is a state or local employee.

9. Failure to Complete Work, Default and Litigation.
Please respond to the following questions:
a. Have you ever failed to complete any work awarded to you? If so, where, and why?
b. Have you ever been declared to be in default on a contract? If so, where, and why?
c. Is there any pending litigation or arbitration which could affect
your organization's ability to provide operation and maintenance of the water and wastewater services for the residents of Ware? If so, please describe.
d. Has your firm ever had a contract terminated for cause within the past five years? If yes, provide details.
e. In the past five years, has your firm been a defendant in a lawsuit, or arbitration in which it was alleged that your firm or its employees or sub-consultants committed errors and omissions? If yes, provide details.
f. During the past seven years, has your firm or your parent firm ever filed for protection under the Federal bankruptcy laws? If yes, provide details.
g. Are there any other factors or information that could affect your firm's ability to provide the services being sought about which the Town should be aware?
h. Please describe how your firm addresses residential infiltration.
i. Does you firm have experience with allowing private septic haulers to deliver waste to your plant for a fee?

Selection Process

Sealed proposals will be accepted in the office of the Town Manager, 126 Main Street, Ware, MA 01082 until 12:00 p.m. Thursday, May 18, 2023, at which time they will be publicly opened. The Board reserves the authority to review each proposal and to determine which, if any, is in the best interest of the inhabitants of the Town of Ware.

Each proposer shall undertake its own review and analysis (due diligence) concerning the physical and environmental condition of the Property, applicable zoning and other land use laws, required permits and approvals, and other development, ownership, and legal considerations pertaining to the Property, and the use of the Property, and shall be responsible for applying for and obtaining any and all permits and approvals necessary or convenient for the proposer's use of the Property. All costs and expenses of purchasing and developing the Property, including without limitation, all costs of permitting and improvements, shall be the sole responsibility of the successful proposer.

The Town may, in its sole discretion, clarify, modify, amend, or terminate this RFP if the Town determines it is in the Town's best interest. The Town reserves the right to reject all Proposals and waive any informalities or non-material deficiencies in a proposal.

The Town may elect to have the Proposals evaluated by a committee as part of making a selection. If deemed necessary, the Town reserves the right to arrange for interviews as part of the selection process.

Proposers wishing to take any exceptions to any requirement in the RFP shall state and explain such exceptions. The Town may accept Proposals which take exception to any requirements in this RFP, or which offer any alternative to a requirement herein, as well as consider such exceptions and alternatives in evaluating responses. Any exception or alternative must be clearly delineated and cannot materially affect the substance of this Request for Proposals.

Following the interviews and the receipt of any additional information requested of the proposers by the Town, if any, proposals will be evaluated and rated by the Town according to the comparative evaluation criteria set forth in this RFP. The Board will select the most advantageous proposal, taking into consideration all of the evaluation criteria set forth in this RFP. The Board is the awarding authority and will notify all proposers in writing of its decision.

The proposer selected by the Board will be given exclusive rights to negotiate with the Town the terms of the P&S of the Property. If, at any time, such negotiations are not proceeding to the satisfaction of the Town, it its sole discretion, then the Town may choose to terminate said negotiations. The Board may select the next most advantageous proposer with whom to initiate negotiations.

The proposer selected must enter into a purchase and sale agreement materially on the same terms as set forth the Purchase and Sale Agreement attached hereto as Attachment B and incorporated herein (the "P&S") within 30 days from the date the sale of the Property is awarded to the proposer. A deposit of 10% of the purchase price shall be paid upon the execution and the remaining amount shall be paid in full at the closing. The closing shall occur no later than ninety (90) days from the date the parties enter into the P&S or such other date as is acceptable to both parties.

The selected proposer shall, if it intends to obtain financing to purchase the Property, provide the Town with a firm commitment letter from an institutional mortgagee on standard terms and conditions within thirty (30) days of the parties entering into the P&S.

Minimum Evaluation Criteria

All responsive proposals must fully comply with all submission requirements listed herein, including submission of all required forms.

Comparative Criteria

1. Similar acquisition projects (number). Please describe the number and type of acquisitions by the firm in the last ten years.
    - Not Advantageous – No water or wastewater acquisitions and operations
    - Acceptable – 1 to 3 acquisitions of Water and/or Wastewater systems
    - Advantageous – Four to eight acquisitions of water and wastewater systems
    - Highly Advantageous – more than eight acquisitions

2. Similar acquisition projects (size)
    - Acceptable – Water or wastewater systems with over 1000 accounts
    - Advantageous – Systems with 1001 to 5000 accounts
    - Highly Advantageous – Water and Wastewater systems with over 5000 accounts

3. Personnel. Describe how (if applicable) existing Town water and wastewater personnel will be included in the firm's staffing plans
    - Not Acceptable – Water or wastewater staff are not included in future staffing plans for the firm
    - Advantageous – All existing staff are included in the future system staffing plan with described compensation and benefits.

4. User Rates: Illustrate current user rates and provide a pro forma for Ware users
    a. Not acceptable – No user rate information provided
    b. Acceptable – Two or less user rate illustrations provided
    c. Highly Advantageous – Two or less user rate illustrations and a pro forma of Ware rates provided

5. Customer Service
    a. Not acceptable – No information on customer service processes provided
    b. Acceptable – Information on customer service processes provided
    c. Advantageous – Information on customer service processes provided including data and performance metrics
    d. Highly advantageous – Information on customer service processes provided including data, performance metrics and the utilization of user feedback/engagement

6. Purchase Price
    a. Least Favorable rating – Proposal that offers less than the fair market value of the Property.
    b. Advantageous – Proposal that offers the fair market value of the Property

    c. Highly Advantageous – Proposal that offers a price above the fair market value of the Property.

Notwithstanding the foregoing, the Town shall not be required to convey the Property to the proposer offering the highest price.

7. Other Financial Benefits
    a. Least Favorable rating – Proposal that, in the judgment of the evaluators, presents a plan that has a below average financial impact on the community.
    b. Advantageous rating – Proposal that, in the judgment of the evaluators, presents a plan that has an average financial impact on the community.
    c. Highly Advantageous rating – Proposal that, in the judgment of the evaluators, presents a plan that has the most favorable financial impact on the community, including taxes, fees, and job growth.

8. Financial resources
    a. Least Favorable rating – Will be given to a proposal that, in the judgment of the evaluators, is contingent on financing and the proposer has not provided a firm commitment from institutional mortgagees to purchase the Property and systems for the offered price.
    b. Advantageous rating – Proposal that is contingent on financial approval, but the proposer has provided a firm commitment from institutional mortgagees to purchase the Property and systems for the offered price.
    c. Highly Advantageous rating – Proposal that is not contingent on financial approval for the purchase and/or development of the Property and systems and the proposer has demonstrable funds to purchase the Property and systems.

9. Ability to Proceed
    a. Least Favorable rating – Proposal which is contingent on the satisfaction of contingencies that cannot be reasonably be satisfied within a reasonable period of time after the date the parties enter into the P&S and/or is contingent on the sale or purchase of other property.
    b. Advantageous rating – Proposal that contains contingencies to closing, but which can be reasonably satisfied, and the parties are able to complete the transaction, within a reasonable period of time after the date the parties enter into the P&S. The sale cannot be contingent on the sale or purchase of other property.
    c. Highly Advantageous rating – Proposal that contains the fewest contingencies to closing, and the parties are able to complete the transaction promptly after the parties enter into a P&S. The sale cannot be contingent on the sale or purchase of other property.

Town Meeting Approval

The acquisition of the Town's water and wastewater assets are fully dependent upon approval by Ware Town Meeting and authorization of the Ware Selectboard. Town Meeting is currently scheduled for May 8, 2023.

Instructions to Proposers

1. Each proposer shall submit one (1) original proposal and five (5) copies of the proposal on or before Thursday, May 18, 2023, at 12:00 noon to:

Purchase, Upgrade, Maintenance and Operation of the Town's Water and Wastewater Systems

Ware Town Hall

Attn: Stuart Beckley, Town Manager

126 Main Street

Ware MA 01082

2. The proposals will be opened and recorded at this time. No proposals submitted after this time will be accepted. Proposals must be submitted in writing in a sealed envelope clearly marked "Purchase, Upgrade, Maintenance and Operation of the Town's Water and Wastewater Systems and Facilities." Responses to the RFP must include all required documents, completed, and signed per the instructions and attached forms included in this RFP package. Electronically mailed (e-mailed) proposals will not be accepted and will be deemed non-responsive and will not be evaluated.

3. If any changes are made to this RFP, an addendum will be issued. Each addendum will be emailed to all plan holders. Failure of any proposer to receive any such addendum or interpretation shall not relieve such proposer from the obligation to comply with the terms of such addenda. All addenda so issued shall become part of this RFP.

4. At the time of the opening of bids, each proposer will be presumed to have inspected the Property and to have read and be thoroughly familiar with the RFP (including all addenda). The failure or omission of any proposer to examine any form, instrument, or document shall in no way relieve any proposer from any obligation to comply with the RFP.

5. Proposers are cautioned that it is the responsibility of each individual proposer to assure that his/her proposal is in the possession of the responsible official or his designated alternate prior to the stated time and at the place of proposal by the due date. The Town is not responsible for proposals delayed by mail and/or delivery service of any nature. Late responses will not be accepted, nor will additional time be granted to individual respondents unless the Board extend the required submittal date for all proposers.

6. Proposals may be corrected, modified, or withdrawn prior to the deadline for submission of proposals by submitting the required number of copies of such correction, modification, withdrawal or a new submission, clearly marked on the outside envelope with the appropriate heading, by the deadline listed above.

7. Proposals cannot be withdrawn, modified or amended for a period of 150 days from the deadline for submission of proposals.

8. All proposals submitted to the Town must include all forms included within the contents of this RFP and they must all be filled out and properly executed. Failure to submit all forms properly filled out and executed will be grounds for rejection of the proposal.

9. All signatures must be handwritten and in ink by the person(s) seeking to purchase the Property. All other words and figures submitted on the proposal shall be neatly written in ink or typed. Proposals that are conditional, obscure, or which contain additions not called for in the specifications, erasures, alteration, or irregularities may be rejected.

10. All proposals become the property of the Town. All proposals are deemed to be public records within the meaning of MA General Law Chapter 4, Section 7(26).

11. The Town will not be liable for any costs incurred by any respondents in the preparation and presentation of responses to this RFP or in the participation in views, interviews, negotiations or any other aspect of this RFP process.

Reservations by the Town

This RFP does not represent any obligation or agreement whatsoever on the part of the Town to sell the Property and systems described in this RFP.

The Town reserves the right, in its sole discretion, to reject at any time any or all proposals, to withdraw the RFP, to select finalists to submit and negotiate a more fully developed response, to negotiate with one or more applicants, and/or negotiate and dispose of the Property and systems on terms that are not materially different from those set forth herein. The Town also reserves the right, at any time and to waive strict compliance with terms and conditions of this RFP or to entertain reasonable modifications or additions to selected proposals provided the same are not materially different from the terms set forth herein.

The Town makes no representations or warranties, express or implied, as to the accuracy and/or completeness of the information provided in this RFP. This RFP (including all attachments and supplements) is made subject to errors, omissions, prior sale, withdrawal without prior notice, and changes to, additions to, and different interpretations of laws and regulations.

Selection of a proposer’s proposal will not create any rights on the proposer’s part, including, without limitation, rights of enforcement, equity, or reimbursement, until the P&S and all related documents are approved by the Board and fully executed.

All determinations as to the completeness or compliance of any proposals, or as to the eligibility or qualification of any proposer, will be within the sole discretion of the Board.

Contact Person

Geoff McAlmond, DPW Director, email: gmcalmond@townofware.com.

All questions shall be submitted by Thursday, May 11, 2023, via email only.

Attachments and Exhibits

Exhibit A:	Water Master Plan
Exhibit B:	Water and Sewer Department Real Property Descriptions
Exhibit C:	Wastewater Collection System Master Plan
Attachment A:	Forms 1-4
Attachment B:	Purchase and Sale Agreement

Exhibit A

Attach Water Master Plan

Water Master Plan

WARE DEPARTMENT OF PUBLIC WORKS
Ware, MA

October 2016

WRIGHT-PIERCE™
Engineering a Better Environment

Water
Wastewater
Infrastructure

WATER MASTER PLAN
WARE, MASSACHUSETTS

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SECTION 1

INTRODUCTION

1.1 GENERAL

The purpose of this master planning document is to evaluate the components of the Ware Department of Public Works' (WDPW) Public Water Supply System, make recommendations, and present the needed improvements in a well thought out and useful Capital Improvement Plan (CIP) that the WDPW will be able to effectively use moving forward.

1.2 REPORT ORGANIZATION

This Master Plan is organized as follows:

Section 1 - Introduction: This section introduces the purpose of the master plan and presents a brief summary of its organization.

Section 2 - Existing System and Facilities: The existing Ware water system and its facilities are presented and reviewed in the section.

Section 3 - Historical and Projected Water Use: This section presents a review of Ware's historical water use and the projections for its water use through the next 10-year planning period (2016 to 2025).

Section 4 - Water Supply Evaluation and Assessment: An overview of the existing water supply evaluation and an assessment of its adequacy though the planning period are presented.

Section 5 - Distribution System and Storage Evaluation and Assessment: This section presents the detailed evaluation performed of the Ware distribution system infrastructure that was also analyzed by a comprehensive hydraulic water model.

Section 6 - Regulatory Review: An overview of the regulations applicable to the Ware system is presented.

Section 7 - Asset Management: Due to the increasing complexities of the WDPW's infrastructure and processes, this section presents an initial assessment of the WDPW's current asset management processes and how it can be optimized or supplemented for increased efficiency.

Section 8 - Recommendations: This section summarizes the recommendations made within the other sections and presents the corresponding estimated costs for their implementation.

Section 9 - Recommended Capital Improvement Program: This section lays out a proposed Capital Improvement Program (CIP) to be used by the WDPW over the next several years as a guide for improvements that will allow it to meet its identified needs.

Section 2

Wright-Pierce
Engineering a Better Environment

SECTION 2

EXISTING SYSTEM SUPPLY AND FACILITIES

2.1 OVERVIEW OF WATER SYSTEM

The Ware Department of Public Works (WDPW) serves the Town of Ware, located in Hampshire County, Massachusetts. Ware is bordered by the Towns of New Salem, Petersham, and Hardwick to the north, the Town of Belchertown to the west, the Towns of New Braintree, West Brookfield, and Warren to the east, and the Town of Palmer to the south. State Route 9 is the main transportation corridor in town and bisects the Town in a north to south direction. The Town has a population of approximately 9,880 people. The water system has service elevations ranging from approximately 384 feet to 647 feet above mean sea level (msl).

The WDPW owns and operates the water system which serves residential, commercial and municipal users. The WDPW currently serves approximately 2,360 water customers consisting of 2,145 residential users, 158 commercial users, 1 agricultural user, 27 industrial users and 29 municipal users. Based on 2015 data, the average day demand is approximately 652,200 gallons per day (gpd) and the maximum day demand is approximately 1,061,000 gpd.

The Ware water system includes four active ground water sources (consisting of six wells) treated at two water treatment facilities, two water storage tanks, a booster pump station, and approximately 42 miles of water main. An overview of the water system is included as Figure 2-1. A brief summary of each water system component follows.

2.2 SUPPLY FACILITIES

The Ware Department of Public Works provides water to its customers from four active source locations consisting of six individual wells located throughout the Town of Ware. Available design parameters and physical properties of each well are included in Table 2-1.


Data from MassGIS and Town of Ware
HARDWICK
W. BROOKFIELD
PALMER
Church St. Tank
Capacity: 1.5 MG
Overflow: 659 FT
Barnes Street Sources
(Wells 1,2,3,4, & Cistern)
Anderson Rd Tank
Capacity: 1.0 MG
Overflow: 659 FT
Legend
Junction
Tank
Well Source
Pipe
Diameter
less than 2"
4"
6"
8"
10"
12"
N
0 250 500 1,000 1,500 2,000
Feet
Overview of Water System
Ware, MA
PROJ NO: 13471A
DATE: 10/18/2016
FIGURE: 2-1
WRIGHT-PIERCE
Engineering a Better Environment
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand).

TABLE 2-1
EXISTING WATER SUPPLY SOURCES

Source	Address	No. Wells	Type	Size	Depth	Year Constructed	Maximum Approved Withdrawal	Source Code
Wellfield (Wells No. 1, 2 & 3)	Barnes Street	3	Gravel Packed	8" x 18"	48'-51'	1978	660 gpm	1309000-01G
Well No. 4 (Giard Well)	Barnes Street and Greenwich Road	1	Gravel Packed	18" x 24"	51'	1965	500 gpm	1309000-02G
Dismal Swamp Well	Gilbertville Road	1	Gravel Packed	12" x 18"	68'	1998	405 gpm	1309000-03G
Cistern	Near Muddy Brook and Barnes St	1	Dug	42' wide	23'	1886	330 gpm	1309000-04G

All of Town's sources are located in the Chicopee River Basin as designated by the Massachusetts Department of Environmental Protection (MassDEP). Withdrawals from each of the sources and in aggregate are limited and are permitted under the Massachusetts Water Management Act (WMA). The permit specifies pumping limitations on two conditions; a maximum daily volume and an annual average volume. A copy of the WMA Registration Statement and Permit is included in Appendix A.

2.2.1 Wellfield

The Wellfield consists of three gravel packed wells (Wells No. 1, 2, and 3) that are located off of Barnes Street. Well No. 1 is approximately 100 feet west of Barnes Street, Well No. 2 is approximately 100 feet west of Well No. 1 and Well No. 3 is approximately 200 feet west of Barnes Street. All three wells are adjacent to the Muddy Brook with Well No. 3 being the closest to the brook. This area was first developed in 1893 and there was a 41-point tubular well field utilized at this location until 1978. In 1978, the three gravel packed wells were installed which were located on the perimeter of the previous wellfield.

Each of the three wells is an 8-inch by 18-inch gravel packed well that is located within a pit with a hatch that contains a water meter and a sump pump. These pits need sump pumps since they tend to fill with groundwater. In 2010, pitless adapters were installed in each well and all of the electrical controls and panels were moved above grade in accordance to a previous MassDEP sanitary survey.

Well No. 1 has a depth of 51 feet (54.2 feet from the top of the pit) with a well screen length of 7 feet. The well is furnished with a Goulds submerged single stage 6-inch, 200 gallons per minute (gpm) pump (model 6CHC) with 80 feet of Total Dynamic Head (TDH). The pump is driven by a Franklin 5 horsepower (HP), 3 phase motor that is rated for 3,460 revolutions per minute (RPM). The pump intake setting is 28 feet. The original pumping capacity of the well was 300 gpm with 14.8 feet of drawdown. Well No. 1 is currently permitted to withdraw up to 220 gpm.

Well No. 2 has a depth of 50 feet and the length of the well screen is 8 feet. The well is furnished with a Goulds submerged single stage 6-inch, 200 gpm pump (model 6CHC) with 80 feet of TDH. The pump has a Franklin 5 HP, 3 phase motor that is rated for 3,460 RPM. The pump intake setting is 28 feet. Well No. 2 is currently permitted to withdraw up to 220 gpm although the original pumping capacity of the well was 300 gpm.

The total depth of Well No. 3 is 48 feet, but from the top of the pit, the depth is 47.5 feet. The well screen has a length of 8 feet and the well is furnished with a Goulds submerged two stage 6-inch, 100 gpm pump (model 100H05-2) with 100 feet of TDH. The pump motor is a Franklin 5 HP, 3 phase motor which is rated for 3,460 RPM. The pump intake setting is 33 feet. The original pumping capacity of the well was 300 gpm with 13.2 feet of drawdown. Well No. 3 is currently permitted to withdraw up to 220 gpm.

All three wells are permitted to have a combined pumping rate of 660 gpm (0.95 MGD). However, due to a decline in well capacity over the past ten years, two new replacement wells were constructed (Wells No. 2R and 3R). It was reported in 2014, that Wells No. 2 and 3 were pumping at approximately 150 gpm and 105 gpm, respectively. It is understood that the intent is to fully replace the current existing Wells No. 2 and 3 with these replacement wells. The replacement wells were recently approved by MassDEP in 2016 (BRP WS 19 – New Source Approval). Activation and pump installation (e.g. low or high head) is currently contingent upon a separate Treatability Study.

Wells No. 2R and 3R are 12-inch by 18-inch gravel and silica media packed wells that have a depth of 50 feet and 42 feet, respectively. The well screen for each well is 6 feet of 12-inch stainless steel, 0.140-inch slot. Recent water quality sampling in 2015 determined that the nitrate, nitrite, iron, and manganese were all under each respective SMCL.

The Wellfield source and the Well No. 4 source (described later) water are pumped directly into the Cistern with low lift pumps. High lift pumps in the Cistern pumps this water through the Pump House for treatment (as discussed later). In 2009, a bypass line was installed so the water can be pumped directly to the Pump House. This bypass line could be used once higher head pumps are installed at the wells due to the increased pressures. The combined withdrawal rate of Wells No. 1, 2, and 3 is controlled with Hand/Off/Auto switches located within the Pump House.

2.2.2 Well No. 4

Well No. 4, which is also called the "Giard Well", was constructed in 1965. Well No. 4 is an 18-inch by 24-inch gravel packed well that has a depth of approximately 51 feet and a well screen of 10 feet. The well is equipped with a vertical turbine pump that is powered by a 10 HP motor. The well is located approximately 800 feet southwest of Snow Pond off Pleasant Street, and the well is enclosed within a block well house that is protected with a black fence with barbed wire for security.

Well No. 4 is currently permitted for a maximum authorized withdrawal of 500 gpm. As noted previously, this well source is pumped to the Cistern with the Wellfield source.

The well does not have any emergency standby power.

A residential house located at 116 Pleasant Street is currently located within Well No. 4's Zone I. Therefore, it would be advantageous for the WDPW to acquire this land when/if it should become available for purchase. The parcel is approximately 1,515 square feet. Acquisition of the property would allow the WDPW to have more ownership within their Zone I.

2.2.3 Dismal Swamp Well

The Dismal Swamp Well, also referred to as Well No. 5, was constructed in 1998 and is located approximately 1,000 feet northwest of Gilbertville Road (Route 32). The well is a 12-inch by 18-inch gravel packed well that has a depth of approximately 68 feet and a well screen of 13 feet. The Dismal Swamp Well is protected by a concrete structure that is built around the casing since the well is located within the 100 year flood plain (as shown in picture above). The well has a pitless adapter. The well vent is located approximately 100 feet west of the well head. The Dismal Swamp well is currently permitted for a maximum authorized withdrawal of 405 gpm. The water is pumped through an 8-inch water main to the Control Building and then into the distribution system. The Control Building is also referred to as the Gilbertville Road Pump Station (shown in the picture to the right) which is where the pump controls and chemical treatment are located.

The Dismal Swamp Well Control Building is equipped for corrosion control treatment and disinfection. The WDPW uses a 45%

solution of potassium hydroxide (KOH) to adjust the pH and a 12.5% solution of sodium hypochlorite (NaOCl) to disinfect the raw water. The KOH feed system includes one 1,550 gallon storage tank and flow paced metering pumps. The WDPW has recently upgraded the KOH feed system with a day tank setup in conformance with MassDEP Guidelines. The NaOCl feed system currently includes one 1,000-gallon storage tank, one 100-gallon day tank, flow paced metering pumps, and high and low level chlorine residual and pH alarm system. The NaOCl feed system is currently not being used due to manganese issues.

The well is equipped with a Goulds 6-inch, 300 gpm pump (model 7CLC-3) rated for 53.5 feet of TDH. The pump is driven by a Grundofs 30 HP motor.

The Dismal Swamp Well Control Building does not have any emergency generator provisions due to flood zone concerns.

2.2.4 Cistern

The Cistern was constructed in 1886 and was the Town's original water supply. The Cistern is a 42 foot wide by 23 foot deep dug well that is located near the Muddy Brook on Barnes Street which is adjacent to the Pump House (described later in this section). The well is located within a concrete building with brick walls that is enclosed within a fence for security. Additional security with the use of a security camera is intended to be installed in the future. The floor of the well is a natural bottom that consists of stone and sand. The Cistern is currently permitted for a maximum authorized withdrawal of 330 gpm (0.475 MGD). The Cistern holds approximately 230,000 gallons when full.

The Cistern is equipped with two 75 HP, 1,780 RPM five stage high lift pumps. The two pumps are located on a steel walkway over the well. A 10-inch pump column extends down from each pump to approximately 36-inches from the bottom of the well. The maximum capacity of each pump is 1,100 gpm. A surge relief valve is installed downstream of the pumps.

As presented previously, the Wellfield (Wells No. 1, 2, and 3) and Well No. 4 pump directly into this Cistern. The Cistern has float switches that activate the two sources when needed. Water from the Cistern is pumped through the Pump House for treatment and into the distribution system.

The Cistern has a temporary chemical feed system set up for emergency chlorination which is no longer used. In 2007, a permanent chemical feed system for disinfection was installed in the Pump House.

The Cistern was last inspected in July of 2014 during its cleaning by Underwater Solutions Inc. It was reported to be in good condition.

2.2.5 Pump House

The Pump House was constructed in 1886 along with the Cistern. The Pump House was most recently upgraded in 2007 and part of the upgrade was the installation of a permanent disinfection feed system. At the Pump House, the Wellfield, Well No. 4, and the Cistern sources are chemically treated with potassium hydroxide to raise the pH and sodium hypochlorite for disinfection. Although not yet required, it is understood that the disinfection would not be Ground Water Rule compliant (for 4-log inactivation of viruses) due to the close proximity of the nearest downstream taps.

The Pump House is equipped with telemetry for all sources, chart recorders for the storage tanks, chemical monitoring equipment, chemical analyzers, alarms, chemical storage tanks, chemical feed pumps, and a generator. The Kohler 180 kW diesel generator provides standby power for the Pump House, the Wellfield, and one of the high lift pumps in the Cistern. Two fuel storage

tanks for the generator are stored in a small room upstairs within a brick containment wall.

The Pump House does not have a SCADA system, but there are Hand/Off/Auto (HOA) switches that control the well sources (Wellfield, Well No. 4, and Cistern) which are turned on or off based upon the level of the water storage tanks. This system can operate from either the Anderson Road tank or the Church Street tank level. A Verizon phone line is used as part of the system which is also located at the Pump House. The Dismal Swamp Well can also be operated at the Pump House with an old PLC from 1998 that is located within the Pump House. This PLC has old telemetry lines and is recommended to be replaced.

The potassium hydroxide feed system includes one 1,500-gallon Chem-Tainer bulk storage tank, a 500-gallon PolyProcessing day tank on a concrete pad, and two 0.5 HP Milton Roy metering pumps. The sodium hypochlorite feed system includes two 50-gallon day tanks on a concrete pad and two LMI metering pumps.

2.3 DISTRIBUTION SYSTEM

2.3.1 Transmission and Distribution Mains

The distribution system consists of approximately 47 miles of water main predominantly ranging in diameter from 6-inch to 12-inch. Approximately 136,300 feet of water main is composed of iron (ductile and cast) pipe and approximately 110,500 feet is composed of asbestos-cement (AC) pipe. A summary of the distribution system piping sorted by material type and pipe diameter is presented in Figures 2-2 and 2-3, respectively.

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FIGURE 2-2
PIPE MATERIALS IN WATER DISTRIBUTION SYSTEM

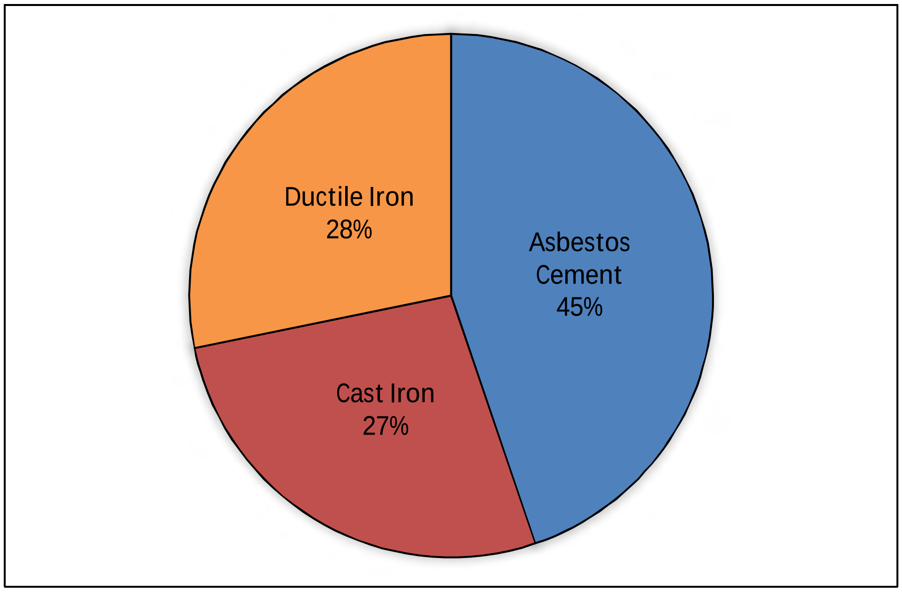
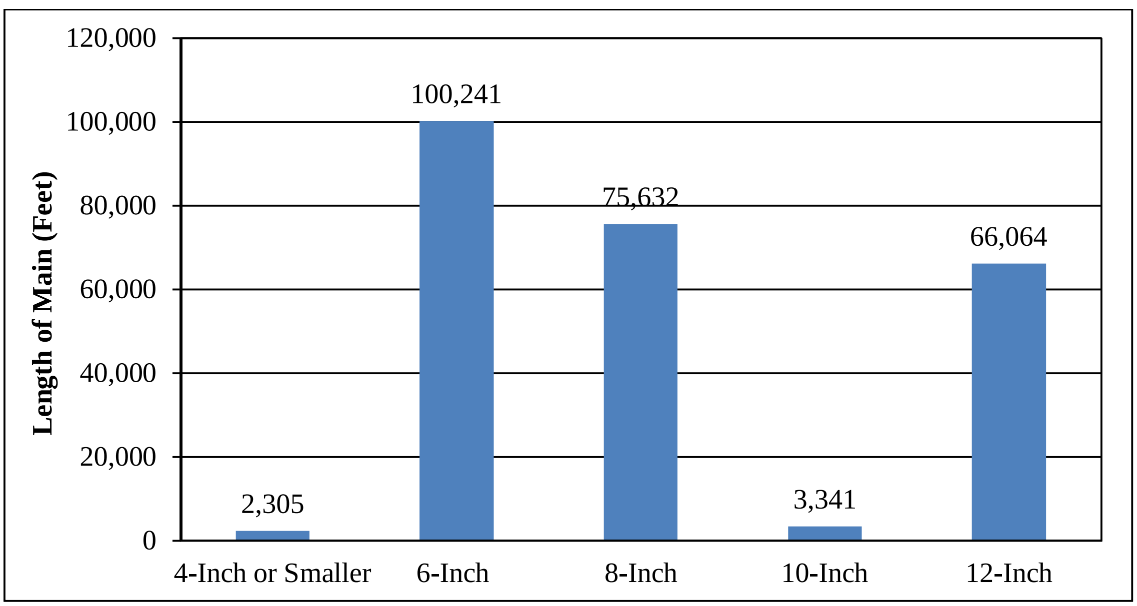


FIGURE 2-3
WATER DISTRIBUTION SYSTEM PIPE SIZE



Three primary piping materials predominate in the Ware distribution system:

- *Asbestos Cement (AC)* – Asbestos cement piping was readily available and typically installed in the 1960s and 1970s. As of 2016, approximately 45% of the distribution mains are AC. It is unknown at this time how much, if any, of the AC mains are vinyl-lined (TCE).

- *Ductile Iron Piping (DI)* – Cement lined ductile iron pipe is typically the piping of choice in today's distribution systems. It offers superior strength characteristics, is readily available, manufactured in a variety of thickness, and can be supplied with a variety of jointing systems. Approximately 28% of the distribution system is ductile iron pipe.

- *Cast Iron Piping (CI)* **–** Cast iron piping was the predecessor to DI and was typically installed from the late 1800s to the late 1960s. It is thought that the oldest CI pipes, dating to the late 1800s, have an average life expectancy of 100 to 120 years. Because of changing materials and manufacturing techniques, pipes laid in the 1920s have an average life expectancy of 100 years, while those laid in the post-World War II era are expected to last only about 75 years (source MIIC Infrastructure Report: Massachusetts Drinking Water, May 2007). Based on the Ware system records, approximately 27% of the system is currently unlined cast iron. Unlined cast iron water mains are typically the primary source of diminished hydraulic capacity in most distribution systems due to their internal tuberculation. Additionally, they can be the cause of discolored water complaints and microbiological problems.

Appendix B includes overviews of the Ware water distribution system that are color coded by water main material type and pipe diameter.

2.4 INTERCONNECTIONS

2.4.1 Interconnections with Adjacent Communities

The Ware water system does not have any interconnections with adjacent communities.

2.5 DISTRIBUTION STORAGE FACILITIES

Distribution storage facilities for the Ware Department of Public Works are comprised of two ground level storage tanks that are on the same hydraulic grade line as summarized in Table 2-2.

TABLE 2-2
EXISTING DISTRIBUTION STORAGE FACILITIES

Name	Overflow Elev. (ft)	Height (ft)	Diameter (ft)	Capacity (MG)	Type
Anderson Road Storage Tank	659	65	52	1.0	Steel
Church Street Storage Tank	659	24	100	1.5	Steel

2.5.1 Anderson Road Storage Tank

The Anderson Road Storage Tank is a welded steel standpipe constructed in 1978 that is located off Route 9 at 122 Anderson Road. The 1.0 million gallon (MG) tank has an overflow elevation of 659 feet and is 52 feet in diameter and 65 feet high. The facility has an altitude valve. The Anderson Road Storage Tank is at the western edge of the distribution system.

The tank has two 24-inch inside diameter manways; one on the northern side and one on the southern side of the tank. They are located approximately 17 inches above the tank base. The tank also has a welded steel ladder from the roof dome to 16 feet above the ground. The ladder has a fall prevention device and a welded safety cage. The tank vent has a diameter of 10 inches and a height of 31 inches which is located at the center of the dome roof. A galvanized steel screen and cap are installed over this vent. There are also two 24-inch diameter hatches on the roof.

The tank was last inspected in December of 2015 during its cleaning by Underwater Solutions

Inc. It was found to be in generally good condition. A high-pressure wash for the exterior wall, roof dome, and associated exterior components and also a re-coat to these surfaces within the next five years were recommended.

2.5.2 Church Street Storage Tank

The Church Street Storage Tank is a welded steel tank constructed in 1978 that is located in the northern part of town at 123 Church Street. The 1.5 MG tank has an overflow elevation of 659 feet and is 100 feet in diameter and 24 feet high. The facility has an altitude valve.

The tank has a 24-inch inside diameter manway on the north-eastern side and on the south-western side of the tank. They are located approximately 17 inches above the tank base. The tank also has a welded steel ladder on the north-eastern side of the tank from the roof dome to 16 feet above the ground. The ladder has a fall prevention device. The tank vent has a diameter of 10 inches and a height of 24 inches which is located at the center of the dome roof. A steel screen and cap are installed over this vent. There are also two 24-inch diameter hatches on the roof.

The tank was last inspected in December of 2015 during its cleaning by Underwater Solutions Inc. It was found to be in generally good condition. A high-pressure wash for the exterior wall, roof dome, and associated exterior components and to re-coat these surfaces within the next five years were recommended.

2.5.3 Booster Pump Station

Adjacent to the Church Street Storage Tank is a booster pump station located in a small below grade structure. Because the tank is at a lower hydraulic grade line than four houses nearby along Gilbertville Road, this booster pump station is utilized to pump water at an increased pressure from the tank to these houses. The building is equipped with three 100 gallon Well-X-Trol hydropneumatic storage tanks that is manufactured by Amtrol, and a 4 HP pump.

The booster pump station does not have any emergency generator provisions.

2.6 SCADA AND CONTROL SYSTEMS

The WDPW currently does not have a modern Supervisory Control and Data Acquisition (SCADA) system. All of the sources are run by Hand/Off/Auto (HOA) switches and are controlled by tank level telemetry. The sources are utilized based upon the level of the water storage tanks and the system can operate on either the level from the Church Street tank or the Anderson Road tank. When the HOA switch is turned on Auto, the sources will turn on by a tank level signal which is through an old pulse telemetry phone line. HOA switches for the Wellfield, Well No. 4 and Cistern are located at the Pump House. The Pump House also has a PLC to operate the Dismal Swamp Well.

The water system in Ware should be upgraded with a modern SCADA system for increased reliability, a higher level of service for consumers, increased efficiency, and optimized labor.

Section 3

SECTION 3

HISTORICAL AND PROJECTED WATER USE

3.1 GENERAL

The purpose of this section is to present an analysis of water use in the Ware water system from 2011 through 2015. The discussion on water use is followed by a presentation of projections of future water demands. Data used in the analysis between 2011 through 2015 was obtained from Massachusetts Department of Environmental Protection (MassDEP) annual statistical reports and meter records provided by the Ware Department of Public Works (WDPW). Additional population data was obtained from the United States (US) Census, UMass Donahue Institute (UMDI), Massachusetts Department of Transportation (MassDOT) Planning, Pioneer Valley Planning Commission (PVPC), and the Town of Ware.

In order to plan for future needs of water system facilities and infrastructure, it is very important to understand future growth within the service area. An important aspect of the planning process is to plan for upgrades and/or additional water works facilities in advance of the impending increases in demand. The findings and recommendations presented herein will serve as the frame-work for the water supply and distribution system analyses. Updated projections of water-use needs through year 2025 were developed and are discussed in this section.

Numerous factors can impact water-use projections, including economic conditions, development (business, industrial, commercial and residential), and conservation efforts. As Ware is a mostly residential Town, residential water use is likely to be the most significant factor that will affect the water demand estimates. It is difficult at best to predict the impacts that the economy can have on a community. However, it is fair to assume that economic development generally leads to increases in population.

3.2 POPULATION DEMOGRAPHICS AND HISTORIC TRENDS

The population data discussed herein will serve as the basis for projecting water-use needs within the Town of Ware.

To better understand the population demographics in the Town of Ware, the following primary sources of information were collected and analyzed:

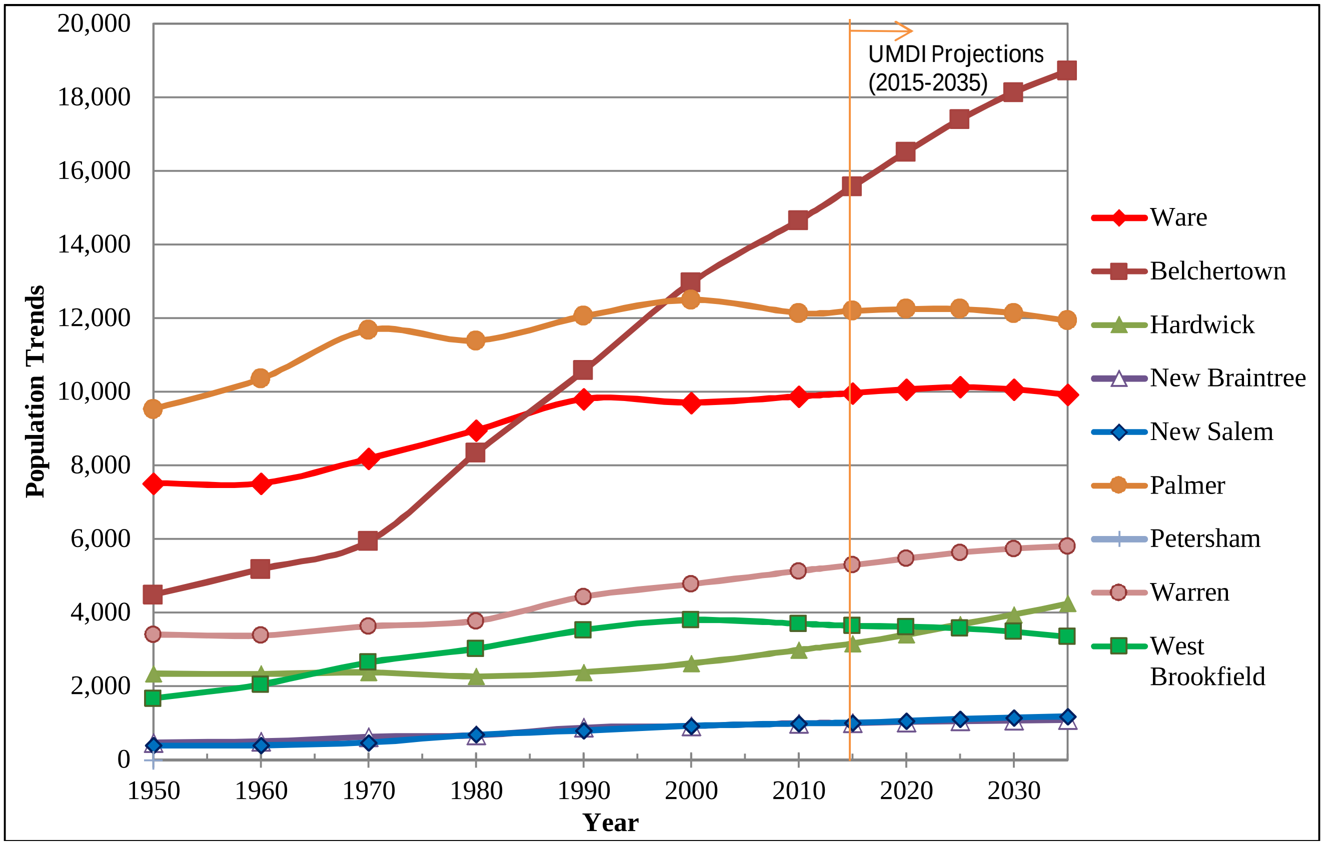
- US Bureau of Census Data
- UMDI
- PVPC
- MassDOT

The Census data includes population trends for each community in Massachusetts extending back to 1950. The population trends in Ware and its neighboring communities are presented in Table 3-1 and graphically in Figure 3-1.

TABLE 3-1
POPULATION TRENDS FOR WARE AND NEIGHBORING COMMUNITIES
WARE, MASSACHUSETTS

Town	1950	1960	1970	1980	1990	2000	2010
Ware	7,517	7,517	8,187	8,953	9,808	9,707	9,872
Belchertown	4,487	5,186	5,936	8,339	10,579	12,968	14,649
Hardwick	2,348	2,340	2,379	2,272	2,385	2,622	2,990
New Braintree	478	509	631	671	881	927	999
New Salem	392	397	474	688	802	929	990
Palmer	9,533	10,358	11,680	11,389	12,054	12,497	12,140
Petersham	814	890	1,014	1,024	1,131	1,180	1,234
Warren	3,406	3,383	3,633	3,777	4,437	4,776	5,135
West Brookfield	1,674	2,053	2,653	3,026	3,532	3,804	3,701

FIGURE 3-1
POPULATION TRENDS AND PROJECTIONS FOR WARE AND NEIGHBORING COMMUNITIES
WARE, MASSACHUSETTS



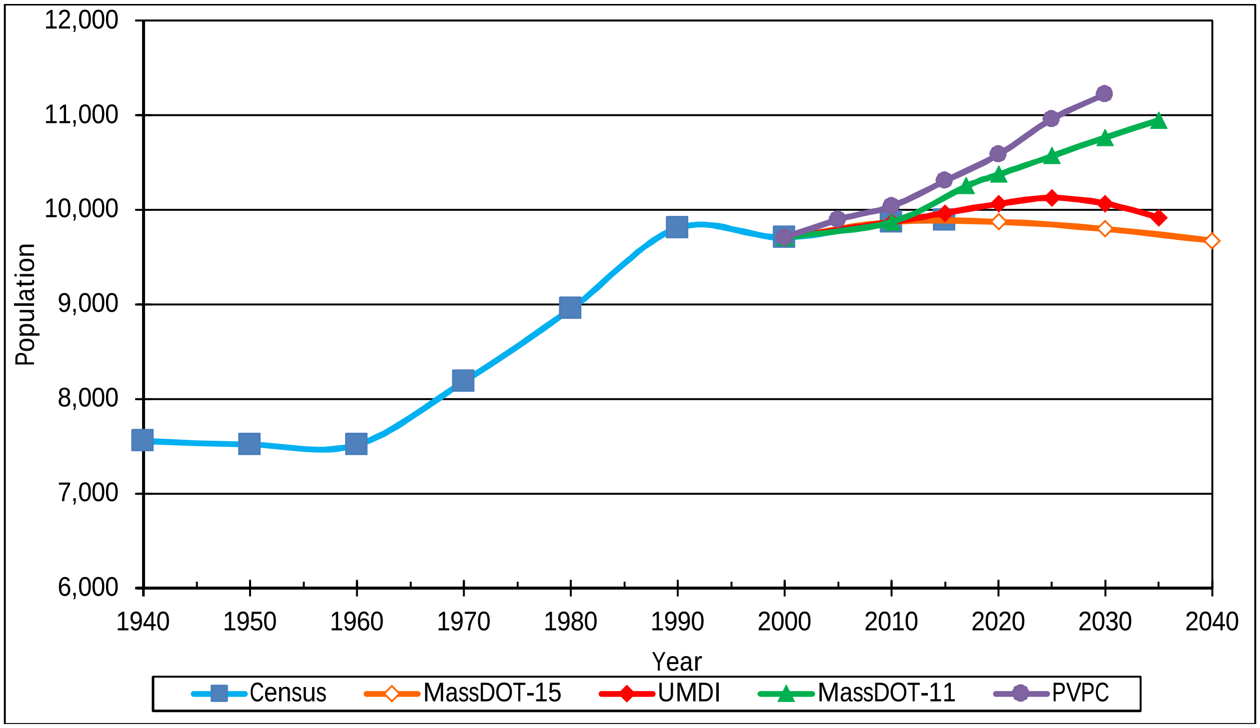
In general, the smaller communities in the suburbs experienced growth during the post-World War II period from 1950's through the 1980's, when growth population began to level off in most communities. The most rapid growth during this period occurred in rural communities with abundant open space and land available for development. In response to this growth, improved land-use planning, growth management and stricter development standards led to more sustained, managed growth over the last 20-30 years for most communities. In addition, escalating property values and high housing costs may have somewhat contributed to slower growth and development in certain communities.

3.3 HISTORICAL AND PROJECTED POPULATION

According to the Census, the Town of Ware has experienced additional population growth since the early 1960s. From 1960 to 1990 the population growth was strong and generally constant at the rate of 9.1% until 2000 when growth slowed significantly and became negative. At that point, growth resumed, but increased at a slower rate of approximately 0.18% per year through 2015. The current 2015 population as reported by UMDI is approximately 9,967 residents and the Census estimated a total population of approximately 9,888 residents in 2015.

Population projections as reported by the US Census, UMDI, MassDOT, and PVPC were reviewed for this study. The historic populations from 1940 to 2010 were provided by the US Census along with an estimated population in 2015. The UMDI projections were estimated in March of 2015 which provided projections from 2015 to 2035. Two sets of projections were used from MassDOT; an older projection from 2011 and an updated projection from 2015. The PVPC projections are from 2003. These various historic and projected populations are shown in Figure 3-2.

FIGURE 3-2
HISTORIC AND PROJECTED POPULATION
WARE, MASSACHUSETTS



As shown in the figure above, the MassDOT (2011) and PVPC projections have been higher than the actual 2010 population and increase at a rapid rate until 2030, while the UMDI and MassDOT (2015) projections only increase slightly until 2025 and then decreases until 2035 and 2040, respectively. Since the most recent projections show much slower growth, they are likely more realistic. Out of MassDOT (2015) and UMDI, UMDI is more conservative and likely more applicable for this Master Plan. Therefore, the UMDI projections for the next ten years, included in Table 3-2, were utilized in this study as they appear be more closely aligned with actual population trends.

TABLE 3-2
UMDI POPULATION PROJECTIONS
WARE, MASSACHUSETTS

Year	Projected Population
2016	9,986
2017	10,006
2018	10,025
2019	10,045
2020	10,064
2021	10,077
2022	10,090
2023	10,103
2024	10,116
2025	10,129

The UMDI projections show a slowing of growth over the next twenty years with an increase of 143 in population from 2016 to 2025. In regards to water service, the WDPW provides water to approximately 72% of the Town's population per the ASRs.

3.4 HISTORICAL WATER DEMAND TRENDS

The following discussion presents characteristics as it relates specifically to water demands. An analysis of historical water-use patterns is necessary to evaluate existing system capabilities and to understand future water supply and infrastructure needs. Within the context of this Report, a number of water industry terms will be used that are outlined below.

- Water *demand* and *production* is defined as the quantity of water which is pumped or produced from all sources of supply. Drinking water in Ware is currently supplied by the four active groundwater sources as discussed in Section 2. In general, demand from each individual source is metered, monitored, recorded, and reported by the WDPW.
- Water *consumption* is defined as the quantity of water used or consumed by the customers or for the operations of the system. Water consumption consists of two components: revenue water and non-revenue water. Revenue or metered water is the sum of all individual water meter readings from customers. Non-revenue water is water

which has been produced and delivered to the distribution system but is not billed to customers. Categories of non-revenue water include water used for un-metered accounts, bleeders, hydrant and main flushing, system leaks, water used for firefighting and losses from storage tank overflows.

MassDEP classifies all water users into seven account or user types as follows:

1. Residential
2. Residential Institutions
3. Commercial/Business
4. Agricultural
5. Industrial
6. Municipal/Institutional/Non-profit
7. Other

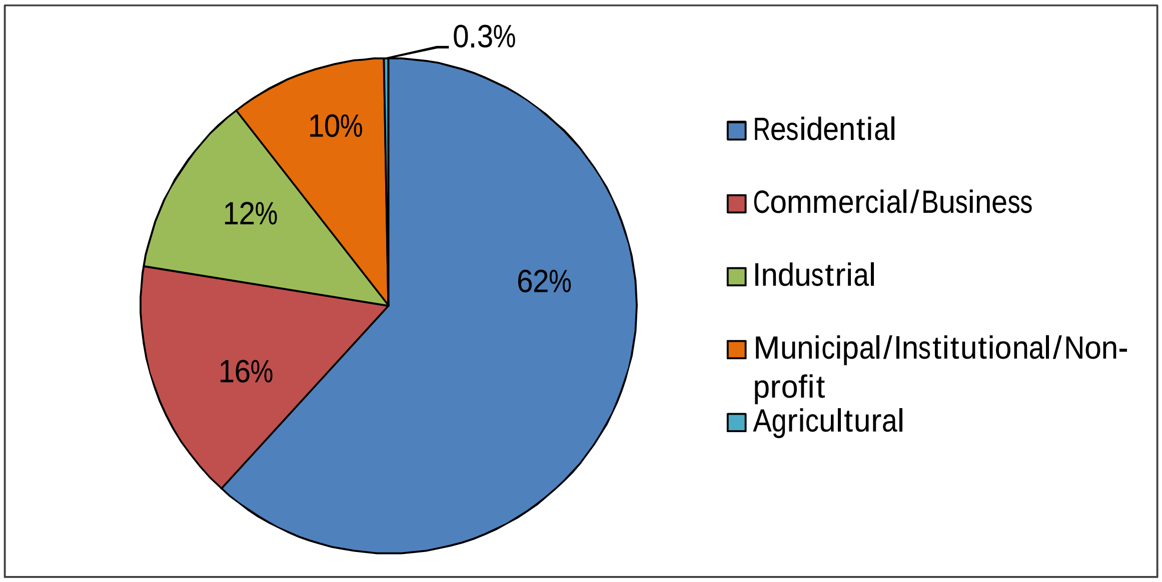
Table 3-3 presents Ware's historic average day demand for each category from 2006 through 2015.

TABLE 3-3
HISTORIC AVERAGE-DAY DEMANDS (MGY)
WARE, MASSACHUSETTS

Category	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Residential	187.4	144.4	135.5	126.2	134.3	119.8	121.8	125.8	112.7	121.2
Commercial/Business	25.2	20.0	18.6	20.5	16.2	14.9	15.3	16.0	14.7	30.9
Agricultural	0	2.0	0.3	0.5	0.7	0.5	0.4	0.5	0.5	0.6
Industrial	35.5	38.0	27.7	22.3	27.2	26.2	30.1	31.6	26.0	23.4
Municipal/Institutional/ Non-profit	2.85	8.8	12.1	13.9	18.8	17.3	15.4	15.1	20.3	20.1
Other	4.87	5.8	4.4	1.1	1.2	1.6	1.7	1.9	1.1	0
Total Metered Use	255.8	218.9	198.6	184.6	198.4	180.2	184.7	191.0	175.4	196.2
Total Supplied	345.8	305.5	291.8	267.1	265.3	252.9	228.6	211.6	217.8	238.1

Year 2015 billing records indicate that the water system has 2,360 meter accounts. The approximate percentage of the total system demand by user type for 2015 is shown in Figure 3-3.

FIGURE 3-3
WATER CONSUMPTION BY DEMAND CATEGORY IN 2015
WARE, MASSACHUSETTS



As shown in the figure, the residential component accounts for the majority (approximately 62%) of the metered demands in the system. Then, the Commercial/Business have the second highest demand at approximately 16%.

Knowledge of average and maximum-day demands of a water system is required in order to evaluate the adequacy of the existing system. The annual average daily flow is useful in estimating total water demand, chemical needs associated with treatment, electric power consumption required for pumping, and long-term supply capacity (Safe Yield or Permitted Withdrawal). Average-day demand is defined as the total water-use in a year divided by 365 days.

The maximum-day demand is defined as the maximum day of water-use that occurs during a given year. The maximum daily demand is generally used to size pumping units, transmission mains, treatment processes, and storage facilities. The ratio of the maximum to average-day demand provides a general indication of the demand fluctuation over a typical day.

A third demand component useful in engineering design is the peak-hour demand. Peak-hour demand is the maximum demand that occurs over a one-hour period. Peak-hour demand is the maximum volume that must be provided by all sources in the system (water supply and storage). If data is not available to determine this component, it can be estimated.

3.4.1 Year-Round Water Demand Trends

Table 3-4 below presents a summary of system-wide demands, average-day demands and maximum-day demands for the last five years.

TABLE 3-4
WATER DEMAND TRENDS
WARE, MASSACHUSETTS

Year	Total Production (gallons/year)	Average Daily Demand (gallons/day)	Maximum Daily Demand (gallons/day)	Ratio (Maximum-day/Average-day)
	(A)	(B)	(C)	(C/B)
2011	252,928,000	692,953	1,228,000	1.77
2012	228,578,000	626,241	939,000	1.50
2013	211,624,500	579,793	1,177,000	2.03
2014	217,837,000	596,814	1,047,000	1.75
2015	238,055,000	652,205	1,061,000	1.63
Average	229,804,500	629,601	1,090,400	1.74

In general, the average day demand (ADD), maximum day demand (MDD), and demand ratio have been relatively consistent in the last five years. Therefore, the average demand ratio of 1.74 was utilized for the future MDD demand calculations later in this report.

3.4.2 Seasonal Water Demand Trends

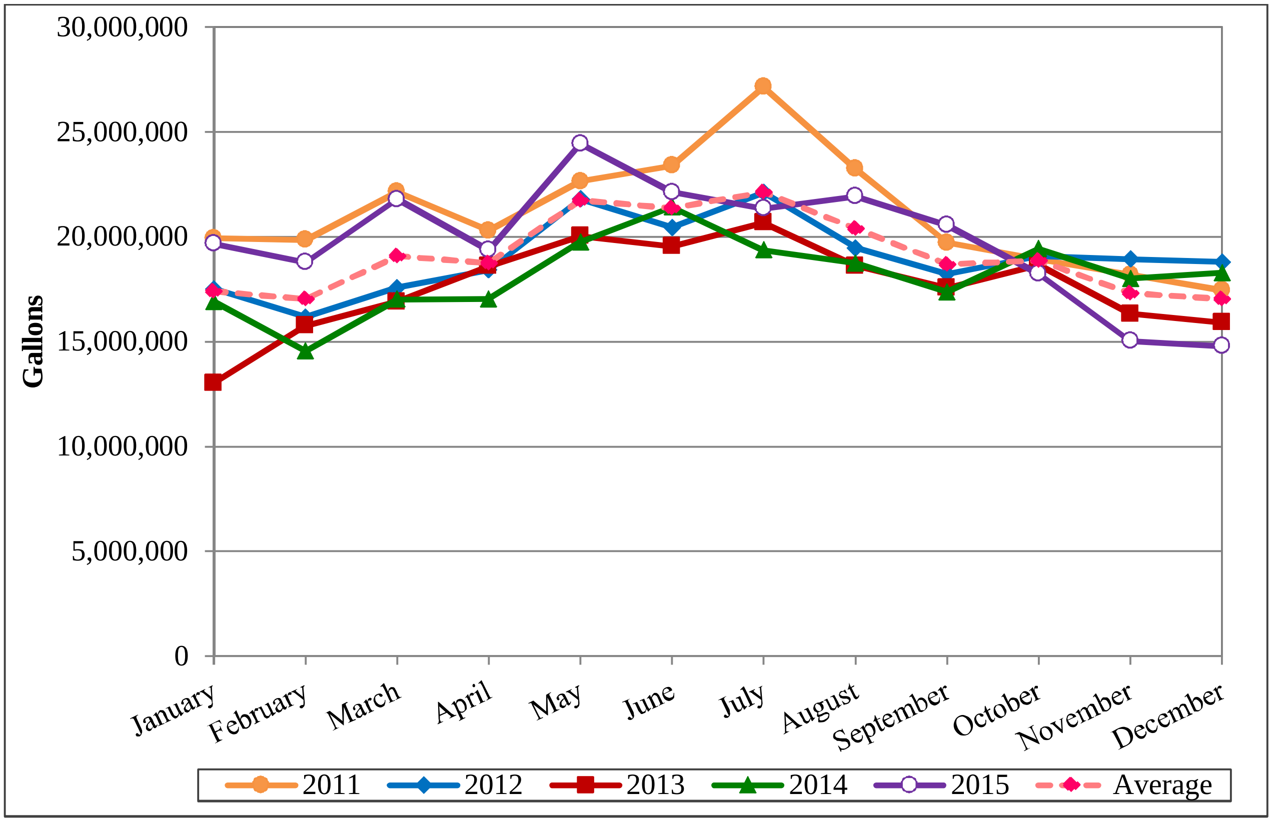
Water demand is typically a function of the time of year among other factors. In general, summer months have higher water demand due to the increased use of water for irrigation and recreation, in addition to seasonal population changes (if present in a particular community). Exceptions include industrial demands, which may follow demand patterns that result in higher average demands during the winter as opposed to the summer months.

The WDPW production trends by month for years 2011 through 2015 are presented in Table 3-5 and graphically in Figure 3-4.

TABLE 3-5
WATER PRODUCTION TRENDS
WARE, MASSACHUSETTS

Year	Total Water Production (Gallons)					
	2011	2012	2013	2014	2015	Average
January	19,932,000	17,518,000	13,028,500	16,902,000	19,676,000	17,411,300
February	19,858,000	16,180,000	15,769,000	14,555,000	18,790,000	17,030,400
March	22,136,000	17,579,000	16,904,000	17,018,000	21,790,000	19,085,400
April	20,299,000	18,412,000	18,599,000	17,028,000	19,361,000	18,739,800
May	22,640,000	21,805,000	20,038,000	19,751,000	24,437,000	21,734,200
June	23,392,000	20,453,000	19,540,000	21,413,000	22,128,000	21,385,200
July	27,140,000	22,112,000	20,673,000	19,358,000	21,350,000	22,126,600
August	23,241,000	19,467,000	18,610,000	18,735,000	21,923,000	20,395,200
September	19,709,000	18,232,000	17,563,000	17,368,000	20,549,000	18,684,200
October	18,938,000	19,088,000	18,658,000	19,419,000	18,237,000	18,868,000
November	18,191,000	18,939,000	16,333,000	18,008,000	15,032,000	17,300,600
December	17,452,000	18,793,000	15,909,000	18,282,000	14,782,000	17,043,600
Total	252,928,000	228,578,000	211,624,500	217,837,000	238,055,000	229,804,500

FIGURE 3-4
SEASONAL WATER DEMAND TRENDS
WARE, MASSACHUSETTS



As expected for a New England town, the general trend in the data shows that the demand increases from the winter months into the spring months and peaks during the summer months (June through August) before dropping again in the winter months. Variability in production between years can be seen during this same period which is expected due to the variability in precipitation from year to year.

3.4.3 Water Production Trends

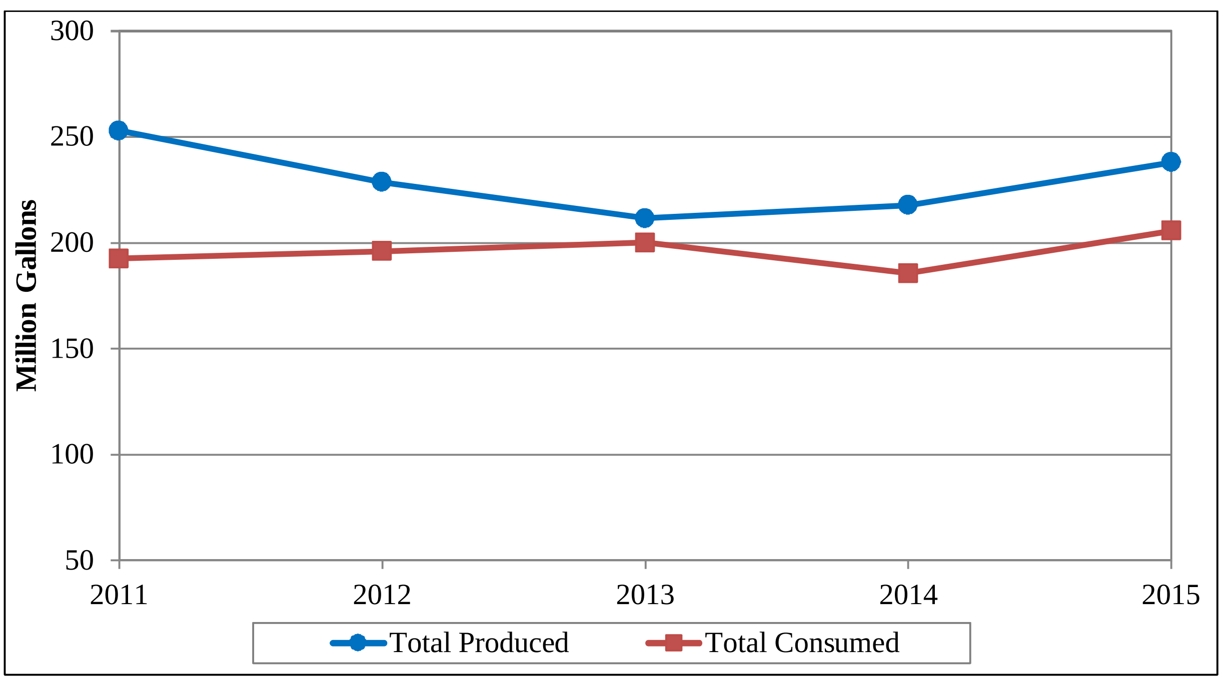
Water production is the total volume of raw water pumped from the well supply into the distribution system whereas water consumption is the actual volume of metered water billed to customers or other non-revenue water that is quantified. The difference between water produced and water consumed can be considered unaccounted-for water. Additional details and concepts regarding non-revenue and unaccounted-for water are presented in the sections that follow.

The WDPW water production and consumption trends for years 2011 through 2015 are presented in Table 3-6 and graphically in Figure 3-5.

TABLE 3-6
WATER PRODUCTION AND CONSUMPTION TRENDS
WARE, MASSACHUSETTS

Year	Total Water Production/Consumption (Million Gallons)		
	Production	Consumption	Difference
2011	252.9	192.6	60.3
2012	228.6	196.0	32.5
2013	211.6	200.1	11.6
2014	217.8	185.7	32.2
2015	238.1	205.7	32.3
Average	229.8	196.0	33.8

FIGURE 3-5
WATER PRODUCTION AND CONSUMPTION TRENDS
WARE, MASSACHUSETTS



3.4.4 Revenue and Non-Revenue Water-Use Trends

Records from the production sources were used as the baseline for determining the WDPW's revenue and non-revenue water-use. In general, revenue water is water-use that has been metered and billed to customers while non-revenue water is water-use that is not metered or results from inaccuracies of metering and other sources previously described. Sources of non-revenue water may include that which is needed for water operations, such as hydrant and water main flushing, leaks in the distribution system, accuracy of meters, un-metered or non-functioning services, lost water, water main breaks, unauthorized use, drainage of storage facilities for maintenance or repair, or accounting errors. Table 3-7 presents a breakdown of typical revenue and non-revenue sources in a system.

TABLE 3-7
REVENUE AND NON-REVENUE WATER USE CATEGORIES*

<table>
<tr><td rowspan="10">Total Production Volume (corrected for known errors)</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption
(Including water exported)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to point of Customer metering</td></tr>
</table>

*** From AWWA M36.**

Following is a list of definitions for the various terms used herein.

- Total Production Volume - The annual volume input to the water supply system.
- Authorized Consumption - The annual volume of metered and/or unmetered water taken by any user authorized to do so.
- Water Losses - The difference between Total Production Volume and Authorized Consumption, consisting of Apparent Losses plus Real Losses.

- Apparent Losses - Unauthorized Consumption, all types of metering inaccuracies and data handling errors.
- Real Losses - The annual volumes lost through all types of leaks, breaks and overflows on mains, service reservoirs and service connections, up to the point of customer metering. Commonly referred to as lost water.
- Revenue Water - Those components of Total Production Volume which are billed and produce revenue.
- Non-Revenue Water (NRW) - The difference between Total Production Volume and Billed Authorized Consumption.

Table 3-8 presents data comparing WDPW's production water volume to the revenue water volume.

TABLE 3-8
REVENUE AND NON-REVENUE WATER USE
WARE, MASSACHUSETTS

Year	Total Production (MGY)	Total Revenue Water (MGY)	Non-Revenue Water (MGY)	% Non-Revenue Water
2011	252.9	180.2	72.7	28.74%
2012	228.6	184.7	43.9	19.18%
2013	211.6	191.0	20.6	9.74%
2014	217.8	175.4	42.5	19.50%
2015	238.1	196.2	41.9	17.60%
Average	229.8	185.5	44.3	18.95%

The data from the table above indicates that non-revenue water has averaged approximately 19% over the past five years.

Sources of unaccounted for water reported in the WDPW's MassDEP Annual Statistical Reports (2011 - 2015) include:

- Water used for system-wide hydrant and main maintenance flushing.

- Water required for new water main construction purposes. This includes water used for filling and flushing new mains, chlorinating, and flushing chlorinated water.
- Water used for fire protection and training (includes flow tests).
- Water used for sewer and stormwater system flushing.
- Water used for street cleaning.
- Tank overflow and drainage.
- Lost water as a result of water main breaks and resulting repairs.
- Lost water from bleeders and blow offs to improve water quality in portions of the system.

Some non-revenue water uses can be confidently estimated by the water supplier and are therefore considered “authorized uses” of water. The remaining volume is considered water losses.

Industry standards suggest that the total lost water volume should be no higher than 20% of the total production volume while real losses, true unaccounted-for water, should be no more than 10% of total production volume. Many states, including Massachusetts, have made or are considering making unaccounted-for water a condition of approval for new supply sources and require communities to maintain unaccounted-for water at 10% or less. Massachusetts requires that water systems reduce unaccounted-for water use to less than 10% in order to move forward with developing new sources of water supply. In addition, MassDEP has established performance standards for all water systems that restricts unaccounted-for water to 10% or less.

Leaks are often the largest contributor to unaccounted-for water. Leaks can originate from anywhere in the system. The largest sources of leakage typically occur on main lines or through valves. Other sources of leaks include service-lines, residential meter boxes, residential leakage on the customer side of the service and other miscellaneous types.

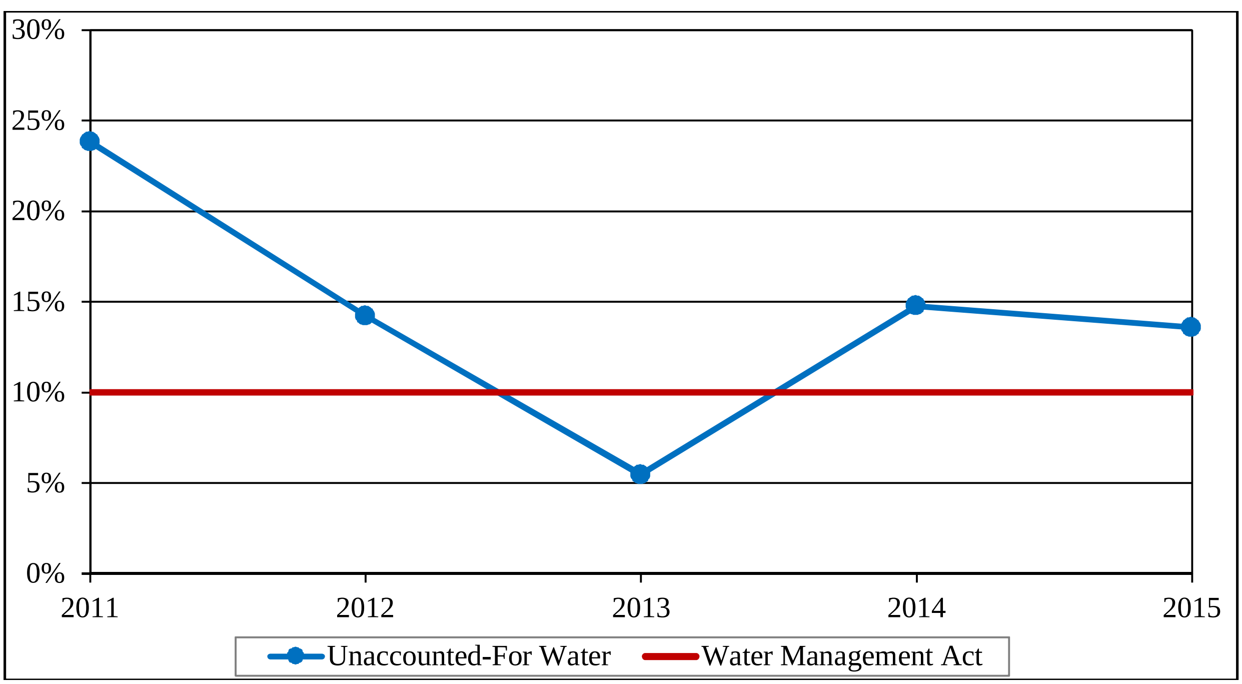
Table 3-9 and Figure 3-6 presents data as reported in the MassDEP Annual Statistical Reports related to lost water also known as unaccounted-for water (UAW) in the Ware system. The

UAW ranged from approximately 5% to 24% with an average of 14.4%. This is higher than the Water Management Act performance standard of 10%.

TABLE 3-9
UNACCOUNTED FOR WATER USE
WARE, MASSACHUSETTS

Year	Non-Revenue Water (MGY)	% of Total Production	Estimate of Non-Revenue which has been Accounted-for	Remaining Unaccounted which has NOT been Accounted-for (UAW)
2011	72.7	28.7%	4.9%	23.8%
2012	43.9	19.2%	5.0%	14.2%
2013	20.6	9.7%	4.3%	5.5%
2014	42.5	19.5%	4.7%	14.8%
2015	41.9	17.6%	4.0%	13.6%
Average	44.3	19.0%	4.6%	14.4%

FIGURE 3-6
UNACCOUNTED FOR WATER USE
WARE, MASSACHUSETTS



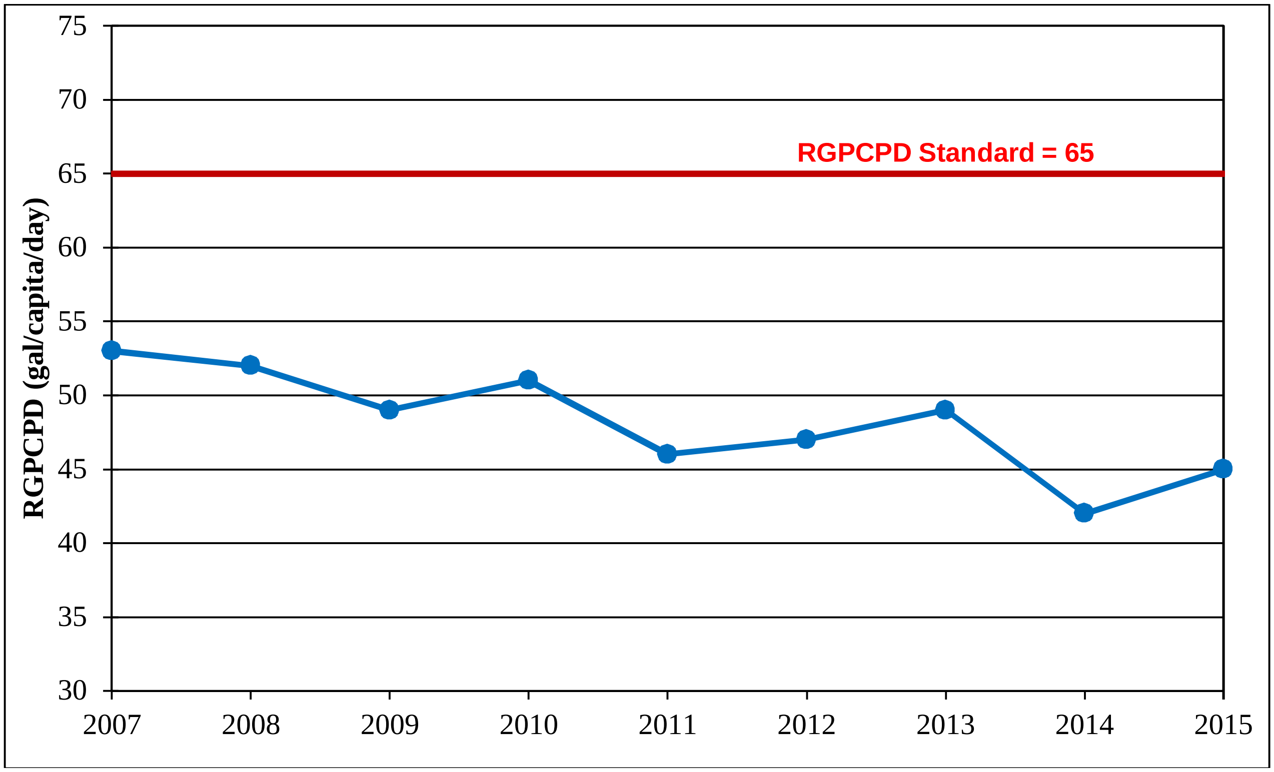
It should be noted that Table 3-9 and Figure 3-6 list and present the UAW values from WDPW's ASRs. After reviewing each year's ASR, MassDEP corrected the WDPW's reported UAW values based upon their own calculations and analysis. According to MassDEP, only one of the UAW (%) values was corrected within this time frame. The corrected value is 10% for year 2013.

In order to comply with MassDEP's performance standard, it will be important for WDPW to gain a clear understanding of the true magnitude of the lost water component of water use. The biggest gains in reducing lost water typically will come from one of several sources: (1) improving accuracies in master and customer meters, (2) controlling where possible variations in water demand, particularly that of large customer users, (3) reduction in main leakage, and (4) improving the accounting, estimation and reporting procedures for non-metered use.

3.4.5 Residential Gallons per Capita per Day Water Consumption

As presented in Figure 3-7 per capita residential water-use in Ware has ranged between 42 and 53 residential gallons per capita per day (rgpcpd) over the past nine years. The WMA permit limits residential consumption to 65 rgpcpd on an annual basis.

FIGURE 3-7
HISTORICAL WATER-USE TRENDS
RESIDENTIAL GALLONS PER CAPITA PER DAY
WARE, MASSACHUSETTS



The values for the last several years are excellent by any standard and are indicative of a well-managed system. It is likely that water use restrictions, conservation requirements, and other provisions in the permit are leading to lower water use. To be conservative however, future water-use projections will be based on 65 rgpcpd for residential water customers. Also, the Massachusetts Department of Conservation and Recreation (DCR) utilizes 65 rgpcpd for their water demand projections to determine the WMA permitted withdrawal rates.

3.4.6 Largest Water-Use Customers

The ten largest water users were identified from the billing database. This data is presented within Table 3-10. These customers and their demands were assigned specific nodes in the hydraulic model developed for this Report. Large water users can have a significant impact on water demand and alterations in the water use patterns for the larger customers could significantly influence future water use.

TABLE 3-10
2015 LARGEST WATER USERS
WARE, MASSACHUSETTS

Rank	Account	Customer Name	Description	Service Address	Gallons/Year	Gallons/Day
1	05-1683	Kanzaki Papers	Industrial Manufacturing	60 Cummings Street - Boiler House	2,005,080	5,493
2	02-2606	Waste Water Treatment Plant	Municipal	30 Robbins Road	1,172,610	3,213
3	05-2525	Kanzaki Papers	Industrial Manufacturing	38 Cummings Street	761,530	2,086
4	05-0021	Baystate Mary Lane Hospital	Hospital	85 South Street	483,120	1,324
5	01-1787	Norcor Auto Wash Inc.	Carwash	134 West Street	223,480	612
6	03-2487	Walmart	Retail Store	352 Palmer Road	211,770	580
7	06-2588	Quabbin Wire and Cable	Industrial Manufacturing	10 Maple Street	207,188	568
8	05-1681	Baystate Mary Lane Hospital	Hospital	60 South Street	176,907	485
9	01-1666	Sean Madigan	Laundromat	142 West Street	115,990	318
10	02-2046	Town of Ware	School Building (Elementary)	4 Gould Road	109,100	299

As shown, the top water users are within the industrial, municipal, and commercial categories. In 2015, the top ten water users consumed approximately 5.5 million gallons of water, or approximately 2.8% of the total metered water use. This small percentage indicates that the largest water users have a minimal impact on the overall system performance.

3.5 WATER USE PROJECTIONS THROUGH THE PLANNING PERIOD

An understanding of current and future average and maximum daily demands of a water system is required in order to evaluate the existing system and plan for future needs. The annual average daily flow is useful in estimating total water demand, chemical needs associated with treatment, electric power consumption required for pumping, and long-term supply capacity (safe or permitted yield). The maximum daily demand is generally used to size transmission mains, treatment processes and equipment, and storage facilities.

3.5.1 Water Demand Projection Methodology

3.5.1.1 Residential

Residential water-use is the result of residential demand by populations living within the Ware water system. Residential users include single family and multifamily dwellings, as well as apartments. On average, the residential component of the total revenue-water is about 62% of the total water-use.

MassDEP performance standards set a residential per capita demand goal of 65 residential gallons per capita per day (rgpcd). The calculated average-per capita water consumption in the Ware water system over the last five years is approximately 46 rgpcd, which is well below the MassDEP standard. However, in order to account for potential fluctuations in demand due to annual changes in weather and rainfall, the MassDEP per capita goal of 65 rgpcd was utilized in the demand projections. Additionally, as only approximately 72% of the Town's population is served by the WDPW, 72% of the projected population was also utilized for the residential demand projection.

3.5.1.2 Commercial

Commercial water-use consists of business parks, restaurants, retail stores, car washes, banks, etc. located within the service area. In just the last year in 2015, commercial demand increased by almost double compared to 2014. Since 2006, the lowest annual demand took place in 2014 at approximately 14.7 million gallons and the highest demand took place in 2015 with approximately 30.9 million gallons. The average commercial water-use since 2006 has been 18.4 MGY.

Employment projections from the Department of Conservation and Recreation (DCR) estimate approximately 2,836 employees in 2017 and 2,884 employees in 2023 which is an increase in employment by about 1.7%. It is assumed that the employment increase will directly correlate with the commercial demand. Therefore, an increase of 0.28% per year was utilized for the commercial demand projections.

3.5.1.3 Agricultural

In the last five years, agricultural demand (by the one noted user) has ranged from 0.4 to 0.6 MGY and averaged approximately 0.5 MGY. Agricultural demand has had an average annual increase of approximately 0.07 MGY from 2012 to 2015, and therefore this demand is expected to increase over the planning period. The average increase of 0.07 MGY was utilized for the agricultural demand projections.

3.5.1.4 Industrial

In the last five years, industrial demand has ranged from 23.4 to 31.6 MGY and averaged approximately 27.5 MGY. Industrial demand is not expected to increase over the planning period. Therefore, the average demand of 27.5 MGY was utilized for the industrial demand projections.

3.5.1.5 Municipal

Municipal water-use is water used by schools, government offices, etc. located within the Ware system. In the last five years, municipal demand has ranged from 15.1 to 20.3 MGY and averaged approximately 17.6 MGY. Municipal demand is not expected to increase over the planning period. Therefore, the average demand of 17.6 MGY was utilized for the municipal demand projections.

3.5.1.6 Unaccounted-For Water

As discussed, UAW ranged from approximately 5% to 24% with an average of 14.4%. MassDEP requires that water systems work to achieve a maximum of 10% unaccounted-for water. The Ware system is close to meeting the MassDEP requirement; however, the 14.4% average for unaccounted-for water was utilized for the projections to be more conservative.

3.5.2 Average Day Water Demand Projections

Table 3-11 presents the projected average daily demands based on the methodology described above.

TABLE 3-11
PROJECTED AVERAGE-DAY DEMANDS (MGY)
WARE, MASSACHUSETTS

Category	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential	170.6	170.9	171.3	171.6	171.9	172.1	172.4	172.6	172.8	173.0
Commercial/Business	31.0	31.1	31.2	31.3	31.4	31.44	31.5	31.6	31.7	31.8
Agricultural	0.61	0.68	0.75	0.82	0.89	0.96	1.03	1.10	1.17	1.24
Industrial	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5
Municipal/Institutional/ Non-profit	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Other	0	0	0	0	0	0	0	0	0	0
Total Metered Use	247.9	247.8	248.3	248.8	249.3	249.6	250.0	250.4	250.8	251.2
Unaccounted-For Water (14.4%)	35.7	35.7	35.8	35.8	35.9	35.9	36.0	36.1	36.1	36.2
Total Water Use	283.6	283.5	284.0	284.6	285.1	285.6	286.0	286.4	286.9	287.3

3.5.3 Maximum and Peak Hourly Flow Demand Projections

As previously discussed, the average peaking factor for the last five years of 1.74 was utilized to estimate the future maximum daily demands. Due to the unavailability of daily demand data for the maximum day to calculate the peak hourly demand, the peak hourly demand will be estimated. Communities of similar size to Ware tend to have a peak hour demand between 2 to 3 times the average day hourly demand. Therefore, a peak hour peaking factor of 3 was utilized to estimate future peak hour demands to be conservative. The resultant projected maximum day and peak hour demands are presented in Table 3-12.

TABLE 3-12
PROJECTED MAXIMUM-DAY DEMANDS
WARE, MASSACHUSETTS

Year	ADD (MGD)	MDD (MGD)	Peak Hour (MGH)
2016	0.78	1.35	0.097
2017	0.78	1.35	0.097
2018	0.78	1.35	0.097
2019	0.78	1.36	0.097
2020	0.78	1.36	0.098
2021	0.78	1.36	0.098
2022	0.78	1.36	0.098
2023	0.78	1.37	0.098
2024	0.79	1.37	0.098
2025	0.79	1.37	0.098

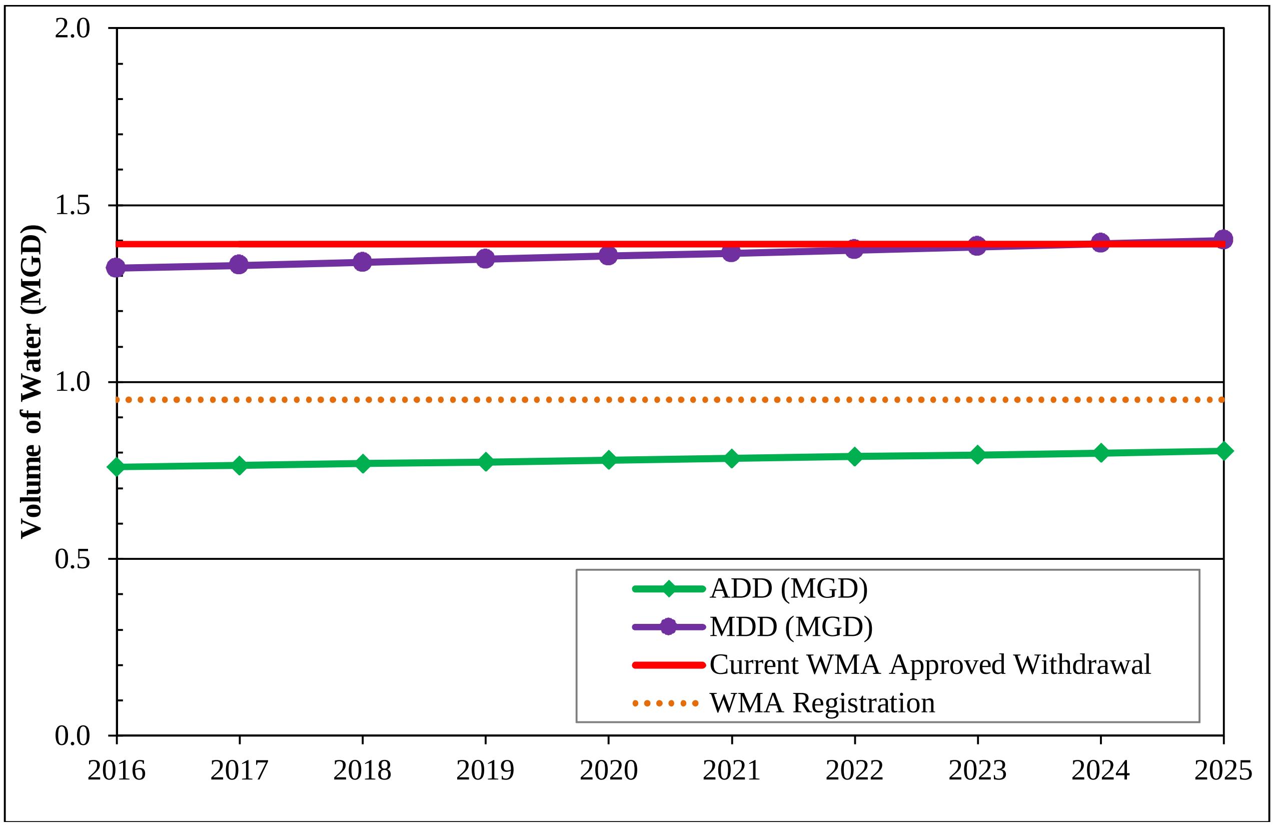
The projected maximum day and average day demand in 2025 is 1.37 MGD and 0.79 MGD, respectively, with a peak hour of 0.098 MGH.

3.6 WATER MANAGEMENT ACT

The Massachusetts Water Management Act (WMA) places water withdrawal limits on water supply sources in part to control water withdrawals from watersheds to ensure the adequate natural water supply needs of flora and fauna that inhabit the watersheds. The WDPW has five registered water supply wells (Well No.1, Well No.2, Well No.3, Well No.4/Giard Well, and the Cistern) and one permitted supply well (Dismal Swamp Well). The WMA registration authorizes withdrawal of 0.95 MGD on average over the calendar year. The current WMA permit authorizes an additional withdrawal of 0.44 MGD for a total authorized withdrawal of 1.39 MGD (through 5/31/2015). The most recent copies of the WDPW's registration statement and WMA Permit are included within Appendix A. It should be noted that the WMA Permit expired on May 31, 2015. Until a new permit is issued to the WDPW, compliance and analysis within this report is based on the most recent authorized annual withdrawal volumes (i.e., Period 5).

The withdrawal limits and projected water demands through year 2025 are shown in Figure 3-8.

FIGURE 3-8
PROJECTED WATER DEMANDS
WARE, MASSACHUSETTS



The data indicates that the WDPW generally has adequate water supply capacity through year 2025 based on the projections presented herein. It should be noted that the WDPW currently has mandatory non-essential outdoor water use restrictions in place that help to reduce the average and maximum daily demands in the system. Therefore, it will be important to continue these restrictions to keep demands below the WMA registered withdrawal volume. A detailed review of the existing sources ability to meet the projected demands is presented in Section 4.

3.6.1 SWMI

Ware's WMA permit will be renewed shortly and as a basis for this permit, the Massachusetts Department of Environmental Protection (MassDEP) utilizes the Massachusetts Department of Conservation and Recreation (DCR) water demand projections to determine the WMA permitted withdrawal volumes. The DCR provided a draft of the Town's water needs forecast in January of 2016 which is presented in Table No. 3-13.

Also, the WMA regulation has now started to integrate the Sustainable Water Management Initiatives (SWMI). The SWMI would impose additional regulations onto a Town based upon the Town's permitted withdrawal volume.

TABLE 3-13
DRAFT WATER NEEDS FORECAST FROM DCR
WARE, MASSACHUSETTS

	2017	2023	2028	2033
ADD Projection (MGD)[1]	0.78	0.79	0.79	0.78
ADD Projection (MGD)[2]	0.66	0.67	0.67	0.67

[1] Assuming 65 RGPCD and 10% UAW. Includes 5% buffer of +0.04.
[2] Assuming water delivery continues at current RGPCD and UAW. Includes 5% buffer of +0.03.

In accordance with the new SWMI regulations that are now included within the WMA, each applicant is assigned a Baseline for water use. The Baseline is a parameter that MassDEP developed in order to determine an applicant's applicability for a requested volume for their permit renewal. The Baseline water use is calculated by determining the volume withdrawn in 2005 plus 5%, the average annual volume withdrawn from 2003 through 2005 plus 5%, or the registered amount. Whichever option provides a greater value is determined as the Baseline. Ware's Baseline is 1.09 MGD which is based off of the volume withdrawn during 2005 plus 5%. As previously provided in Table No. 3-11, the future estimated average day demand for 2025 could reach a total of 287.3 MGY (0.79 MGD). DCR's draft water needs forecast projects a total demand of 0.78 MGD by year 2033 in its first scenario. Both of these projections are below the established Baseline.

In accordance with the new SWMI regulations, MassDEP has established review categories called "tiers" for all water supply systems as part of the permit requirement. The calculated Baseline along with the requested water withdrawal volume is ultimately the threshold for determining an applicant's tier. There are a total of three tiers and each tier has specified requirements that Ware would be required to fulfill based on a variety of categories established by the WMA. If the Town's water demand surpasses the Baseline, then the Town would fall into a tier where there will be additional requirements placed upon the Town. Additional requirements would include submitting a minimization plan, performing additional conservation measures, optimizing withdrawal, and returning water to the sub-basin(s). The projected average day future demand that was previously calculated (as well as DCR's projection) does not surpass the Baseline. Therefore, the Town should not expect to have any additional requirements from the new SWMI regulations related to increased water withdrawal.

Section 4

WRIGHT-PIERCE
Engineering a Better Environment

SECTION 4

WATER SUPPLY EVALUATION AND ASSESSMENT

4.1 GENERAL

As presented within the previous two sections of this report, the Ware Department of Public Works (WDPW) utilizes four active groundwater sources for its water supply. Withdrawal from each source of supply is permitted through the Massachusetts Water Management Act (WMA). The WDPW's current permit includes the five previously registered groundwater wells (Well No.1, Well No.2, Well No.3, Well No.4/Giard Well, and Cistern) and one permitted supply well (Dismal Swamp Well). The registration authorizes a withdrawal of 0.95 million gallons per day (MGD) on average over the calendar year and the WMA permit authorizes an additional average daily withdrawal of 0.44 MGD. This results in a total authorized average daily withdrawal of 1.39 MGD for all sources (through 5/31/2015 as noted in the previous section).

This section presents the evaluation and assessment of those sources' ability to reliably meet the forecasted water use needs for the system.

4.2 ADEQUACY OF EXISTING WATER SUPPLY CAPACITY

A water system is considered to have adequate long-term supply if it can meet the following system conditions:

- Design Condition No. 1 - The permitted annual average-day pumping rate of the source of supply should exceed the projected average-day demand, and;
- Design Condition No. 2 - The pumping capacity of the system with the largest source (or pumping unit) out of service should be greater than or equal to the projected maximum-day demand.

Both conditions should be met in order to assure the reliability of service to the customers. Each of these conditions has been evaluated on a system-wide basis for the WDPW and the results are presented in the following sections of the report.

Table 4-1 summarizes the WMA's maximum authorized daily withdrawal volumes for each well individually as well as a registered and permitted total. The individual withdrawals included for the registered sources are based on the approved maximum daily pumping volume that was assigned to the source in accordance with its Zone II or pump test. The individual withdrawals for the permitted sources are taken from the WMA permit.

TABLE 4-1
MAXIMUM AUTHORIZED DAILY WITHDRAWAL VOLUMES
WARE, MASSACHUSETTS

<table>
<tr><th rowspan="2">Source</th><th rowspan="2">PWS Source ID</th><th colspan="2">Maximum Authorized Annual Average</th><th rowspan="2">Individual Withdrawals (MGD)</th><th rowspan="2">Maximum Daily Rate (MGD)</th></tr>
<tr><th>Registered</th><th>Permitted</th></tr>
<tr><td>Well No. 1</td><td rowspan="3">1309000-01G</td><td>Yes</td><td>No</td><td>0.317</td><td rowspan="3">0.95</td></tr>
<tr><td>Well No. 2</td><td>Yes</td><td>No</td><td>0.317</td></tr>
<tr><td>Well No. 3</td><td>Yes</td><td>No</td><td>0.317</td></tr>
<tr><td>Well No. 4/Giard Well</td><td>1309000-02G</td><td>Yes</td><td>No</td><td>0.720</td><td>0.72</td></tr>
<tr><td>Cistern</td><td>1309000-04G</td><td>Yes</td><td>Yes[1]</td><td>0.475</td><td>1.08[3]</td></tr>
<tr><td>Dismal Swamp Well</td><td>1309000-03G</td><td>No</td><td>Yes</td><td>0.583</td><td>0.583</td></tr>
<tr><td colspan="2">Total (MGD):</td><td>0.95</td><td>0.35 - 0.44[2]</td><td>2.729</td><td>2.383</td></tr>
<tr><td colspan="2">TOTAL (Registered & Permitted) (MGD):</td><td colspan="2">1.30 - 1.39[2]</td><td></td><td></td></tr>
</table>

[1] Rate Limitation (Max Day)
[2] Daily Average (per period as noted in permit)
[3] Combined rate for Cistern and Wells No. 1, 2, and 3.

Due to permitting restrictions, it is noted that the total authorized withdrawal amounts by the WMA permit do not match the sum of all individual sources. The total authorized withdrawal is currently at 1.39 MGD (0.95 MGD registered and 0.44 MGD permitted) and the total individual withdrawals add up to 2.7 MGD (almost double of the total withdrawal).

As presented within Section 2 of this report, the WDPW treats its sources at two water treatment plants (WTPs) which can also be referred to as chemical feed facilities; the Pump House and the Dismal Swamp Well Control Building. The Pump House treats the water from the Wellfield

(Wells No. 1, 2, and 3), Well No. 4, and the Cistern. Table 4-2 presents the pumping capacities of the WDPW's current wells and associated WTPs.

TABLE 4-2
WELL AND WTP PUMPING CAPACITIES
WARE, MASSACHUSETTS

Source	Well Capacity (MGD)	WTP Capacity (MGD)
Well No. 1	0.317	1.584
Well No. 2	0.317	
Well No. 3	0.317	
Cistern	0.475	
Well No. 4/Giard Well	0.720	
Dismal Swamp Well	0.583	0.583
Total:	**2.729**	**2.167**

It is noted that the actual capacity of a well is dynamic as wells lose capacity over time and can regain some of that lost capacity after a cleaning. Therefore, the design pumping capacity is more often used when evaluating the adequacy of a groundwater system unless extreme circumstances to the contrary are known.

4.2.1 Average-Day Demand Analysis

As presented previously (Design Condition No. 1), the first analysis of the ability for a water system to meet anticipated demands is to confirm whether or not the sources can meet the projected average-day demands with all available sources. As it is good waterworks practice to run the wells on a 16 hour on and 8 hour off basis over a regular period of 24 hours, the available capacities based on 16 hours of runtime (available safe yield) were calculated and used for the analysis.

Table 4-3, which follows, presents the summarized results of average-day demand analysis.

TABLE 4-3
AVERAGE-DAY DEMAND ANALYSIS RESULTS
WARE, MASSACHUSETTS

Source	Well Capacity (MGD)	WTP Capacity (MGD)	Available flow @ 16-hours of Pumping (MGD)
Well No. 1	0.317	1.584	1.056
Well No. 2	0.317		
Well No. 3	0.317		
Cistern	0.475		
Well No. 4/Giard Well	0.720		
Dismal Swamp Well	0.583	0.583	0.389
Total:	**2.729**	**2.167**	**1.445**

By comparing the projected average-day required total of 0.79 MGD for 2025, it can be seen that the WDPW system would have adequate water capacity under this analysis.

4.2.2 Maximum-Day Demand Analysis

Also as discussed previously (Design Condition No. 2), the second analysis of the ability for a water system to meet anticipated demands is to confirm whether or not the sources can meet the projected maximum-day demands with the largest available source considered to be off-line (i.e., unavailable). As it is good waterworks practice to run the wells on a 16 hour on and 8 hour off basis over a regular 24 hour period, the available capacity based on 16 hours of runtime (available safe yield) was also used as the starting point for this analysis.

Since the WDPW has all of its wells connected to WTPs, the analysis was run under two scenarios. The first was performed to assess the impact of losing the largest connected source (i.e., well) and the second was performed to assess the impact of losing the largest connected WTP. Both of these scenarios were run for the system as it currently exists.

Table 4-4 presents the summarized results of the first maximum-day analysis that assessed the loss of the largest source (Well No. 4).

TABLE 4-4
MAXIMUM-DAY DEMAND RESULTS – LARGEST SOURCE OFF-LINE
WARE, MASSACHUSETTS

Source	Well Capacity (MGD)	WTP Capacity (MGD)	Available flow @ 16-hours of Pumping (MGD)
Well No. 1	0.317	1.426	0.951
Well No. 2	0.317		
Well No. 3	0.317		
Cistern	0.475		
Well No. 4/Giard Well	0.000		
Dismal Swamp Well	0.583	0.583	0.389
Total:	**2.009**	**2.009**	**1.339**

By comparing the projected maximum-day required total of 1.37 MGD for 2025, it can be seen that the WDPW system would be in a slight deficit of 0.031 MGD (1.37 – 1.339 MGD) under this analysis scenario. Although this analysis indicates a small deficit, it could be overcome with additional pumping (as analysis utilizes 16 hours) and/or from storage in the system. For example, running the analysis with 17 hours would indicate sufficient capacity at 1.423 MGD.

Table 4-5 presents the summarized results of the first maximum-day analysis that assessed the loss of the largest WTP (the Pump House).

TABLE 4-5
MAXIMUM-DAY DEMAND RESULTS – LARGEST WTP OFF-LINE
WARE, MASSACHUSETTS

Source	Well Capacity (MGD)	WTP Capacity (MGD)	Available flow @ 16-hours of Pumping (MGD)
Well No. 1	0.317	0.000	0.000
Well No. 2	0.317		
Well No. 3	0.317		
Cistern	0.475		
Well No. 4/Giard Well	0.720		
Dismal Swamp Well	0.583	0.583	0.389
Total:	**2.729**	**0.583**	**0.389**

By comparing the projected maximum-day required total of 1.37 MGD for 2025, it can be seen that the WDPW system would not have adequate water capacity under this analysis scenario even if the remaining sources were temporarily run non-stop for 24-hour operation (assuming all other sources were operable).

However, it should be noted that the Pump House currently has a generator for emergency power and also the Cistern has two pumps available to pump water through the WTP. One pump is for back-up in case the other pump goes down. Nonetheless, this scenario should still be considered a possibility as a potentially catastrophic event could occur that renders the Wellfield, Well No. 4, and the Cistern sources inoperable (e.g., loss due to unforeseen contamination that cannot be treated). Other potential reasons for loss of capacity can include failure or temporary loss of treatment equipment, regulatory actions limiting use, scheduled and unscheduled maintenance, etc.

4.3 OPPORTUNITIES FOR EXPANDED WATER SUPPLY

Based on the analyses presented in the previous section, the WDPW has sufficient supply capacity to meet its projected average-day demands but not for its projected maximum-day demands when the largest well is considered to be off-line and pumping is limited to 16 hours of operation. However, this condition can be easily met when pumping is limited to 17 hours.

Under the most extreme scenario, the WDPW cannot meet its maximum-day demands when the WTP is considered inoperable. This would likely have a low probability, as there are two pumps feeding into the facility and it has emergency power provisions. However, other catastrophic events that render the WTP unusable should also be considered. Therefore, in order for the WDPW to more reliably meet the maximum-day demands under the more extreme scenario, other reliable sources of supply should be considered for implementation to make up the difference in an emergency. Based on the scenario that considered the largest WTP to be off-line, a deficit of approximately 0.981 MGD (1.37 MGD – 0.389 MGD) is identified.

The following sections present available options to the WDPW for this.

4.3.1 Interconnections

A possible source of additional supply would be an interconnection with a neighboring community (or communities) via an intermunicipal agreement (IMA) or a large water supplier such as the Massachusetts Water Resources Authority (MWRA). The following two sections present these options further.

4.3.1.1 Neighboring Communities

As presented previously within Section 2 of this report, the Town of Ware is surrounded by eight neighboring communities, but the WDPW does not have interconnections with any of these communities.

If the establishment of a suitable interconnection and IMA for the purchase of water from a neighboring community be desired, then at a minimum, the following major conditions would need to be satisfied for this option to be viable:

- Adequate and guaranteed supply quantity from the supplier;
- Proper hydraulics for the transfer of the water supply into the WDPW system;
- A permanent, reliable, and redundant interconnection;
- Acceptable and compatible water quality; and
- No impacts to the WDPW's distribution system.

Should a formal interconnection be desired, it is important to understand each contributing cost factor in a neighboring community's cost structure to determine if an interconnection makes sense for each community. The economic decision to purchase water from an adjacent utility requires consideration of two costs:

- <u>Marginal or Production Cost:</u> The bare or production cost of water at a utility to produce, treat and deliver water to the distribution system; and

- <u>Avoided Cost:</u> The cost to develop or treat a similar supply within the receiving utility's service area.

A utility considering an interconnection with an adjacent community to purchase water should be willing to pay somewhere between the avoided cost to develop its own independent supply and the selling community's marginal production cost. If the price of purchasing water is greater than the community's ability to develop or treat its own supply at a lower cost, then no incentive exists to purchase water from an adjacent water system.

The WDPW has noted that there would be no incentive to purchase water from a neighboring community since there would be a high cost associated with this. Therefore, it would not be recommended for WDPW to establish an interconnection.

Additional effort would need to be expended by the WDPW should it desire to pursue a formal interconnection with one of its neighboring community water systems which is beyond the scope of this Master Plan.

4.3.1.2 MWRA

Another long term water supply alternative would be an emergency interconnection to the MWRA system. The nearest communities served by MWRA water include Chicopee, South Hadley, and Wilbraham. These three towns are fully served by the MWRA. Therefore, access to the MWRA for the WDPW would require a wheeling agreement through the Chicopee, South Hadley, or Wilbraham distribution systems.

Additional effort would need to be expended by the WDPW should it desire to pursue a formal emergency interconnection with the MWRA which is beyond the scope of this Master Plan.

4.3.2 New Sources

If desired, another alternative for improved long term water supply would be the implementation of a new groundwater well source or sources. However, this solution is not guaranteed due to many unknowns.

4.3.2.1 New Source Approval Process

If the WDPW desired to implement a new groundwater source(s), then the WDPW would need to follow the New Source Approval (NSA) process. The NSA, in conjunction with the Water Management Act Withdrawal Permit application process, requires applicants to evaluate potential impacts caused by the proposed withdrawals. MassDEP receives comments from the Executive Office of Environmental Affairs (EOEA) through the Massachusetts Environmental Policy Act (MEPA) (301 CMR 11.00) review process to ensure protection of natural resources.

The process of exploring, testing, permitting, and developing a new water supply source can be a difficult and costly endeavor. The following state-level permits, at a minimum are required:

- MassDEP New Source Approval (NSA)
- Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form (ENF)
- MassDEP Water Management Act (WMA)
- Potentially, MEPA Environmental Impact Report (EIR)
- Massachusetts Natural Heritage and Endangered Species Program (NHESP)
- And others potentially identified in the process.

In addition, local permits from the conservation commission, for example, may be needed depending upon the location of the proposed water supply.

The NSA process is involved, requires many steps, and can’t be completed until the other state permits are successfully approved. The following outlines the various steps, in a roughly chronological order, required to navigate the new source development process (from the beginning). Fortunately, much of the same data can be used to support the various permit applications.

- **Step #1 – Conduct Groundwater Exploration Program**

  The Groundwater Exploration process begins with a desktop hydrogeological study of potential well sites utilizing existing information from the United States Geological Survey (USGS), MassDEP, and private consultant's work in or near areas under consideration.

  Following the desktop study, sites that the WDPW wishes to pursue further should be the subject of a limited field investigation to confirm the hydrogeologic suitability of the site for water supply development. In some cases, this process may begin with geophysical investigations to identify aquifer extents and other broad hydrogeologic characteristics.

  Next a relatively small-scale pumping test should be conducted to gain an initial assessment of aquifer and water quality characteristics and potential well yield before instigating the MassDEP Site Exam Process.

- **Step #2 – Submit Request for Site Exam**

  Once initial testing has shown a site likely to be suitable for the development of a public water supply, a request is made to invite the MassDEP to come and investigate the site suitability themselves. The Request for Site Exam is submitted as a report that summarizes all of the initial investigations and presents the case for why the subject site is considered suitable for public water supply. The Request for Site Exam must include:
  - A characterization of land use in a half-mile radius around the well;
  - A map showing current land uses, other existing private and public water withdrawals, zoning, and potential contamination sources;
  - An evaluation of potential impact to the proposed public water supply from contamination sources;
  - A boring and construction log for the test well at the site, an estimate of yield from that well, and water quality testing results;
  - Locations and boring logs for other exploratory wells;
  - A preliminary conceptual model of the aquifer including stratigraphic cross-sections, boundary conditions, and initial estimates of the Zones 2 and 3 areas;

- Description of any potential contamination sources in the estimated Zone 2 area;
- An initial estimate of the final production well proposed yield;
- Water Quality results obtained during initial test well testing;
- A wellhead protection plan including local contact persons, a plan for drafting needed regulatory and zoning controls, and a timeframe for achieving those controls; and
- A surveyed site plan showing the Zone 1, well locations, and elevations.

- **Step #3 – Conduct MassDEP Site Exam**

  After the Request for Site Exam has been reviewed and accepted, the MassDEP will make a site visit. This visit will include:
  - A land use/sanitary survey of the preliminary Zone 2 area;
  - A discussion of proposed observation well locations and any special requirements for the forthcoming prolonged pumping test; and
  - The identification of any potentially hydrologically connected surface water features.

  To be approved for further testing after the Site Exam, the MassDEP must be satisfied that:
  - The site is not at significant risk from floods or other disasters;
  - The site will be readily accessible at all times;
  - The site is not subject to undue short circuiting from surface waters;
  - The site meets Zone 1 protection and ownership requirements; and
  - The site is not located within one half mile of potentially serious sources of pollution.

- **Step #4 – Submit Prolonged Pumping Test Proposal**

  Following a satisfactory review of the Request for Site Exam report and the Site Exam itself, MassDEP will provide written approval to proceed with the submittal of a Pumping Test Proposal. The Prolonged Pumping Test must be conducted at a pumping rate of at least half that of the requested permit rate for the final production wells. Specific guidelines for the number and placement of observation wells, the delivery of discharge water, water level monitoring criteria, water quality monitoring criteria, and flow monitoring must be followed and described in the proposal. Further guidelines resulting from the Site Exam may also need to be followed. A draft of proposed zoning and regulatory controls must also be submitted at this time, as well as a description of the status of other necessary permit applications and regulatory review.

- **Step #5 – Conduct Pumping Test**

  Once the Prolonged Pumping Test Proposal has been approved, the Prolonged Pumping Test and all associated monitoring will be conducted following the criteria outlined in the proposal and any other specific instructions received from MassDEP. Special monitoring requirements may be required to assess specific hydrologic or water quality questions at MassDEP discretion. The pumping test must proceed for a minimum of 5 consecutive days and onwards until no more than a half-inch fluctuation is observed at a proximal observation well over the final 24-hours of pumping. Recovery of the aquifer must be monitored until water levels have recovered to 95% of pre-test levels or until recovery time equals the total duration of pumping.

- **Step #6 – Submit Source Final Report**

  The final step in the NSA process is to submit a Source Final Report describing all of the pertinent information collected to date, the methods, analyses, and results of the Prolonged Pumping Test, a full description of the area hydrogeology, a final delineation of the Zones 2 and 3 for the proposed well, an analysis of water quality data, an analysis of potential hydraulic connections to surface waters, a discussion of the well's proposed period and rate of operation and expected groundwater impacts from that operation, a groundwater monitoring plan to protect the quality of water derived from the proposed well, and an approvable wellhead protection bylaw. Detailed numerical modeling will be required to adequately delineate the Zone 2 area for the proposed well. The 1997 MassDEP Zone 2 model should be utilized. The Source Final Report must also include a detailed discussion of the methods and results of the Zone 2 modeling effort.

Final NSA will not be granted until all other permitting and regulatory goals are achieved, ownership and control of the Zone 1 is adequately demonstrated, an approved wellhead protection bylaw is in place, and a groundwater monitoring program has been accepted.

- **Step #7 - MEPA ENF Submittal**

  An environmental notification form (ENF) submittal is required for any new withdrawal or expansion of withdrawal of 100,000 gallons per day or greater requiring new construction. The ENF is a relatively simple form and letter describing the proposed project, any potential impacts, and proposed mitigation. Following review of the ENF, the MEPA office may grant a MEPA certificate for the proposed project or request the submittal of an Environmental Impact Report (EIR) to provide a more detailed description of the proposed project and potential impacts. An EIR is mandatory for proposed groundwater withdrawals of 1,500,000 gallons per day or greater or the construction of 10 or more miles of water main. The issues considered by the MEPA office when evaluating an ENF for a new proposed water supply will include proximity to water resources and rare, water-dependent species habitat, potential interference with other withdrawals, and potential for water quality issues. The lower the potential for any of those issues to be significant, the less likely the MEPA office will be to require a full EIR. A successful review of the proposed new water supply source by the MEPA office is a prerequisite for the receipt of a WMA permit and a NSA permit.

- **Step #8 - WMA Permit Application**

  A WMA permit is required for any new withdrawal or expansion of withdrawal of 100,000 gallons per day or greater. Although similar and interlinked with the NSA process, the WMA permit is entirely focused on potential water quantity impacts to water resources and other, pre-existing water users. The water quality component, which figures prominently in the NSA process for drinking water supplies, is not part of the WMA permit. Much of the data required to satisfy WMA requirements that no significant drawdown or water quantity impacts are likely from the proposed new water supply source are the same as those needed for NSA analyses. However, the WMA requires that the data be used in a different way and submitted in a different format.

As with the MEPA permit process, the WMA process can be made simpler by minimizing the potential for any impacts to water resources, water-dependent, rare species habitat, and other water withdrawals. The effort to prove that no significant impacts are likely to occur from the proposed new water supply is made simpler if the new supply is located greater than 1,000 feet from any surface water resources and one half mile from other water withdrawals or potential contamination sources.

- **Step #9 – Submit Design Plan for Permanent Works**

  Once the MassDEP has granted NSA for the proposed water supply site, the site is permitted and approved for a specified withdrawal rate. The next step is to apply for and receive permits for the actual physical apparatus used to withdraw, treat, store, and transmit the water. The proponent submits detailed design drawings to MassDEP specifying exactly what will be built and how the construction will proceed. After MassDEP review and commentary, approval of the Permanent Works Plan allows construction of the proposed new water supply to proceed.

- **Step #10 – Construct Permanent Works for Water Supply**

  Once approval of the design documents has been granted, the project is advertised for public bids in accordance with State bidding law. Throughout construction, independent construction oversight must be provided by the applicant.

- **Step #11 – MassDEP Inspection of Permanent Works**

  Final MassDEP Inspection and approval of the constructed Permanent Works must occur before the new water supply source is allowed to operate. The inspection will include whether construction was completed in conformance with the approved plans, sanitary conditions, and other items pertinent to public safety.

4.3.3 Existing Sources

As discussed earlier in this report, the WDPW provides water to its customers from four active source locations consisting of six individual wells located within the Town of Ware. The four active sources are reported to have been installed as early as 1886 with the Cistern and more recently with the replacement wells for the Wellfield in 2016.

In general, well performance over time is influenced by many factors that can contribute to a steady and sometimes rapid decline in hydraulic performance. Well screen plugging and deterioration in yield can occur from encrustation and biofouling of the well screen surface, between the slot openings, gravel pack, and within the surrounding aquifer formation. In addition, the migration of silt, clay and fine sand over time can steadily decrease the soil pore space openings in the adjacent gravel pack and aquifer formation.

Well redevelopment entails the removal of the materials plugging the well screen via mechanical and chemical rehabilitation of the well and well screen. As most of the WDPW's well sources contain elevated concentrations of iron and manganese, loss of pumping capacity over time is common and well cleanings/redevelopments are routinely practiced.

Cleaning and redevelopment of each well is recommended when the specific capacity of the well drops no more than 10% from the last cleaning. Therefore, it's very important that the specific data be proactively tracked and recorded as it's possible that lost capacity may not be regained.

Although the exact method of cleaning and redevelopment varies for every source due to a variety of conditions (e.g., age, construction, screen type, water quality, surrounding formation, etc.), a comprehensive and routine well maintenance program should include the following:

- Prior to the well redevelopment process, a pre-cleaning pump test should be performed on each well utilizing the existing equipment to establish baseline performance data.
- After the initial performance test is completed, the pump equipment should be removed and the well televised for a record of its existing condition.

- After the removal of the pumping equipment, the well should be cleaned and redeveloped in accordance with the program that was specifically tailored for it. The traditional approaches used historically throughout New England may be suitable under certain circumstances. However, it is highly recommended that the technique selected avoid the use of any process which introduces a food source for bacteria growth (i.e., regrowth after cleaning).
- After the well is cleaned and redeveloped, the well should be televised again for a record of its rehabilitated condition and to identify any issues that were not visible prior to the first televised recording.
- Upon confirmation that all is acceptable from the second televised recording, a post-cleaning pump test should be performed on each well utilizing the existing equipment (cleaned and rehabilitated as necessary) to establish the new performance data.

In summary, the ultimate effectiveness of the chemical and/or mechanical cleaning is determined by the previously mentioned factors which resulted in the well's reduction in yield. The effectiveness of a well cleaning is also reduced when the well yield is allowed to decline for a longer period (i.e. increasing time between well cleanings). This often results in the inability of the well to regain its original construction hydraulic performance. Therefore, when significant well performance is lost and/or the cleaning frequency becomes too costly, a replacement well needs to be considered.

Although no sources are currently understood to be significantly under capacity, the WDPW should routinely clean and redevelop its existing sources to maintain its capacity.

4.4 SOURCE TREATMENT

As was presented within Section 2 of this report, the Wellfield, Well No. 4, and the Cistern are all chemically treated at the Pump House and the Dismal Swamp Well is chemically treated individually. At both locations, the water is treated with potassium hydroxide (KOH) for pH adjustment and sodium hypochlorite (NaOCl) for disinfection.

Historically, iron and manganese have been causing water quality problems and chronic consumer complaints in Ware. Both the iron and manganese concentrations have been exceeding their corresponding SMCL of 0.30 mg/L and 0.05 mg/L, respectively. It should be noted that the injection of NaOCl oxidizes any iron and manganese present in the water while the injection of KOH speeds up the process. This oxidation is what causes the minerals to become visible and cause consumer complaints. It should also be noted that even concentrations that are below their corresponding SMCLs will oxidize and slowly accumulate within the distribution system over time. These sediments will then be re-suspended during increased demands or with a flow reversal (e.g. use of hydrant) and cause dirty water complaints.

Additional information related to a regulatory review of these and other water quality constituents is presented later within Section 6 of this report.

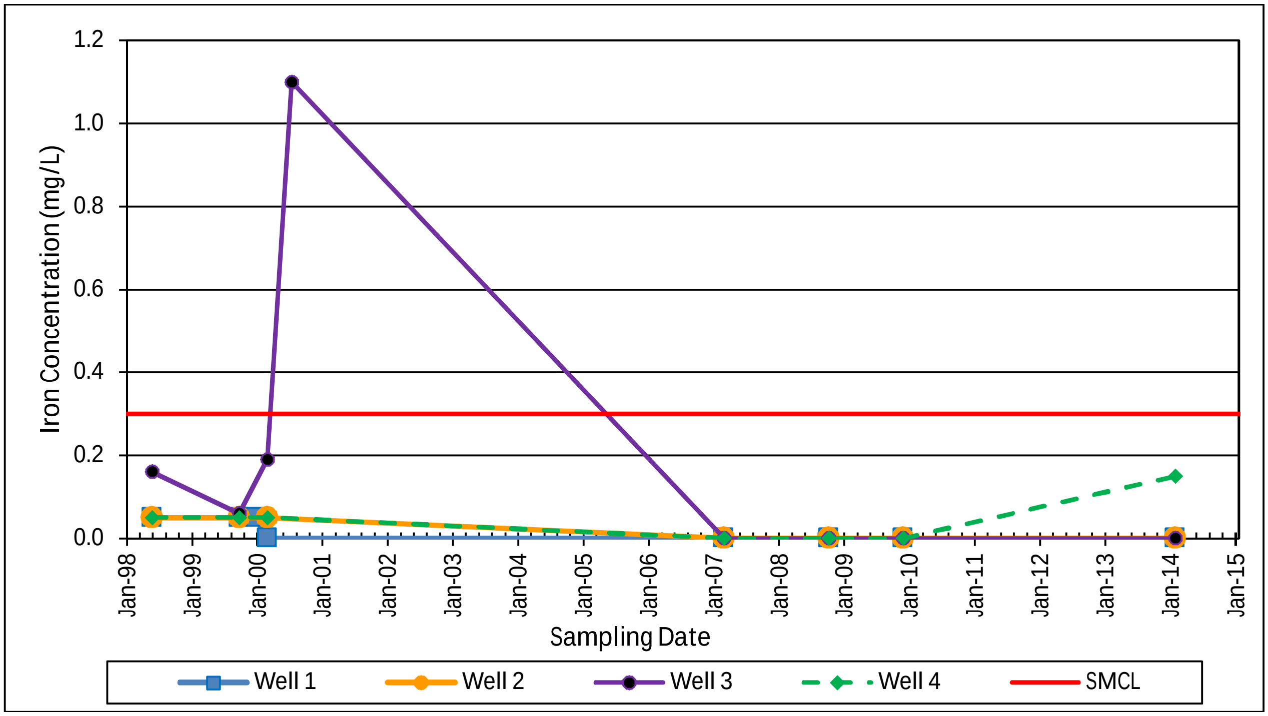
Figures 4-1 through 4-6 within this section present the available historic water quality data for iron and manganese from the Wellfield, Well No. 4, Cistern, and Dismal Swamp Well sources.

4.4.1 Barnes Street Sources

The Barnes Street Sources consist of Wells No. 1 through 4 and the Cistern. These sources are blended together at the Cistern and then chemically treated at the Pump House. Limited grab samples from each well source have been historically tested for iron and manganese.

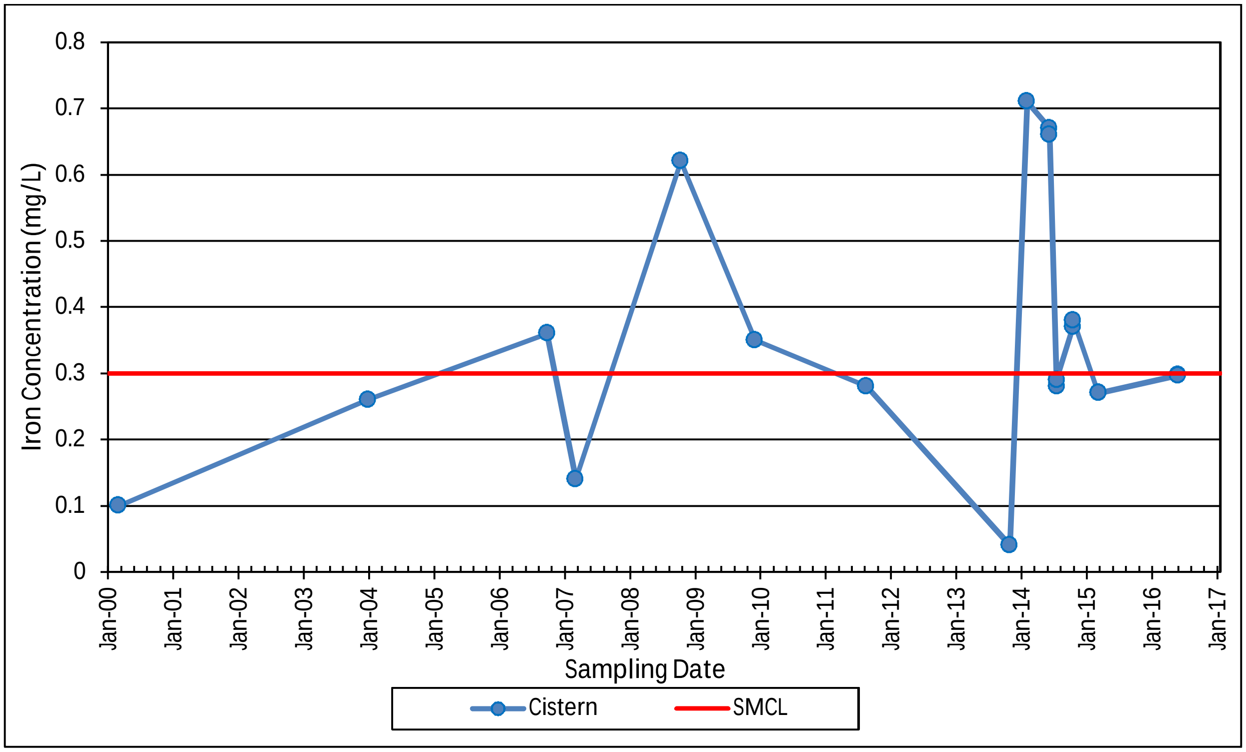
The available iron concentrations in Wells No. 1 through 4 between the years of 1998 and 2014 are presented in Figure 4-1.

FIGURE 4-1
IRON CONCENTRATIONS FOR WELLS NO. 1-4
WARE, MASSACHUSETTS



Besides the one exceedance of 1.1 mg/L for Well No. 3 in 2000, all of the wells (Wells No. 1 through 4) have been below the iron SMCL of 0.30 mg/L. Although the data is limited, the iron concentrations in Well No. 4 may be increasing. The blended iron concentrations at the Cistern are presented in Figure 4-2.

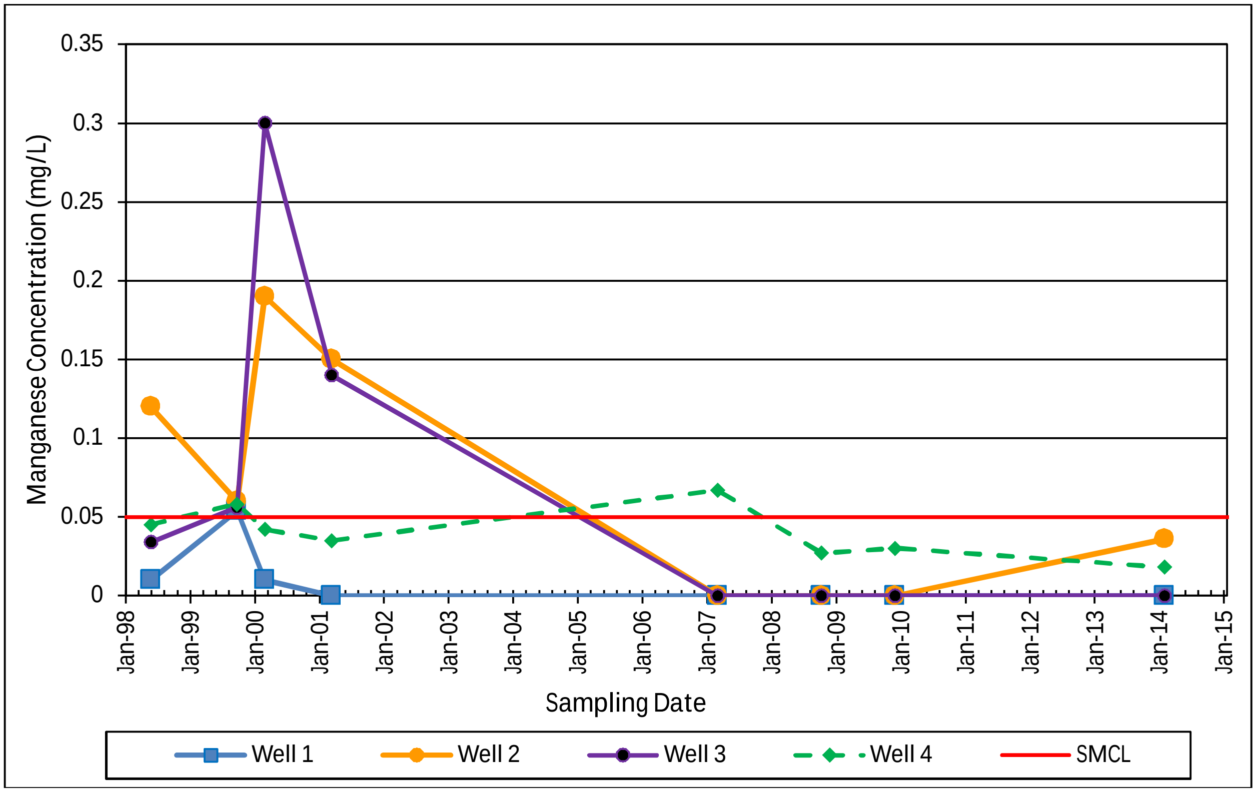
FIGURE 4-2
IRON CONCENTRATIONS FOR THE CISTERN
WARE, MASSACHUSETTS



Based on historic water quality since 2000, Wells No. 1 through 4 have not shown iron concentrations above the SMCL of 0.3 mg/L while the Cistern has had several exceedances since 2006. Therefore, it can be determined that the Cistern source is likely the cause of the iron exceedances during those pumping conditions. Furthermore, it can be assumed that the Cistern has a higher concentration than what is presented in the results (Figure 4-2) since all the sources were likely blended during sampling. These concentrations of iron (ranging to 2+ times the SMCL) will contribute to consumer complaints about “dirty water”.

The manganese concentrations in Wells No. 1 through 4 between the years of 1998 and 2014 are presented in Figure 4-3.

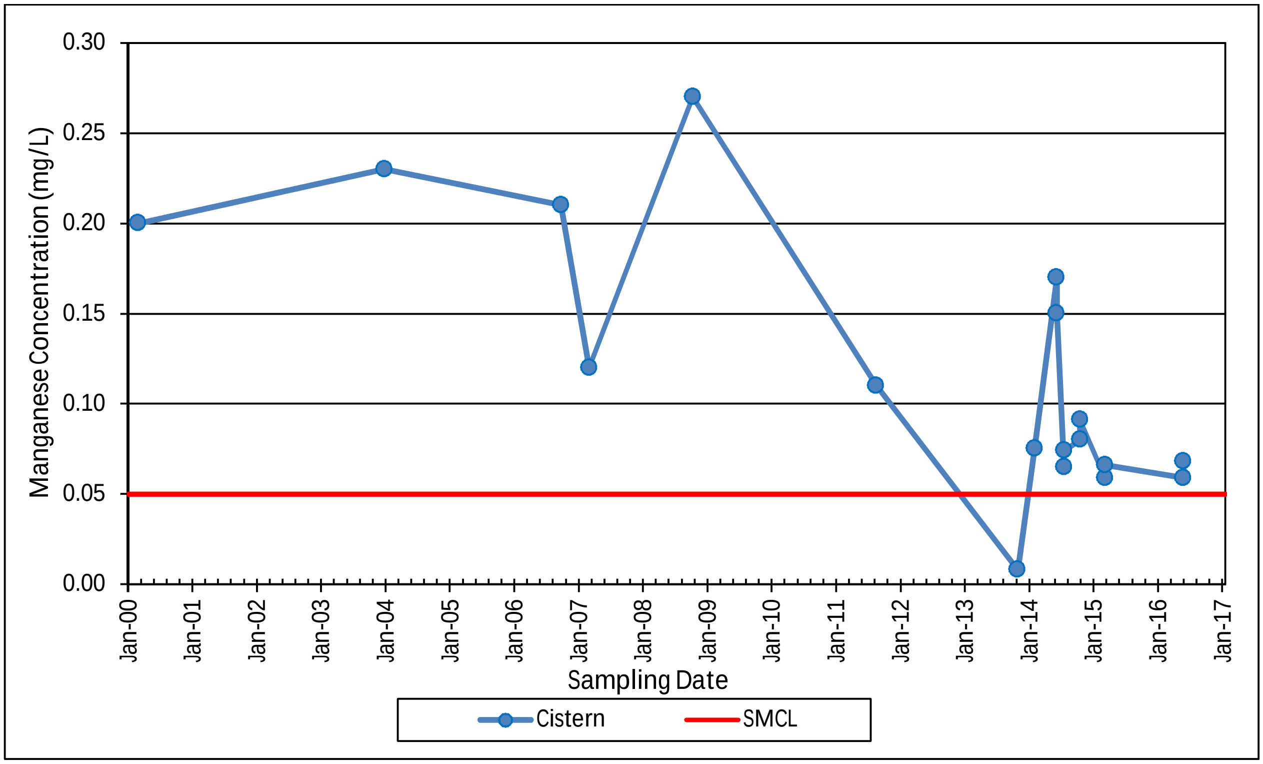
FIGURE 4-3
MANGANESE CONCENTRATIONS FOR WELLS NO. 1-4
WARE, MASSACHUSETTS



There have been several manganese exceedances from the four wells between 1998 and 2007. Well No. 1 has had one exceedance of 0.054 mg/L in 1999. Well No. 2 has had four exceedances (0.12 mg/L, 0.06 mg/L, 0.19 mg/L, and 0.15 mg/L) between 1998 and 2001. Well No. 3 has had three exceedances (0.056 mg/L, 0.30 mg/L, and 0.14 mg/L) between 1999 and 2001. Well No. 4 has had a total of two exceedances; 0.058 mg/L in 1999 and 0.067 mg/L in 2008. Since 2007, all of the manganese concentrations have been below the SMCL of 0.05 mg/L. However, Well No. 2 may be increasing based on the most recent data (2014).

The blended manganese concentration from the Cistern source is presented in Figure 4-4.

FIGURE 4-4
MANGANESE CONCENTRATIONS FOR THE CISTERN SOURCE
WARE, MASSACHUSETTS



Similarly, the concentration of manganese at the Cistern appears to also have come down recently but the concentrations are still above the manganese Secondary Maximum Contaminant Limit (SMCL) of 0.05 mg/L. The blended source has consistently had manganese concentrations well above the corresponding SMCL of 0.05 mg/L (ranging to approximately 5+ times the SMCL) from 2000 to 2016.

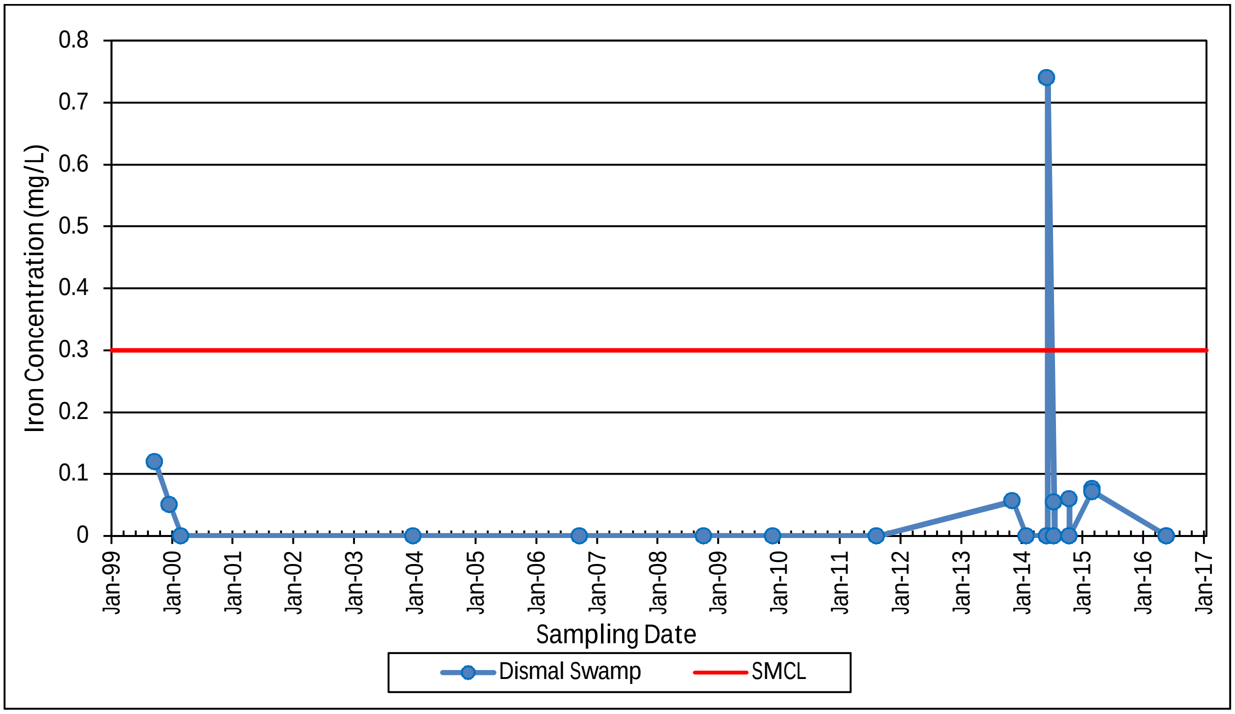
Although the manganese concentrations from Wells No. 1 through 4 have been below the SMCL since 2007, the Cistern's combined concentrations were still exceeding the SMCL. Therefore, it can be determined that the Cistern source is contributing to the elevated concentrations of manganese. These concentrations of manganese will also contribute to any water quality complaints.

4.4.2 Dismal Swamp Well Source

The Dismal Swamp Well source is being treated at the Gibertville Road Pump Station with potassium hydroxide (KOH) for pH adjustment and sodium hypochlorite (NaOCl) for disinfection. It is understood that the NaOCl feed system is not being used due to elevated manganese concentrations in the raw water. The WDPW will reactivate system with chlorination in the future or as required by MassDEP.

The historic iron concentrations for the Dismal Swamp Well source from 1999 to 2016 are presented in Figure 4-5.

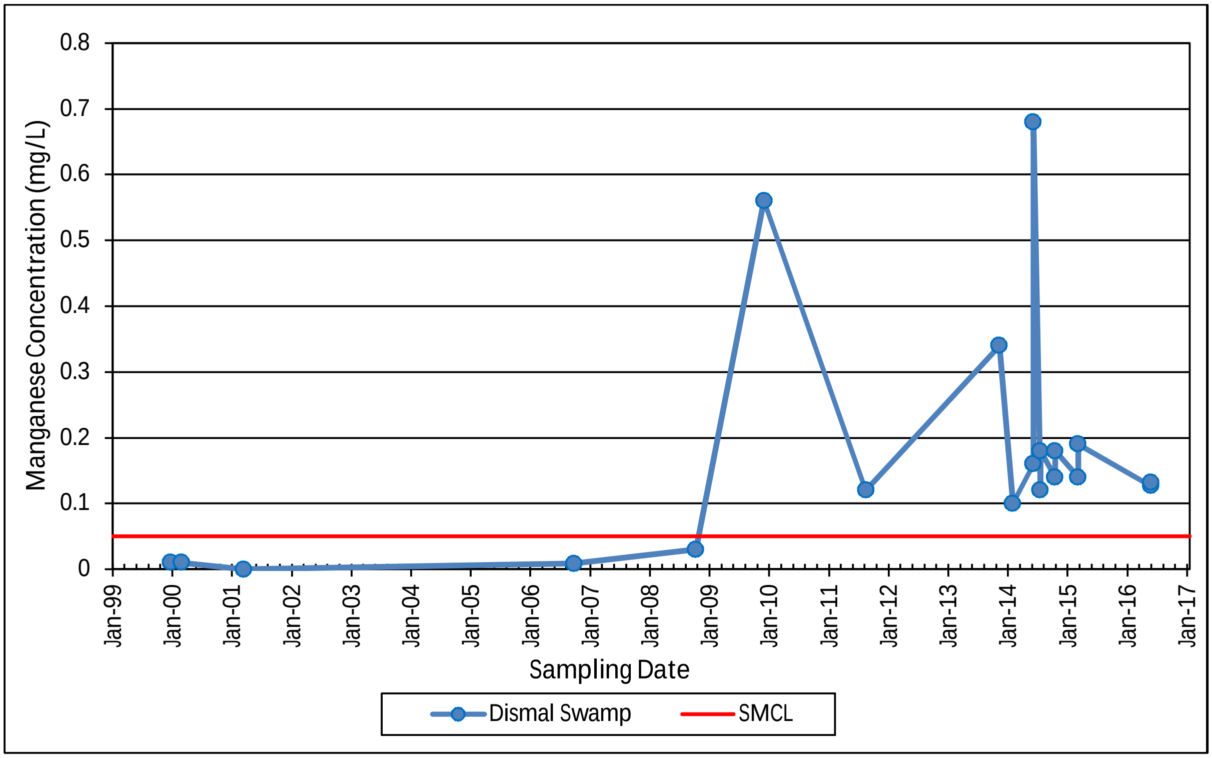
FIGURE 4-5
IRON CONCENTRATIONS FOR DISMAL SWAMP WELL SOURCE
WARE, MASSACHUSETTS



As can be seen from the data, the iron concentrations for the Dismal Swamp Well has been primarily below the corresponding SMCL with the exception of the one exceedance of 0.74 mg/L on June 16, 2014.

The historic manganese concentrations from 1999 to 2016 are presented in Figure 4-6.

FIGURE 4-6
MANGANESE CONCENTRATIONS FOR DISMAL SWAMP WELL SOURCE
WARE, MASSACHUSETTS



All of the sampling data since 2008 has been above the corresponding SMCL at the Dismal Swamp Well. Three of the data points were also above the ORSGL established by the MassDEP (further discussed in Section 6). The "Barnes Street Water Quality Evaluation" by Tata & Howard on April 18, 2012 evaluated potential causes for these exceedances since 2008. The report compared the concentrations and pumping rate to see if increased pumping from the well would contribute to increased concentrations and determined that there was not a direct correlation. The report noted that a check valve at the pump station was not working correctly when they were writing the report and suspected that it may have contributed to the manganese exceedances since distribution water could have flowed back into the well. Another factor that was considered for the high concentrations was potential changes in the aquifer and natural groundwater fluctuations.

4.4.3 Treatment Options

Due to chronic water quality issues, Wright-Pierce and WDPW acquired grant funding from USDA and supplemented it with Town funds to study the implementation of treatment at its sources. Based on information presented, four options are available.

4.4.3.1 Option No. 1

The first option is to only treat the Dismal Swamp Well source. This source has historically had the highest exceedances of manganese out of the six sources in Town. If treated, the Dismal Swamp Well would be capable of providing up to 0.583 MGD of treated water. Since the Town is projected to need 0.79 MGD for average daily demand (ADD) and 1.37 MGD for maximum daily demand (MDD) by 2025, this source would not be able to meet either of these demands. Water from the other sources would need to be utilized. Since the other sources would not be treated under this option, then the Town would still have iron and manganese issues.

4.4.3.2 Option No. 1a

As previously discussed, the Cistern source is suspected to be the cause for the elevated iron and manganese concentrations. Therefore, Option No. 1a would be similar to Option No. 1 but would also include the removal of the Cistern source. This option would treat the water at the Dismal Swamp Well source and then only utilize Wells No. 1 through 4 to fulfill demand. The combined approved maximum daily rate would be 1.67 MGD which would meet ADD and MDD.

Within the past several years, Wells No. 1 through 4 have had low concentrations of iron and manganese (below their corresponding SMCLs). In the future it is possible for these concentrations to increase due to increased pumping without the use of the Cistern. Eventually these sources may also need to be treated.

4.4.3.3 Option No. 2

Option No. 2 is to treat all of the Town's sources. Since the Dismal Swamp Well is not in a close proximity to the Barnes Street sources, it would have to be treated separately. Therefore, the installation of two water treatment plants would be required. A total combined maximum daily rate of 2.383 MGD could be provided to the Town from all of the sources. Since the ADD and MDD that would be needed by 2025 is only 0.79 MGD and 1.37 MGD, respectively, the total rate of 2.383 MGD would not be necessary and likely too costly.

4.4.3.4 Option No. 3

The last option is to only treat the water from the Barnes Street sources. The Barnes Street sources consist of the Wellfield (Wells No. 1, 2, and 3), Well No. 4, and the Cistern which when combined could supply the Town with an approved maximum daily rate of 1.80 MGD. This would meet the projected ADD and MDD of 0.79 MGD and 1.37 MGD, respectively. The Dismal Swamp Well source then could be used as a back-up source in case of an emergency. The Barnes Street sources are located in close proximity to each other and already are pumped through a common point with available land nearby and is in close proximity to the sewer system. Treatment could easily be provided at this common point.

Option No. 3 is overall the best plausible option. The Barnes Street sources alone can meet the Town's water demand needs and should the system grow significantly, treatment can be added at the Dismal Swamp Well (if needed). Therefore, Wright-Pierce recommends that the WDPW proceed with Option No. 3.

4.5 MISCELLANEOUS SUPPLY ISSUES AND RECOMMENDATIONS

The following section presents some other supply related issues that should be noted.

4.5.1 Emergency Power Provisions

Having appropriate emergency power provisions to maintain an adequate supply capacity during a loss of power event is an important consideration for water suppliers. The following is an excerpt from MassDEP's Guidelines and Policies about required emergency (standby) power provisions for water suppliers:

"*Standby power is required at all water treatment facilities and other facilities as may be required by MassDEP, unless it can be demonstrated that the facility has the ability to provide the maximum daily demand for up to 24 hours by other means. This may include the combined ability of other sources to provide the maximum daily demand through existing or new emergency power generation at those sources, from storage tanks, or through a viable interconnection with another public water supplier that is part of an emergency plan approved by MassDEP.*"

As was previously presented within Section 2 of this report, the WDPW has emergency power provisions only installed at the Pump House. This generator provides emergency power for the Pump House, the Wellfield, and one of the high lift pumps in the Cistern. With emergency power at this location, the WDPW has the capability to provide 1.08 MGD when utilizing the Cistern and Wellfield sources. The WDPW is also has an additional usable volume of 0.43 MG from their two water storage tanks (as calculated in detail within Section 5.5). Combined, these would add up to 1.51 MGD. The projected MDD for 2025 is 1.37 MGD; therefore, the WDPW currently has adequate provisions for emergency power according to the MassDEP requirements presented for the ability to provide the maximum daily demand for up to 24 hours.

There are no emergency power provisions provided at any other of the locations. Should the WDPW desire to have full emergency power provisions, suitable generators would need to be installed at all of its other source locations. These locations include the Dismal Swamp Well, Well No. 4, and the Booster Pump Station at the Church Street Tank. It is noted that emergency power provisions shall also be incorporated into the future Barnes Street WTP.

Section 5

SECTION 5

DISTRIBUTION SYSTEM EVALUATION AND ASSESSMENT

5.1 PURPOSE/SCOPE OF SYSTEM ANALYSIS

The purpose of the distribution system analysis is to assess the hydraulic adequacy of the Ware Department of Public Works' (WDPW) pumping and storage facilities, transmission mains, and distribution piping and its ability to satisfy both existing and projected demand conditions. The scope of the evaluation will be focused on the following:

A. Distribution System Hydraulics
   - Maximum and Minimum System Pressures
   - Adequate Fire Flows
   - Reliable Pipe Looping and Redundancy, Pipe Velocities and Pipe Sizing
   - Interconnections to Adjacent Utilities

B. Storage Analysis
   - Adequate Storage Volume
   - Location of Storage
   - Storage Redundancy
   - Adequate Emergency, Fire Storage and Peak-Hour Storage Volumes

Water systems are analyzed, planned and designed primarily through the application of basic hydraulic principles. The existing computer hydraulic model developed in 2012 by another consultant was supplied to Wright-Pierce by the Town to be used as the hydraulic tool for analyzing the condition of the Ware water system under existing and projected demands. The evaluation was based on compliance with Commonwealth of Massachusetts code requirements and standard engineering practice. A variety of options were considered as part of this Study. Specific recommendations are discussed in this section and summarized with cost estimates in Section 8.

5.2 DISTRIBUTION SYSTEM COMPUTER MODEL

A computerized hydraulic model of the Ware water distribution system was developed in 2012 by a previous consultant for the WDPW. Wright-Pierce (WP) was supplied with this model for the analysis and it is understood to have been previously calibrated. The model was originally developed using the InfoWater hydraulic modeling software as manufactured by Innovyze and was also used as the software modeling tool for this Master Plan. The element features or attributes assigned to the water system utilities included: pipe material, pipe diameter, pipe friction coefficient (Hazen-Williams C-Value), storage tank operating elevations, pump and tank level controls, and water system pump operation parameters.

5.2.1 Stress Conditions

Several stress conditions are run in order to evaluate the adequacy of the system to meet existing and projected demand conditions. This is done by simulating the following two demand conditions, using the computer hydraulic model:

- <u>Peak Hour on Maximum Day in the Year 2025</u>
  Under peak-hour conditions, a water system is considered adequate if a minimum pressure of 35 pounds per square inch (psi) can be provided to the entire service area.
- <u>Maximum Day in the Year 2025 Plus Various Fire Flow Requirements</u>
  Under maximum-day *plus* fire flow demand conditions, a system must be capable of providing the needed fire flow during maximum-day demands, while maintaining a minimum residual pressure of 20 psi coincidental throughout the distribution system.

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

5.3 WATER SYSTEM CHARACTERISTICS AND ADEQUACY

The approach used to evaluate the Ware distribution system was to first, identify the hydraulic requirements of the system, and secondly to identify the adequacy and limitations of the system under the existing and projected demand conditions.

Several factors are normally considered in the evaluation of the adequacy of a water distribution system. These include: system pressures, velocity of water in the pipelines, headloss, pipe looping, redundancy, piping reliability and adequacy, and future fire flow capabilities. Following is a discussion of each of these factors, as well as how they apply to both existing and projected demand conditions.

The following discussion presents the findings from the analysis and offers various options for resolving deficiencies.

5.3.1 Piping Validation

It is critical that actual details of the subsurface piping network be clearly understood in order to validate the necessity of improvements. The hydraulic model and system piping configuration was obtained from the existing hydraulic model provided by the Ware Department of Public Works. The piping network within the model is understood to be current.

5.3.2 Water System Pressure

A water system should be designed to accommodate a range of pressures within minimum and maximum guidelines (40 to 80 psi). Low system pressures result in customer complaints, may affect the accuracy of meters, and will restrict available flow for firefighting. Higher pressures can contribute to increased water loss from leakage (i.e., unaccounted-for water), can increase maintenance on equipment, lead to higher energy costs, and tend to increase consumption.

Approximately 64 percent of Ware's water system has static pressures between 80 and 120 psi, and approximately 33 percent of nodes have static pressures between 40 and 80 psi. The remaining

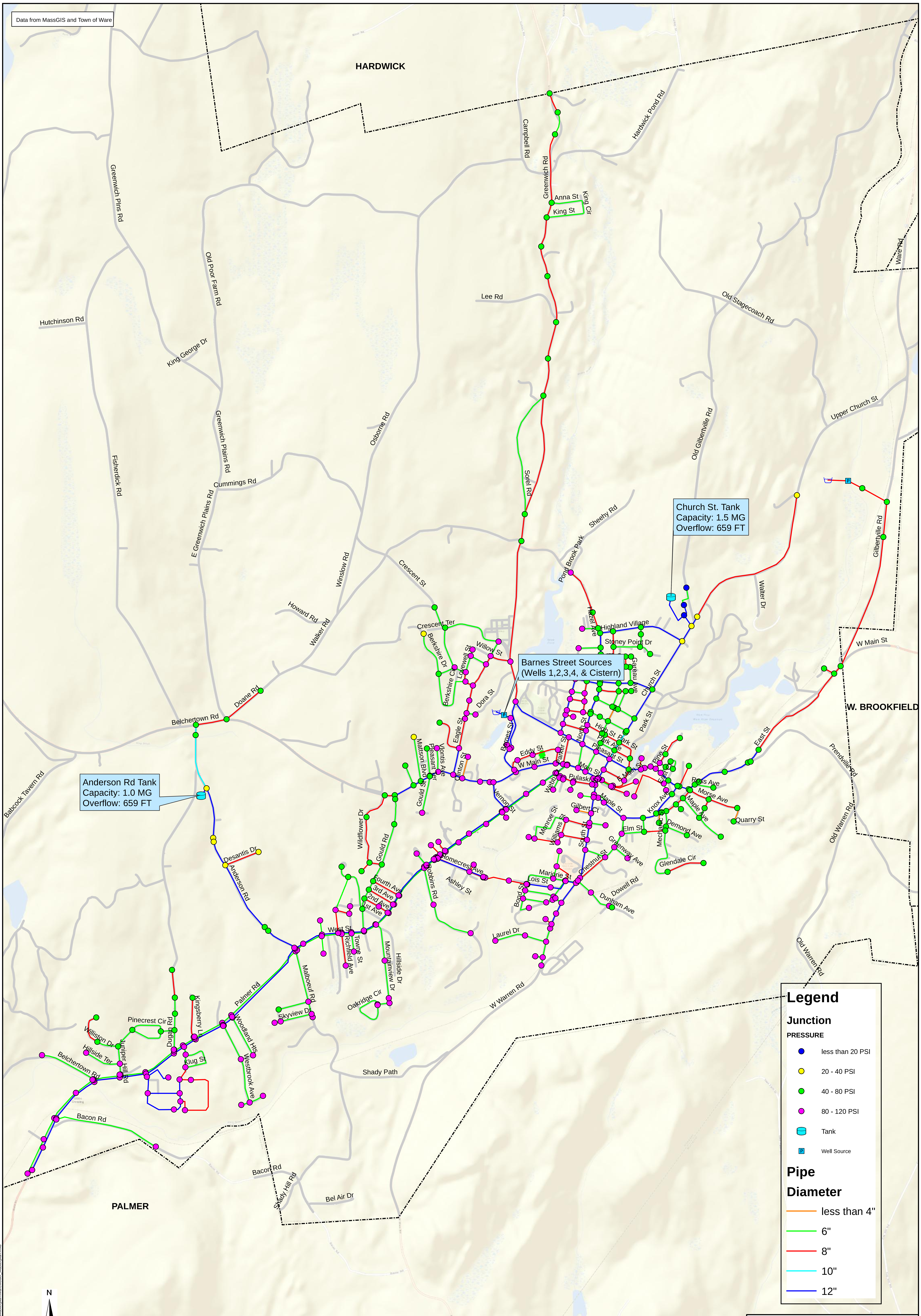
3% is below 40 psi. Figure 5-1 represents a color coded static pressure node map for various pressure ranges. As shown in the figure, the system is predominantly made up of pressures between 80 to 120 psi. There are only a few nodes that are less than 20 psi and these are located adjacent to the Church Street Tank. It is understood that these residential services in the immediate vicinity of Church Street Tank are on a small local boosted system.

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

Massachusetts Guidelines for Public Water Systems states that normal working pressure in the distribution system should be approximately 60 to 80 psi and not less than 35 psi. Standard water works practice generally allows a normal maximum system pressure of 80 to 100 psi. State Plumbing Code requires that household pressures must be lower than 100 psi. This can be achieved locally and is not a municipal requirement. Pressures throughout the system during fire flow events should be maintained above 20 psi at all locations. Services in areas where pressures exceed 80 psi should be considered for installation of pressure reducing valves.

5.3.3 Pipe Velocities and Head Loss

Water velocities in pipelines can have either a positive or negative impact on operations and water quality throughout the system. Pipes with velocities that exceed 5 feet per second (fps) contribute to increased headloss which in turn requires pumps to work harder and energy costs to increase. Higher velocities can also scour the interior of the pipe, which reduces its useful life. High velocities are common in smaller diameter piping. On the other hand, pipes having velocities below 2 fps present a risk of depositing sediment which could contribute to poor water quality and poor hydraulics. Generally, velocities in the system under all existing and future conditions were found to be adequate. The transmission mains from the Barnes Street sources (via the Cistern) will also experience velocities between approximately 2 to 3 fps depending on number of wells in operation.



Static Pressure Node Map

Ware, MA

PROJ NO: 13471A DATE: 10/18/2016 FIGURE: 5-1

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5.3.4 Dead-End Mains and Pipe Looping

Dead-end mains in a water system present a number of operational issues. First, because water cannot pass through a dead-ended pipe, velocities in these pipes tend to be very low. This condition can cause sediment build-up and contributes to poor water quality. In winter months, pipes having low velocities can be prone to freezing. Generally, the only way to improve this condition is to regularly flush the ends of these pipes, add bleeders, or loop the pipe into another location in the distribution system.

Flushing can be labor intensive and if not done on a regular basis, will have little effect in improving conditions. Bleeders, can be effective in improving water quality and help prevent freezing. But this method increases the unaccounted-for water component and electrical pumping costs. Looping requires capital investment in new piping. In some cases it may not be practical to loop pipes.

Measurable improvements in water quality, pressure and flow characteristics can be made by eliminating dead-ends. Not only would pipe looping improve hydraulics, it would also provide redundancy to the system. The WDPW distribution system is generally well looped, with the majority of the dead ends being 6-inch diameter water mains located on side streets. The longest dead-end in the system is a stretch of approximately 14,000 linear feet of 8-inch water main that runs north on Greenwich Road to the Hardwick Town line. Due to the isolated location of this water main relative to adjacent mains, no opportunities for looping this dead-end are available at this time.

5.3.5 Fire Flow

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

Specific fire protection requirements at a given locale vary with the physical characteristics of a building. ISO assigns a required fire flow based on the worst case premise in a general location using the following factors: (1) materials of construction, (2) its occupancy use, (3) proximity to other structures, (4) height and size of building, (5) the existence of fire walls, (6) presence or absence of sprinklers, as well as others. Some special use buildings may have required fire flow as high as 12,000 gallons per minute (gpm). Table 5-1 presents typical fire flow requirements for various building types and uses.

TABLE 5-1
TYPICAL FIRE FLOW REQUIREMENTS

Land-Use or Building Type	Range of Required Fire Flows and Flow Duration
SINGLE AND TWO FAMILY DWELLINGS	
Over 100 feet Building Separation	500 gpm for 2 hours
31 to 100 feet Building Separation	700 gpm for 2 hours
11 to 30 feet Building Separation	1,000 gpm for 2 hours
10 feet or less Building Separation	1,500 gpm for 2 hours
MULTIPLE FAMILY RESIDENTIAL COMPLEXES	2,000 to 3,000 gpm for 2-3 hours
AVERAGE DENSITY COMMERCIAL	1,500 to 2,500 gpm for 2-3 hours
HIGH VALUE COMMERCIAL	2,500 to 3,500 gpm for 2-3 hours
LIGHT INDUSTRIAL	2,000 to 3,500 gpm for 2-3 hours
HEAVY INDUSTRIAL	2,500 to 3,500 gpm for 2-3 hours

Municipal fire insurance ratings are partially based on a water utility's ability to provide needed fire flows up to a maximum flow of 3,500 gpm. The ISO requirement of 3,500 gpm is the criteria used for all non-residential land uses. This is the largest fire flow that the ISO recognizes as necessary for a system to provide even if a specific building within the community requires a greater fire flow. Many areas in Ware are considered to have fire flow requirements of 3,500 gpm.

The Ware public water system is predominately comprised of residential customers (91%). However, there are many locations throughout the system where the ISO requirement is 3,000 gpm or greater. The basis of our analysis considers the latest available ISO hydrant flow requirements and testing data completed in 2015. Table 5-2 lists the results of the model simulations of the available fire flows coincident with the projected year 2025 maximum-day demand for ISO locations throughout the service area.

The estimated available fire flows shown in Table 5-2 differ from the ISO field testing results completed in 2015 because of varying pumping rates, system demands and tank elevations during the testing period along with system pressure constraints used for the analysis. The available fire flows presented are based on maintaining a minimum 20 psi residual in all areas of the distribution system. The three locations adjacent to Church Street Tank that are boosted were not factored into the analysis. Normal field testing procedures do not take into account pressures in the distribution system other than at a test hydrant, which typically result in higher estimated available fire flow.

It should be noted that Table 5-2 presents a second set of estimated available fire flows which excludes an additional two nodes on Upper Church Street in proximity to the storage tank with elevations over 600 feet. These nodes are not understood to be boosted and due to their elevation were found to be the critical node in the majority of the fire flow simulations. The critical node being the first node in the system to drop to 20 psi during the simulation. By excluding these nodes from the analysis, the estimated available fire flow would represent a system with these nodes incorporated into the boosted area near the tank.

A discussion of piping replacement options to improve fire flows in deficient areas of the system follows.

TABLE 5-2
AVAILABLE FIRE FLOWS AT 2015 ISO TEST LOCATIONS
PROJECTED 2025 MAXIMUM-DAY DEMANDS

Test No.	Land-Use Description	Test Location	Available Fire Flow (gpm) Year 2015[1]	Estimated Available Fire Flow[2] (gpm) 2025	Estimated Available Fire Flow[3] (gpm) (Excluding >600' Elevation) 2025	ISO Required Fire Flow (gpm)[4]	Adequate (Yes/No)
1	Commercial	Palmer Road at Belchertown Road	1,800	1,010	1,625	1,500	**No**
2	Residential	Belchertown Road at Greenwich Plains Road	1,800	1,840	1,840	500	Yes
3	Commercial	R Palmer Road at Gould Road	2,500	900	1,960	3,000	**No**
4	Commercial	West Street at HomeCrest Avenue	2,500	810	1,770	3,500	**No**
5	Commercial	Warebrook Drive at Eagle Street	2,000	790	1,460	2,250	**No**
6	Commercial	Cresent Street at Greenwood Road	1,700	780	1,180	3,500	**No**
7	Commercial	Convent Hill Road at North Street	2,000	760	1,850	2,250	**No**
8	Commercial	Church Street at Park Street	2,500	770	1,770	3,000	**No**
9	Commercial	E. Main Street at Canal Street	2,300	775	1,745	2,000	**No**
10	Commercial	71 South Street	2,300	785	1,750	2,250	**No**
11	Commercial	Mechanic Street at Desmond Avenue	1,800	780	1,690	3,000	**No**
12	Commercial	East Street at Ross Avenue	2,300	775	1,750	1,750	**No**
13	Residential	Greenwich Road at Lee Road	600	670	670	500	Yes
14	Commercial	Gilbertville Road at East Street	1,000	780	1,000	3,000	**No**

[1] Available Flows per reported 2015 ISO Hydrant Test Data does not consider maintaining 20 psi residual system pressure.
[2] Estimated available fire flows based on tank levels 2 feet down from overflow and well supply pumping off, minimum system pressure of 20 psi (excluding boosted nodes around Church Street Tank).
[3] Estimated fire flows assume an expanded boosted zone around Church Street Tank which excludes all nodes above 600 feet from the analysis.
[4] Flows greater than 3,500 gpm are not considered in evaluating system compliance with ISO fire suppression rate schedule.

5.3.5.1 Fire Flow Deficiencies

In general, Ware has adequate hydraulic capacity to meet its residential fire flow demand requirements, however there are numerous areas where commercial fire flows are inadequate. Table 5-2 displays a total of ten inadequate fire flow areas under current maximum day demand conditions.

Figure 5-2 displays each ISO node within the system and whether it has adequate available fire flow to meet the required ISO demand assuming a minimum system pressure constraint of 20 psi. The AFF run was based on the existing system infrastructure utilizing current projected 2025 Maximum Day Demands. The status of all well supplies is off, and storage tank levels were set to 2 feet below overflow elevation (overflow elevation: 659 feet). This elevation most accurately represents the operating zone of the storage tanks based on existing information. The following sections discuss options that have been considered to resolve the apparent fire flow deficiencies.

<u>Residential Fire Flow</u>

Of the 14 ISO test locations, only two are classified as residential. The first location (ISO #2) is located at the intersection of Belchertown Road and Greenwich Plains Road, while the second location (ISO #13) is located at the intersection of Greenwich Road and Lee Road. The results of the hydraulic simulation estimated adequate fire flow available at both locations to meet the 500 gpm requirement as shown on Table 5-2.

<u>Commercial Fire Flow</u>

The remaining 12 ISO test locations are all categorized as commercial with required fire flow demands ranging from 1,500 gpm to 3,500 gpm. Of the 12 commercial ISO test locations evaluated, all identified as having inadequate fire flow based on the hydraulic analysis. A discussion of each deficient ISO location along with potential improvements follows.

FIGURE: 5-2

ISO Test Locations

Ware, MA

Palmer Road at Belchertown Road (ISO #1)

Fire flows at this location were found to be deficient by approximately 490 gpm. This section of Palmer Road is located on the west side of the distribution system and is currently served by a 12-inch ductile iron water main with a parallel 6-inch diameter cast iron water main. Fire flow is limited at this location due the low system pressures at the high elevations around Church Street Tank that are not currently boosted. When running the fire flow simulation with an increased boosted zone on Upper Church Street to include all nodes with elevations 600 feet or higher, the ISO fire flow demand is met. Therefore, expanding the boosted zone adjacent to Church Street Tank to include the additional high elevation homes on Upper Church Road is the recommended improvement to address this fire flow deficiency.

R Palmer Road at Gould Road (ISO #3)

Fire flows at this location were found to be deficient by approximately 2,100 gpm. This section of Palmer Road is currently served by a 12-inch asbestos cement main and a parallel 6-inch cast iron main. Fire flow is limited at this location due the low system pressures at the high elevations around Church Street Tank during the simulation. When removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand of 3,000 gpm, which would indicate that hydraulic restrictions are not the limiting factor but that elevational restrictions are. When running the fire flow simulation with the expanded boosted zone improvement on Upper Church Street, the available fire flow increases to approximately 1,960 gpm, however it is still deficient by approximately 1,000 gpm. The Anderson Road Tank is located just over a mile away from this ISO location, with all 12-inch diameter water main along the route. Elevational restrictions in the system can be improved by installing booster stations or increasing the hydraulic grade line of the system (i.e. raising tanks). Although expanding the boosted pressure zone to include the houses on Upper Church Street will not increase flow enough to meet the required ISO demand, this improvement is still recommended based on the increase of 1,000 gpm in additional fire flow it provides.

West Street at HomeCrest Avenue (ISO #4)

Fire flows at this location were found be deficient by approximately 2,690 gpm. This ISO location is approximately 2,500 linear feet east of ISO #3 where Palmer Road transitions to West Street.

Similar to ISO #3, this section of West Street is served by a 12-inch diameter asbestos concrete main with a parallel 6-inch cast iron main. Available fire flow is limited at this location due to low system pressures at the high elevations around Church Street Tank. When removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand of 3,500 gpm, which would indicate that hydraulic restrictions are not the limiting factor but that elevational restrictions are. Similar to ISO #3, when running the fire flow simulation with the increased boosted zone improvement on Upper Church Street, the available fire flow increases; however, it is still deficient by approximately 1,730 gpm. For similar reasons noted for ISO #3, the expansion of the boosted zone to include Upper Church Street is recommended.

Warebrook Drive at Eagle Street (ISO #5)

Fire flows at this location were found to be deficient by approximately 1,460 gpm. This location is located on the west side of the distribution system and is currently served by a 12-inch ductile iron main off W. Main Street from the south. An 8-inch ductile iron main on Eagle Street feeds this location from the north (i.e. looped). Fire flow is limited at this location due the low system pressures at the high elevations around Church Street Tank during the simulation. When removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand, which would indicate that hydraulic restrictions are not the limiting factor but rather elevational. Similar to previous ISO locations, available fire flow increases by approximately 670 gpm when running the fire flow simulation with the expanded boosted zone on Upper Church Street; however, it still does not meet the ISO required demand of 2,250 gpm. Although the ISO fire flow demand cannot be met, the expansion of the boosted zone is still recommended for similar reasons noted in previous locations.

Cresent Street at Greenwood Road (ISO #6)

Fire flows at this location were found to be deficient by approximately 2,720 gpm. This ISO location is fed by an 8-inch asbestos cement water main from Pleasant Street and is located just north of the Barnes Street well sources. This ISO location is also looped via Eagle Street by an 8-inch water main. When removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand at this location. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increased by approximately 400 gpm, which is still approximately 2,320 gpm less than the 3,500 gpm required by ISO. Unlike previous ISO locations which were located on existing 12-inch diameter mains, this location is fed from 8-inch diameter mains. A second simulation was run after increasing the diameter of the existing 8-inch mains on Pleasant Street and Eagle Street to 12 inches in diameter along with the expanded boosted zone. This improvement would create a loop of 12-inch pipe feeding the ISO location. The results of this simulation found an increase in available fire flow of approximately 300 gpm, which is still less than the required 3,500 gpm at this location. Given the minimal benefit at this location of expanding the boosted zone or increasing the pipe diameters, we do not recommend any improvements for this location.

Convent Hill Road at North Street (ISO #7)

Fire flows at this location was found to be deficient by approximately 1,490 gpm. North Street is served by a 12-inch ductile iron pipe. The fire flow location is looped through 12-inch diameter water mains on Highland Village to the north and Walnut Street to the south. These two mains are fed from another 12-inch diameter ductile iron main on Church Street which creates a loop. The Church Street Tank is located just north of the fire flow location. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increases by approximately 1,000 gpm, which reduces the deficit to approximately 400 gpm. The model indicated higher head-loss though the existing sections of 10-inch and 12-inch cast iron main that run along Church Street from Pleasant Street to the tank. The low C-factor (60) which has been assigned to this stretch of cast iron pipe would indicate that the piping may be restricted due to heavy tuberculation over time or potentially a partially closed valve; however, the installation date is unknown. A second simulation was run after installing new piping on Church Street from Pleasant Street to the storage tank (approximately 3,800 linear feet) while also incorporating the expanded boosted zone. The results of the simulation increased the available fire flow by approximately 650 gpm, which meets the ISO flow requirement of 2,250 gpm. In addition to expanding the boosted pressure zone, we also recommend that the Church Street piping is rehabbed/replaced between Pleasant Street and the tank. Additional investigation by the WDPW is recommended on this stretch of pipe to determine the cause of the hydraulic restriction. If it is determined that tuberculation is the cause, then it will be much more cost effective to clean and line this pipe rather than replace it entirely.

Church Street at Park Street (ISO #8)

Fire flows at this location were found to be deficient by approximately 2,320 gpm. This section of Church Street at Park Street is served by a 10-inch cast iron water main. The Church Street Tank is located to the north and the piping transitions to 12-inch cast iron approximately one block from the ISO location and continues as 12 inches all the way to the tank. It should also be noted that when removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increases by approximately 1,000 gpm, which reduces the deficit to approximately 1,230 gpm. When running the simulation with the proposed improvements on Church Street (see ISO #7) along with the expanded boosted zone, the available fire flow increased to approximately 2,375 gpm; however, it is still not adequate to meet the ISO flow 3,000 gpm. Although the ISO fire flow demand cannot be met, the expansion of the boosted zone along with the piping upgrades on Church Street are still recommended because they increase available fire flow by approximately 1,600 gpm.

East Main Street at Canal Street (ISO #9)

Fire flows at this location were found to be deficient by approximately 1,225 gpm. This location is served by a 12-inch ductile iron pipe on East Main Street. Supply to this location is primarily fed via the 12-inch diameter cast iron main on Church Street. When removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increased by approximately 1,000 gpm, reducing the deficit to approximately 250 gpm below the ISO required 2,000 gpm. When running a third simulation with the proposed improvements on Church Street (see ISO #7) along with the expanded boosted pressure zone, the available fire flow increases to approximately 2,340 gpm which meets the required ISO demand of 2,000 gpm. Therefore, we would recommend implementing these two improvements in order to meet the ISO fire flow demand.

71 South Street (ISO #10)

Fire flows at 71 South Street were found to be deficient by approximately 1,465 gpm. This location is served by a 12-inch ductile iron main on South Street. This end of South Street is also fed from West Street via an 8-inch water main off Homecrest Avenue, which provides additional looping. When removing the system pressure constraint of 20 psi from the simulation, there is adequate available fire flow to meet the ISO demand. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increased by approximately 1,000 gpm, reducing the deficit to approximately 500 gpm below the ISO required flow of 2,250 gpm. When running a third simulation with the proposed improvements on Church Street (see ISO #7) along with the expanded boosted pressure zone, the available fire flow increased to approximately 2,300 gpm which meets the required ISO demand of 2,250 gpm. Therefore, we would recommend implementing these two improvements in order to meet the ISO fire flow demand.

Mechanic Street at Desmond Avenue (ISO #11)

Fire flows at this location were found be deficient by approximately 2,220 gpm. This location is currently served by an existing 6-inch cast iron water main on Mechanic Street. When removing the system pressure constraint of 20 psi from the simulation, there was still inadequate available fire flow to meet the ISO demand. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increased by approximately 900 gpm, reducing the deficit to approximately 1,300 gpm below the ISO required flow of 3,000 gpm. The commercial fire flow requirement of 3,000 gpm is a large flow for a 6-inch pipe to accommodate. A second improvement scenario was performed in which the pipe on Mechanic Street was increased to 8 inches in diameter in addition to incorporating the expanded boosted zone. The results of this scenario increased the available fire only marginally (approximately 100 gpm), indicating that the majority of the headloss is occurring elsewhere in the distribution system. A third improvement scenario was run which incorporated the upgrades from the previous scenario along with the upgrades on Church Street (ISO #7) and the expanded pressure zone. These improvements increased the available fire flow to approximately 2,340 gpm; however, it did not meet the required ISO flow of 3,000 gpm. The minimum recommendation is to upsize the pipe on

Mechanic Street to 8-inch in diameter. If the other noted upgrades are also incorporated it will increase available fire even closer to the required ISO flow of 3,000 gpm.

East Street at Ross Avenue (ISO #12)

Fire flows at this location were found to be deficient by approximately 975 gpm. This location is currently served by a 12-inch ductile iron main on East Street. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increased by to approximately 1,750 gpm which meets the required ISO flow at this location. Therefore, we recommend the expansion of the boosted zone to meet the ISO demands.

Gilbertville Road at East Street (ISO #14)

Fire flows at this location were found be deficient by approximately 2,220 gpm. This location is currently served by an existing 8-inch asbestos cement water main. This location is on a long stretch of 8-inch water main that serves as the primary feed into the system from Dismal Swamp Well. When running the fire flow simulation with the expanded boosted zone on Upper Church Street, the available fire flow increased only marginally (approximately 220 gpm) which is still well below the required ISO flow of 3,000 gpm. Due to the isolated geographic location of this water main compared to the rest of the distribution system, no opportunities for looping are feasible at this time. An increase in pipe diameter will also not make a significant improvement. Therefore, no recommendations are made for this location.

5.3.6 Summary

A variety of hydraulic criteria were used to evaluate the adequacy of the distribution system. In many regards, the water system is strong and in relatively good condition. However, a number of deficiencies exist throughout the system that should be addressed as funding allows. Following is an overview of the areas of identified deficiencies. Specific detail can be found in the previous sections. Summary recommendations for distribution system piping improvements can be found in Section 8 of this report.

5.3.6.1 Water System Pressure

Pressures throughout the system are generally adequate, however because of the rolling terrain of Ware, the pressures in the system range vary significantly. As is typical of most systems, areas of low pressure exist in the immediate vicinity of storage tanks (Church Street Tank) and in the highest elevations of the system. Little can be done about these conditions unless the tank overflow is raised or individual booster systems are placed on the service lines of the affected customers. Currently there is a booster pump station at the Church Street Tank since the tank is at a lower hydraulic grade line than four houses nearby along Gilbertville Road. It is recommended based on the fire flow analysis that this boosted zone be expanded to include an additional 10 to 11 houses along Upper Church Street with elevations above 600 feet. Under the projected maximum day demand in 2025 pressure will range between 20 to 116 psi. The use of localized pressure reducing valves is recommended for pressures above 100 psi.

5.3.6.2 Pipe Velocities and Headloss

A higher velocity of water in a pipeline increases headloss and subsequently increases pumping costs. In general, velocities throughout the system were adequate under 2025 maximum day demand conditions with the pumps off. Velocities were not evaluated during fire flow analysis (as this is an extreme situation).

5.3.6.3 Dead-End Mains and Pipe Looping

The entire system generally appears to be well looped with the exception of a long 14,000 linear foot stretch of 8-inch water main on Greenwich Road which extends north to the Hardwick town line. However, due to its geographic location relative to the rest of the system, no opportunities for looping are available at this time. The majority of the dead-ends consist of small diameter asbestos cement and cast iron piping. In general, older un-lined cast iron dead-end mains should be targeted for long term replacement and included in the yearly pipe replacement program.

5.3.6.4 Fire Flow

In general, the Ware water system is adequate in terms of being able to provide the needed residential fire flows. However, it should be noted that approximately 40% of the pipe in the system is 6 inches or smaller in diameter, which may limit fire flow capacity (standard water works practice recommends 8 inches as a minimum). Given the amount of 6-inch pipe in the system, replacement should be prioritized to locations with hydraulic deficiencies. These residential areas identified through the hydraulic analysis were found to be the most hydraulically deficient (i.e. <500 gpm available fire flow):

1. Mountainview Drive and Oakridge Circle (3,700 linear feet of 6-inch)
2. Canal Street (280 linear feet), Clinton Street (550 linear feet), and Maple Street (290 linear feet) (all 4-inch dead-ends)
3. Dunham Avenue (80 linear feet of a 2-inch dead-end)

A number of commercial locations of the system are deficient. In total, 12 commercial ISO fire flow test locations were evaluated using the hydraulic water model and all 12 were found to be deficient. The analysis was performed using standard engineering practice where the available fire flow represents the total flow available while maintaining a minimum of 20 psi throughout the system, not just at the fire flow node. Due to the various high elevations in the system, the available fire flows at these locations were limited by pressure drops below 20 psi elsewhere in the system. Although the improvements described previously did not solve all the commercial ISO flow deficiencies, the following provided the largest increase in available fire flow and should be considered:

1. Expansion of the boosted zone around Church Street Tank to include the 10 to 11 additional homes on Upper Church Street (ISO #1).
2. Replacement of approximately 800 linear feet of 10-inch cast iron pipe on Church Street between Pleasant Street and Prospect Street with new 12-inch ductile iron pipe (ISO #7).
3. Replacement of approximately 3,000 linear feet of 12-inch cast iron pipe on Church Street between Prospect Street and the Church Street Tank. Confirmation of pipe condition is

recommended prior to replacement to determine if hydraulic restriction is related to another cause (i.e. partially closed valve, mislabeled pipe size, or etc.) (ISO #7).

4. Replace approximately 2,000 linear feet of 6-inch cast iron pipe on Mechanic Street with new 8-inch ductile iron (ISO #11).

As noted previously, little can be done about the low pressures in high elevation unless the tank overflow is raised or individual booster systems are placed on the service lines of the affected customers. Therefore, if meeting the ISO demands at the large commercial locations is critical, it would be most effective to incorporate local booster systems on a case-by-case basis at these locations. It should also be noted that the estimates provided are with all well pumps off. Increased flows would be provided with pumps on (but is not part of typical fire flow analyses).

5.4 WATER MAIN INVENTORY

Water mains in particular have been identified as the largest component of drinking water systems requiring attention. In fact, the 2011 Drinking Water Infrastructure Needs Survey Assessment (DWINSA) report by the EPA identified the transmission and distribution component to be over 64.4% of the total need for the next twenty years. This corresponds to an amount of $247.5 billion dollars.

The water works industry is moving towards a practice of maintaining an on-going replacement program where 1% to 2% of the total system length is replaced annually. Doing this would help assure that the distribution system is fully replaced every 50 to 100 years to improve and maintain reliability. As this approach would require large annual capital expenditures that could have proportionately larger rate impacts to smaller systems, replacing 2% of a distribution system annually could be very difficult without financial assistance. Taking into consideration the size of the WDPW system, we will assume replacing 0.5% of the system annually. With a current system size of approximately 47 miles, this would equate to approximately 1,240 linear feet per year of water main replacement. Assuming a unit capital cost of $175 per linear foot of 8-inch water main installed, the total cost per year for WDPW calculates to be approximately $220,000. Under this scenario, the distribution system would be fully replaced in 200 years. It is acknowledged that as priorities change and funding better understood, the annual replacement program can be re-assessed and modified as necessary.

Within the annual replacement program budget, the WDPW plans to complete a phased project to remove an older existing 6-inch cast iron water main on West Street with poor hydraulic capacity. Currently this street has 6-inch and 12-inch water mains that supply water to the customers. The project includes relocating the services from the 6-inch main to the 12-inch main and then eliminating the 6-inch main and any interconnections from the system.

5.4.1 Method of Analysis

The Ware water distribution system is comprised of several types of water main installed between 1912 and the present. Each type of water main will reach the end of its useful life at a different time depending on the age, diameter, materials of construction, installation, and working pressure. Therefore, it is important to have a comprehensive inventory of all water mains in the system. Based on data provided by the WDPW the following data was compiled and tabulated for all water main segments:

- Diameter;
- Material of Construction;
- C-value;
- Static Pressure;
- Break History.

In future analyses, the installation date (if available) and areas of water quality complaints (after WTP construction) should be included.

A weighted ranking system was then developed for the data and used to calculate a numerical value (sum) for each segment and prioritization of the future water main improvements. In general, the higher the weighted value, the more important that criteria is for determination of replacement need. The values and weighting factors determined for each of the criteria are presented below.

Diameter - In general, the smaller the diameter of the installed water main, the less likely it may be able to provide adequate supply. Larger diameter water mains have thicker walls, and are therefore stronger as well. In general, 8-inch diameter pipe is the accepted minimum water main diameter recommended for water distribution systems. Accordingly, the criteria values for diameter were established as follows:

TABLE 5-3
DIAMETER CRITERIA VALUES

Diameter	Value
2-inch	100
4-inch	100
6-inch	100
8-inch	40
10-inch	20
12-inch	10
16-inch	5

The corresponding weighting factor selected for diameter was 20%.

Material of Construction - The typical water main materials of construction have a variety of differences based on their strength, corrosion resistance, flow characteristics, etc. that can be correlated to their useful life expectancies. However, it is noted that even the same materials (such as cast iron) have different life expectancies based on their period of manufacture. A recent study by the American Water Works Association (AWWA) titled "Buried No Longer: Confronting American's Water Infrastructure Challenge" utilized a pipe failure probability model, extensive research and professional experiences to estimate the typical service life for various types of pipe as shown in Table 5-4.

TABLE 5-4
ESTIMATED SERVICE LIFE BY MATERIAL

Material	Service Life (Years)
Asbestos Cement	100
Cast Iron	115
Ductile Iron	110
HDPE	100
PVC	100

It should be noted that due to changing materials and manufacturing techniques, pipe installed through the 1920s has a longer useful life than installed after World War II. In addition, the data provided in Table 5-4 is for pipes that were installed in suitable ground conditions and modern laying practices. Pipes that were installed in poor ground conditions or improperly installed may have shorter expected service lives.

Based on the expected service life and current age of the water main in the Ware system, the following criteria values were utilized for the pipe material:

TABLE 5-5
MATERIALS CRITERIA VALUES

Material	Value
Asbestos Cement	100
Cast Iron	70
Ductile Iron	5
HDPE	5
PVC	5

A weighting factor of 30% was selected for the material of construction.

Static Pressure - Based on the current hydraulic model, static pressures within the water distribution system can vary from a high of approximately 120 psi down to a low of approximately 40 psi. Massachusetts Guidelines for Public Water Systems states that normal working pressure in the distribution system should be approximately 60 to 80 psi and not less than 35 psi. Standard water works practice generally allows a normal maximum system pressure of 80 to 100 psi. Although common in New England, higher pressures can lead to increased water loss at leaks and more frequent breaks as water mains approach the end of their useful life. For the static pressure criteria, the following values were established.

TABLE 5-6
PRESSURE CRITERIA VALUES

Pressure (psi)	Value
Greater than 120	100
100 - 120	80
80 - 100	60
Less than 80	20

The weighting factor of 20% was selected for static pressure.

Break History - Historical water main break records offer one of the clearest indications of past and likely future, problem areas within a water distribution system. Although highly undesirable, breaks can be a regular occurrence within water distribution systems that must be dealt with immediately. Several factors can contribute to breaks including poor installation, shallow burial depths, corrosion, environmental factors, and many of the other criteria discussed. Accordingly, the criteria values for break history were established as follows:

TABLE 5-7
BREAK HISTORY CRITERIA VALUES

Breaks	Value
4+	100
3	80
2	60
1	40
0	0

Due to its highly undesirable impacts, a weighting factor of 30% was selected for break history.

5.4.2 Prioritization of Water Main Projects

Utilizing the criteria and weighting factors discussed above a pipe condition score was calculated for each pipe in the distribution system. These scores were then sorted from highest to lowest as an initial means of upgrade prioritization (as a higher sum indicated a greater need for upgrade/replacement). Two water main inventory spreadsheets were developed from this exercise. The first includes the alphabetized list of pipes by street and their associated physical characteristics (no pipe condition scores). The second spreadsheet sorts the pipes according to their pipe condition scores, from highest to lowest and also highlights the pipes recommended for replacement. These spreadsheets are included in Appendix H.

Figure 5-3 includes pipe condition scores for all water mains in the system. Pipe rankings were colored as follows:

- Red: Pipe ranking from 75-90.
- Orange: Pipe ranking from 60-74.
- Blue: Pipe ranking from 40-59.
- Green: Pipe ranking from 0-39.

Water Main Ranking

Ware, MA

PROJ NO: 13471A DATE: 10/18/2016 FIGURE: 5-3

WRIGHT-PIERCE
Engineering a Better Environment

The piping upgrades included in the Capital Improvement Plan were selected based on two primary factors: pipe condition score and available funding per year. In general, those pipes with a pipe condition score greater than 60 are considered to be in fair to poor condition. However, because of limitations in funding, all piping with scores of 60 or higher cannot be replaced within a 10-year improvement period. As stated earlier in this section, we are assuming a replacement schedule of approximately 1,240 LF of pipe per year at $175/LF which correlates to approximately $220,000 per year for replacement costs. Over the course of the 10-year capital improvement period, this correlates to approximately 12,400 linear feet of new pipe construction. In general, water mains with pipe condition scores of 60 or more were initially selected for replacement that added up to a total of approximately 36,192 linear feet. Since this value exceeds the proposed budgeted amount for repairs, we would recommend the WDPW replace these pipes each year as budget allows. The specific water main replacement recommendations and associated costs are included in Section 9 and within the Capital Improvements Plan (CIP) in Section 9.

5.5 DISTRIBUTION STORAGE

Distribution storage is used for and provides a number of important functions to a water system. This includes establishing and sustaining adequate pressure throughout the system, fire fighting capabilities, and short-term emergency purposes. Storage also provides a "cushion" to equalize peak fluctuations, improves service reliability, provides operational flexibility, and allows intermittent operation of pumping equipment. Ware has two distribution storage facilities on a single pressure zone. As part of this study, a storage analysis was conducted, and is presented in the following section.

5.5.1 Storage Analysis

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

- Storage should be provided to satisfy all demands which exceed the maximum day flow rate. In general, the volume of storage which is depleted during the typical daytime, peak flow periods is then refilled during the lower demand, early morning hours.

- Storage should be provided for fire protection. If a fire occurred during the maximum day demand, the water used to fight the fire would be drawn from storage volume.
- Storage can also be provided to meet emergency conditions such as power failures, transmission main breaks, other potential disruptions in service, etc.

The primary criteria used to evaluate storage requirements include: average and peak water usage, water supply capabilities, as well as fire protection and reserve or emergency needs. Each of these criteria is used to establish three components of storage: (1) peak-hour volume, (2) fire volume, and (3) emergency volume. The total of these components is referred to as the active or available usable storage volume. All storage components described should be available while still providing at least 20 psi of pressure throughout the system. This pressure is equivalent to the volume of water stored 46 feet above the highest service. It is also desirable for storage tanks to be dispersed appropriately throughout the distribution system to deliver flows from multiple locations to reduce pipe velocities and provide flows to a fire location.

Peak-hour storage is the volume of water required during peak demand periods above the maximum available pumping capacity. This volume should be provided independent of the required fire or emergency volumes in order to assure sufficient reserve volume in the event of a fire or emergency during a peak demand period.

Fire storage is that component set aside solely for the purpose of fire fighting. Properly sized storage will include a sufficient volume of water for fire protection on days of maximum demands while maintaining a minimum pressure of 20 psi throughout the distribution system.

Emergency storage is desirable and is recommended for other purposes above and beyond that required for equalizing and fire volumes. This may include storage desired as a factor of safety for emergencies or where demands are unpredictable and fluctuate widely. Determining emergency storage is somewhat arbitrary and generally depends on the level of safety a utility desires. Emergency storage is often simply calculated as the volume necessary to supply the system during repair or maintenance work, or in the event that the pumping facilities do not have emergency back-up power equipment. In most cases, this is calculated as a specified number of hours of the average-day demands.

Storage in the Ware system is provided by two storage facilities. The storage facilities are located throughout the system and have a maximum hydraulic grade-line of 659 feet. Storage components for these two tanks were calculated as follows:

1. Equalization Storage for Peak-Hour Storage Fluctuation - The storage volume necessary to provide the system hourly fluctuation demands was estimated to be 25 percent of the maximum day total demand. Twenty-five percent of the projected year 2025 maximum-day demand is approximately 0.34 MG (0.25 * 1.36).
2. Fire Protection Storage Volume - The maximum required available fire flow which is generally recommended to be provided in this system is 3,500 gpm for 3 hours, equal to 0.63 MG. This rate was chosen based on the commercial fire flow requirements established by the Insurance Services Office (ISO).
3. Emergency Storage - Emergency storage volume provides a short term water supply during emergencies such as transmission main failures, equipment failures, power failures and natural disasters. Emergency storage is typically estimated to be one average day demand. However, the emergency storage component can be waived if back up power is provided at sources capable of providing the average daily demand. The Cistern has backup power that is utilized at the Pump House and also the Wellfield which is capable of providing the average daily demand. Therefore, the emergency component is waived.

The calculation for the current available active storage volume is summarized on Table 5-8 and the storage analyses developed within Table 5-9.

TABLE 5-8
EXISTING AVAILABLE ACTIVE STORAGE VOLUME

Storage Component	Anderson Road Tank	Church Street Tank
Total Capacity (MG)	1.0	1.5
Diameter (ft)	52	100
Overflow Elevation (ft)	659	659
Base Elevation (ft)	594	635
Unit Volume (gal/ft)	15,885	58,748
Highest User Served (ft)	607	607
Minimum Tank Elevation to Maintain 20 psi System Pressure (ft)	653.2	653.2
Total Active Storage (MG)	**0.09**	**0.34**

To determine the adequacy of the existing active storage volume available, an analysis of each of the storage components described was made using projected demands through year 2025. Table 5-9 presents the storage component analysis.

TABLE 5-9
STORAGE COMPONENT ANALYSIS

	2016	2025
Projected Average-Day Demand (MGD)	0.78	0.79
Projected Maximum-Day Demand (MGD)	1.35	1.37
Peak Hour Storage (25% MDD)	0.34	0.34
Fire Protection Storage	0.63	0.63
Emergency (waived)	N/A	N/A
Total Storage Needed	**0.97**	**1.0**
Available Usable Storage	0.43	0.43
Surplus or (Deficit)	**-0.54**	**-0.57**

The existing active storage volume in the system is approximately 0.43 MG (0.09 MG + 0.34 MG) and the total required active storage volume for the previously described components is 1.0 in year 2025. Based on this analysis, the Ware water system will have an increased storage deficit of approximately 0.57 MG in year 2025.

Additional usable storage can be achieved by expanding the boosted zone near the Church Street Tank to include the additional users on Upper Church Road with elevations over 600 feet. The revised calculation for available active storage with the expanded booster zone is summarized in Table 5-10 and the revised storage analysis developed within Table-5-11.

TABLE 5-10
AVAILABLE ACTIVE STORAGE VOLUME
WITH EXPANDED BOOSTED PRESSURE ZONE

Storage Component	Anderson Road Tank	Church Street Tank
Total Capacity (MG)	1.0	1.5
Diameter (ft)	52	100
Overflow Elevation (ft)	659	659
Base Elevation (ft)	594	635
Unit Volume (gal/ft)	15,885	58,748
Highest User Served (ft)	585	585
Minimum Tank Elevation to Maintain 20 psi System Pressure (ft)	631	631
Total Active Storage (MG)	**0.44**	**1.63**

TABLE 5-11
STORAGE COMPONENT ANALYSIS
WITH EXPANDED BOOSTED PRESSURE ZONE

	2016	2025
Projected Average-Day Demand (MGD)	0.78	0.79
Projected Maximum-Day Demand (MGD)	1.35	1.37
Peak Hour Storage (25% MDD)	0.34	0.34
Fire Protection Storage	0.63	0.63
Emergency (waived)	N/A	N/A
Total Storage Needed	**0.97**	**1.0**
Available Usable Storage	2.07	2.07
Surplus or (Deficit)	**1.1**	**1.07**

Under this scenario, the existing active storage volume in the system is approximately 2.07 MG and the total required active storage volume for the previously described components is 1.0 in year 2025. Based on this analysis, the Ware water system will have storage surplus of approximately 1.07 MG in year 2025 if they expand their boosted zone to include the users over 600 feet in elevation. Otherwise an additional water storage tank would be required.

5.5.2 Storage Tank Operations

One of the potential drawbacks of surplus storage is the increased detention time that is created when adequate turnover is not present. The current tanks operations obtained from the hydraulic model have an operating range of only a few feet. Furthermore, all of the WDPW's tanks have one inlet/outlet pipe. This configuration can result in stratified water within the tank because the last water to enter the tank when it is filling is typically the first water to leave the tank when it is emptying. Over time, this "last in, first out" configuration causes the ageing of water in the top portion of the tank. Old water can result in stagnation, loss of chlorine residual, increase in disinfection byproducts, and increased microbiological activity (i.e. total coliform) within the tank.

Therefore, it is good practice to minimize water age in the tanks as much as possible. This can be accomplished by operating the system to allow the tank levels to fluctuate over a greater range, by adding internal tank mixing systems, or both.

Implementation of tank mixing is recommended to be implemented at both of the WDPW's tanks. Therefore, the following section provides a background for the various forms of mixing systems.

5.5.2.1 Storage Tank Mixing Systems

In general, there are two types of tank mixing systems currently available for most tanks: (1) passive and (2) active. Some of the most common system types for each along with their typical advantages and disadvantages are discussed in the following sections.

Passive Type Mixing System

Passive systems mix a tank through the use of specialized valving, which take advantage of the existing flows into and out of a tank.

Elastomeric Check Valve Tank Mixing System

The TideFlex tank mixing system is a passive system consisting of inlet piping and a series of elastomeric check valves that ensure fill and draw from the tank are at different elevations, increase jet velocities to promote mixing and turnover in the tank. This system includes the installation of vertical or horizontal piping inside the tank (depending on tank geometry) that would extend from the existing common inlet/outlet at the bottom of the tank. Water is dispersed into the tank via multiple check valves along the inlet pipe at multiple elevations and/or locations. These inlet check valves are designed to have a high jet velocity that promotes mixing in the tank during tank filling. The outlet check valves are typically located near the bottom of the tank. The effective mixing action generated by this system occurs when the tank is filling.

Advantages and disadvantages of this type of passive mixing system include the following:

Advantages:

1. This mixing system has the lowest operation costs because no new pumps or motors are typically required.
2. Ice formation within the tank should be reduced as the surface water is agitated during each fill cycle.
3. This system is essentially maintenance-free as the only components of this system that require maintenance are the check valves. The manufacturer claims that the valves have a 25-year operation life.

Disadvantages:

1. The tank only mixes when filling. No mixing occurs during periods of inactivity and may require a minimum operational flow rate to achieve mixing.
2. The mixing system requires internal piping and pipe supports. Depending on tank materials, the piping manifold could need to welded (or attached via other means) to the tank walls and/or floor.
3. Depending on required layout (size and number of valves), the additional head loss created by the valves may increase pumping costs slightly.
4. Cannot be used for integral chlorine boosting. A separate booster station would be required.

Active Type Mixing Systems

Active mixing systems use mechanical means to mix a tank that do not depend on the existing flows into and out of a tank. There are currently two common types of active mixing systems in the municipal water works industry.

SolarBee Recirculation System

The first SolarBee Recirculation System introduced to the market is an active type system that consists of a solar powered pump that floats on the water surface in the center of the storage tank. The intake for the pump is set just above the tank floor and is curved upward to reduce the potential for redisturbing the sediment that has settled on the bottom of the tank. Water is drawn from the lower portion of the tank and distributed at the water surface to promote mixing in the tank. A photovoltaic panel that can be mounted to the top of the tank (or elsewhere) supplies the required power during the daylight and a rechargeable battery supplies energy during the night. There is an optional electric input for periods of extended overcast weather or during low solar conditions. Operational information about the status of the SolarBee unit is communicated to a local control panel and can also be transmitted to a Supervisory Control and Data Acquisition (SCADA) location using existing telemetry. There are no specific operations and maintenance (O&M) costs related to the SolarBee mixing system except for maintenance required to keep the photovoltaic cell clean. There is no electric power required to mix the tank with the photovoltaic cell in full operation.

Advantages and disadvantages of this type of active mixing system include the following:

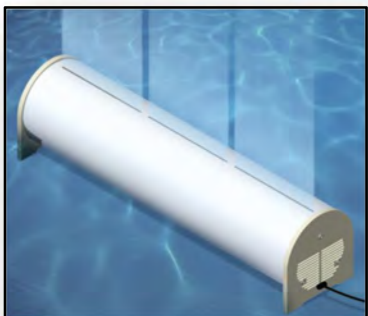
Advantages:

1. The tank is continuously mixed (as long as the system is in operation) as it does not depend on the tank to be filling.
2. The system can be maintained without taking the tank out of service.
3. The system is designed to fit through roof hatches for removal and maintenance purposes.
4. Ice formation within the tank should be minimal as water movement is continuous as long as the unit is functioning.
5. Low operation costs as power is supplied by solar equipment.
6. No internal piping manifold is required (i.e., no welding or attachment via other means to the tank walls and/or floor).
7. No additional head loss is created.

8. Can also be used for chlorine boosting (with equipment add on).

Disadvantages:

1. Maintenance is required at the photovoltaic cell to ensure a clean surface for solar energy gain. Snow or ice may impact the photovoltaic cell.
2. Any work or maintenance on the unit requires a confined space entry permit into the top of the tank with a raft.
3. A crane is required when/if retrieval of the SolarBee unit is required.
4. Electricity may be required to maintain mixing during extended overcast periods.



Grid powered models (referred to as GridBee) are also now available from the same manufacturer when utilization of solar power is not feasible or desired. Unlike the SolarBee (which floats on the water surface), the GridBee unit is mounted on the tank's floor.

Mechanical Mixing System

The PAX System is another active type mechanical mixing system that consists of a submersible motor and impeller system connected to the top of a tripod which is placed on the tank's bottom/floor. The unit is relatively compact and its tripod legs are collapsible to make installation through the smaller 18-inch openings possible. The motor is a water-filled, water lubricated, brushless DC type that is powered off a 120 Volt alternating current (VAC) circuit. The unit is typically set in the center of the tank and is 4-feet in height. The unit's impeller rotates at a rate of up to 1,200 revolutions per minute (rpm) and is set at the appropriate rate determined by the Manufacturer for the particular tank size. The unit's control center is of stainless steel construction. Status outputs include an on or off status and a common fault. It is understood that solar panel options are also available for powering the units.

Advantages and disadvantages of this type of active mixing system include the following:

Advantages:

1. The tank is continuously mixed (as long as the system is in operation) as it does not depend on the tank to be filling.
2. The system is designed to fit through small openings for removal and maintenance purposes.
3. Ice formation within the tank should be minimal as water movement is continuous as long as the unit is functioning.
4. No internal piping manifold is required.
5. No additional head loss is created.

Disadvantages:

1. The tank must be taken out of service system for maintenance.
2. A crane is likely required when retrieval of the PAX unit is required (through a roof hatch).
3. The unit's legs would need to be welded and/or restrained if installed on an uneven floor.
4. If the solar option is selected, maintenance would also be required at the photovoltaic cell to ensure a clean surface for solar energy gain. Snow or ice may impact the photovoltaic cell.
5. If the solar option is selected, electricity may be required to maintain mixing during extended overcast periods.
6. Cannot be used for integral chlorine boosting. A separate booster station would be required.

In summary, as the water level within the WDPW's water storage tanks do not currently fluctuate significantly, the use of active mixing systems is recommended for all tanks. Both of the tanks should be individually evaluated for proper sizing.

5.5.3 Tank Evaluation and Maintenance

As described with Section 2 of this report, the current condition of Ware's water storage tanks are generally acceptable with some cleaning and miscellaneous repairs recommended. That section, as well as individual inspection reports, should be referred to for additional detail.

5.6 INTERCONNECTION WITH ADJACENT WATER SYSTEMS

Interconnections with surrounding communities are valuable from an emergency response perspective, but the Town of Ware currently does not have any interconnections with adjacent communities. If ever determined to be needed or desired, the WDPW currently has existing water mains close to the borders of Hardwick, West Brookfield, and Palmer.

5.7 DISTRIBUTION SYSTEM MAINTENANCE

5.7.1 Unaccounted-for Water Reduction

As discussed in Section 3, non-revenue water in the Ware system was estimated to be an average of approximately 19.0% of the total water production. Approximately, 60% of all non-revenue water is attributed to leakage in water systems in the US.

Water leakage can be divided into two broad categories: (1) Unavoidable Leakage and (2) Underground Leakage, as described below.

- Unavoidable Leakage - Unavoidable leakage includes the numerous minor water leaks that normally exist in any water system. However, because of their number and size, they are more costly to repair than to simply allow them to exist.
- Underground Leakage - Underground leakage occurs from factors such as earth settlement and corrosive water or corrosive soil, which cause deterioration of pipes and joints. It also includes serious water main breaks and service-line breaks. The cost of wasted water from underground leakage often makes leak repair economical.

Unfortunately, most underground leakage is never seen reaching the surface since the individual leaks, although numerous, are spread throughout the system and have relatively low flows. Due to the large amount of older piping in the Ware distribution system, low volume underground leakage is most likely a major contributor to the unaccounted-for water.

MassDEP requires that a leak detection survey be performed on the entire Ware water system every two years. Comprehensive water audits can be useful in determining water usage that is above normal in various areas, providing target areas for leak detection or system maintenance.

5.7.2 Comprehensive Water Audit

A water audit is a process whereby a detailed accounting of all water use is made. It quantifies usage to various categories over a certain period of time. The audit can often pinpoint uses within the system that are above normal limits. An audit involves quantifying water from all production sources, all metered users, and all non-metered authorized users. It also requires making estimates of potential water losses, unavoidable leakage and total leakage. From analysis of the data, a priority listing can be developed to target specific areas of abnormal usage in the system.

5.7.3 Valve Maintenance

Since operation of valves within a distribution system is usually required only in emergencies (water main breaks), valves are often installed and then forgotten until such an emergency arises. Like other mechanical devices, valve operability is adversely affected by neglect. As a result of this neglect, valves can be found to be inoperable at the worst possible time.

Typically valves within any water system are of the sliding disk type (gate valves). This type of valve, which permits an unobstructed flow when fully opened, is hydraulically very efficient. However, when gate valves are left in the open position, deposits may settle and accumulate on the valve seats and prevent tight closure.

To prevent these problems, a valve exercising and maintenance program is recommended. The Insurance Services Office (ISO) recommends that valves be inspected and operated annually. We recommend that the transmission main valves, those valves located on the larger diameter pipes between the supplies and storage, be inspected semi-annually, once in the spring and again in the fall. The fall operation will discover any problems before the onset of winter. In the spring, inspect these valves by making sure a valve wrench can be put on the operating nut. This inspection will uncover any problems that have been caused by the previous winter and spring rains. All data should be logged and recorded in a data management system. If an asset management system is implemented, it should include custom designed queries that will allow selection of valves by age, condition and type. The water system capital budget should include repair or replacement of a fixed number of valves each year based on condition or operational problems.

The following valve inspection program steps should be included in an asset management system:

A. The data file for each valve should contain at least the following information:
    - Valve Size
    - Opening direction
    - Manufacturer of valve
    - Number of turns to open
    - Date of installation
    - Both general and specific descriptions of valve location including valve ties
    - Date of last maintenance - parts replaced and condition of valve
    - Valve Status (Open/Closed)

B. Prepare a master sheet which would be used to summarize the work performed and man hours involved. The actual valve maintenance program should use a checklist to determine:
    - Condition of gate box
    - Obstructions in gate box that might prevent gate wrench from seating on valve operating nut
    - Operability of valve
    - Number of turns to close and open the valve

- Any leaks detected

Altitude valves at the storage facilities and surge relief valves should also be incorporated into the annual valve exercising and maintenance program. Failure of altitude valves in an open position could result in the tank overflowing resulting in wasted water and potential damage to property. Failure in the closed position could cause a deficit in available fire protection or equalization volume by removing the volume of water in the tank from the active storage volume. Failure of the relief valves at the pump stations could cause damage to the pumps and motors, resulting in costly repair bills. Altitude valves should be serviced and settings should be checked and logged annually.

As part of the Town’s annual flushing program, operators must open and close all required main and hydrant valves on a routine. This program can also help identify a closed valve. A closed or partially closed valve can drastically reduce the system's hydraulics and available fire flow. We recommend electronic logs of valve status and maintenance history be tracked as part of the asset management system.

The most important part of the maintenance program is to evaluate the inspection reports and to implement the necessary repairs. The Fire Department should be notified whenever it is necessary to shut down a portion of the distribution system for such repairs.

Power valve operators are the preferred method for exercising valves for the following reasons. First, water system personnel are able to operate more valves per day, thus reducing the total time allotted for valve operation, and second, reduce the potential of physical injuries caused by valve operation. For increased efficiency, the WDPW may want to consider the purchase and use of this equipment.

5.7.4 Hydrant Maintenance

The distribution system contains approximately 344 active hydrants. Routine hydrant maintenance is essential and should be coordinated with active involvement from the Fire Department. The

ISO recommends that fire hydrants be inspected twice a year. The best time for these inspections is in the spring and in the fall. The fall inspection enables detection of problems before winter conditions. The spring inspection may uncover any problems which may have been caused by the previous winter (e.g., frost heaves).

In addition to semi-annual inspections, non-draining hydrants should be pumped dry immediately after use and checked for:

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

Similar to a valve management program, hydrant maintenance activities should be recorded and the results evaluated and integrated into an asset management database. The water system budget should include replacement of a fixed number of hydrants each year, and maintain a hydrant flushing/inspection program.

5.7.5 Water Main Maintenance

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

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

It is understood that the WDPW currently implements a unidirectional flushing program. If found to be effective, this program should continue to be implemented going forward with improvements to the program as necessary. In general, as the WDPW implements treatment at its sources (to remove potential precipitates), the effectiveness of the flushing program will increase, while the corresponding effort required to perform the program will likely decrease. As improvements to the system are made the flushing program should be reassessed to confirm its applicability and/or increase its effectiveness.

Section 6

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SECTION 6

REGULATORY REVIEW

6.1 GENERAL

The Ware Department of Public Works (WDPW) supplies drinking water to the residents of the Town of Ware from four active groundwater sources that have some water quality concerns and the sources require treatment. Over the past few years, the Massachusetts Department of Environmental Protection (MassDEP) and the United States Environmental Protection Agency (EPA) have undertaken significant rule making activity, including:

- A new Office of Research and Standards Guideline (ORSG) for manganese.
- Incorporation of the new federal Revised Total Coliform Rule (RTCR).
- Updates to the Stage 2 Disinfectants and Disinfection By-Product Rule.
- Additional requirements from the federal Reduction of Lead in the Drinking Water Act.
- Updates to the Unregulated Contaminant Monitoring Rule 3 (UCMR 3).
- The addition of the Unregulated Contaminant Monitoring Rule 4 (UCMR 4).

In addition, several pending regulations are anticipated in the near future including the Radon Rule.

6.2 OVERVIEW OF DRINKING WATER REGULATIONS

The purpose of this regulatory review is to assist WDPW in identifying major regulatory topics that might influence long-term decision making regarding supply or treatment strategies. This review highlights important new rules, but does not explore their implications for WDPW in great detail as they are still in their early stages.

The purpose of the Safe Drinking Water Act (SDWA) of 1974 (amended in 1984 and 1996) is to ensure that public water systems meet national standards that protect consumers from the harm of contaminants in drinking water, by requiring EPA to regulate contaminants that present health risks and which are known to, or are likely to, occur in public drinking water supplies. For each regulated contaminant, EPA sets a legal limit on the amount allowed in drinking water. Limits set by States must be at least as strict as those established by EPA.

The Massachusetts Department of Environmental Protection (MassDEP) Drinking Water Program is the primacy agency which regulates Massachusetts water systems under 310 Code of Massachusetts Regulations, Chapters 22 and 36. Chapter 36 is the State's Well Head Protection Regulation and Water Management Act Program.

Existing and future regulations that may impact the WDPW include:

- Ground Water Rule (GWR)
- Total Coliform Rule (TCR)
- Lead and Copper Rule (LCR)
- Stage 2 Disinfectants/Disinfection Byproduct Rule (Stage 2 D/DBPR)
- Radon Rule
- Surface Water Treatment Regulations
- Unregulated Contaminant Monitoring Rule (UCMR)

In 2002, Congress amended the Safe Drinking Water Act (SDWA) by enacting the Public Health Security and Bioterrorism Preparedness and Response Act, which added several important sections to the SDWA to address water system security.

6.2.1 National Primary Drinking Water Regulations

National Primary Drinking Water Regulations (or primary standards) are legally enforceable standards that apply to public water systems for primary contaminants. Primary standards limit the levels of contaminants in drinking water that adversely affect the public's health. Currently, the primary contaminant standards are divided into the following six categories:

- Microorganisms;
- Disinfectants;
- Disinfection Byproducts;

- Inorganic Chemicals;
- Organic Chemicals; and
- Radionuclides.

The concentrations allowed for the primary contaminants are quantified with a maximum contaminant level (MCL) due to the fact that each can compromise public health through chronic or acute exposure. A complete listing of the national primary drinking water standards published by the EPA is included within Appendix C.

6.2.2 National Secondary Drinking Water Regulations

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

A complete listing of the national secondary drinking water standards as published by the EPA is included within Appendix D.

6.2.3 Massachusetts Drinking Water Standards

Under the SDWA, a state may be granted primacy for implementing the provisions of the SDWA. The MassDEP has primacy for administering the SDWA in the Commonwealth of Massachusetts. Within the MassDEP, the Office of Research and Standards (ORS) is charged with establishing public health standards and guidelines for contaminants in drinking water. This involves adoption of standards established by the EPA, or the adoption of a more stringent standard or guideline.

In general, the Massachusetts drinking water standards follow the national primary and secondary standards. A complete listing of the Massachusetts drinking water standards and guidelines is included within Appendix E. MassDEP has established MCLs not currently in the

National Primary Drinking Water Regulations for total Nitrate/Nitrite, Perchlorate and Radon. MassDEP has also established health guidelines for 32 additional contaminants as well as one additional SMCL for Methyl tertiary butyl ether (MTBE) not covered in the National standards.

In general, Nitrate has been detected in some of the WDPW well sources at levels below the regulated limit. Should the concentration of these compounds increase and exceed their corresponding limits, new treatment processes may need to be considered.

Of particular note to this project is MassDEP's inclusion of manganese with an ORS Guideline Limit of 0.3 mg/L in the Massachusetts Drinking Water Standards. In general, MassDEP is requiring community water systems to implement removal treatment when the ORS Guideline is exceeded.

6.2.3.1 Manganese

MassDEP has been taking a much closer look at raw water and distribution system manganese (Mn) concentrations as a 2004 report by the EPA advised about potential impacts to infants/children from consuming water with manganese concentrations in excess of 0.3 mg/L for sustained periods of time. It is understood that MassDEP is in the process of assembling a more formalized policy on a recommended manganese strategy.

The U.S. Environmental Protection Agency (EPA) originally set a Secondary Maximum Contaminant Level (SMCL) of 0.05 mg/L. This was set to avoid aesthetic concerns such as stains on plumbing and laundered clothes. Each state however can choose to adopt the standard or set a more stringent one. In 2004 the EPA issued a report titled Drinking Water Health Advisory for Manganese to provide guidance to communities that may be exposed to high Mn concentrations.

MassDEP's Guidelines for Public Water Systems state that if the Mn concentration in the raw water exceeds 0.30 mg/L then removal is required. If the Mn concentration is between 0.05 mg/L and 0.30 mg/L, then MassDEP requires the water system to consult with their local MassDEP Office.

Some recent studies have identified the public health risks associated with the ingestion of elevated levels of Mn and MassDEP's recent ORS guideline for Mn closely follows the EPA's Health Advisory for Mn. It is understood that the MassDEP has recently provided a notice on manganese monitoring to Public Water Suppliers along with a Manganese Monitoring Information Sheet. This can be found in Appendix F.

Historically, Mn has been causing water quality problems and chronic consumer complaints in Ware. Mn concentrations have been exceeding its corresponding SMCL of 0.05 mg/L. Additional information regarding Ware's historical Mn concentrations since 1998 can be found in Section 4.

6.2.4 Ground Water Rule

The Ground Water Rule (GWR) which pertains to groundwater sources NOT under the influence of surface water was finalized on November 8, 2006. Compliance requirements of the GWR began in 2010. The purpose of the GWR is to better identify systems at risk for fecal contamination, and to provide the primacy agency a flexible range of tools to better protect the public health.

The GWR has the following four major components:

1. Periodic sanitary surveys of ground water systems that require the evaluation of eight critical elements and the identification of significant deficiencies (e.g., a well located near a leaking septic system). States must have completed the initial survey by December 31, 2012 for most community water systems (CWSs) and then by December 31, 2014 for CWSs with outstanding performance and for all non-community water systems.

2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions:

   a. Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99 percent (4-log) inactivation or removal of viruses and that have a total coliform-positive routine sample under Total Coliform Rule (TCR) sampling in the distribution system.
   b. Assessment monitoring - As a complement to triggered monitoring, a State has the option to require systems with sources that seem susceptible to fecal contamination, to conduct source water assessment monitoring to help identify high risk systems.

3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following correction action options:
   a. correct all significant deficiencies,
   b. eliminate the source of contamination,
   c. provide an alternate source of water, or
   d. provide treatment which reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.

4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99 percent (4-log) inactivation or removal of viruses.

A sanitary survey by the State primacy agency would be required every 3 years, and would review eight critical components to the extent that they apply to the individual water system being surveyed:

1. Source
2. Treatment
3. Distribution System
4. Finished Water Storage
5. Pumps, Pump Facilities and Controls
6. Monitoring, Reporting, and Data Verification

7. System Management and Operation
8. Operator Compliance with State Requirements

Survey frequency may be reduced to five years if the system either treats to 4-log inactivation of viruses or has an outstanding performance record in the eight performance elements documented in previous inspections and has no history of TCR MCL or monitoring violations since the last sanitary survey.

Significant deficiencies in groundwater systems include, but are not limited to, the following types:

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

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

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

Systems serving 3,300 or more people per day must monitor the disinfection continuously. When a system continuously monitors chemical disinfection, the system must notify the State any time the residual disinfectant concentration falls below the state-determined residual disinfectant concentration and is not restored within four hours. If any sample does not contain the required residual concentration, the system must take follow-up samples every four hours until the required residual disinfectant concentration is restored.

6.2.5 Revised Total Coliform Rule

On February 13, 2013, the Revised Total Coliform Rule (RTCR) was published in the Federal Register which was then followed by some minor corrections on February 26, 2014. The corrections became effective on April 28, 2014. As of April 1, 2016, all public water systems have been required to comply with the RTCR requirements. Provisions of the RTCR include:

- A maximum contaminant level goal (MCLG) and maximum contaminant level (MCL) for E. coli for protection against potential fecal contamination was set.
- A total coliform treatment technique (TT) requirement was set.
- Monitoring total coliforms and E. coli according to a sample siting plan and schedule specific to the PWS was added to the requirements.

- Allowing PWSs to transition to the RTCR using their existing Total Coliform Rule (TCR) monitoring frequency were added in the provisions.
- Monitoring and certifying the completion of a state-approved start-up procedure for seasonal systems were added to the requirements.
- Assessments and corrective action when monitoring results show that PWSs may be vulnerable to contamination were added to the requirements.
- Public notification requirements for violations.
- Specific language for CWSs to include in their Consumer Confidence Reports when they must conduct an assessment of if they incur an E. coli MCL violation.

In general, the existing TCR establishes an MCL based on the presence or absence of total coliforms (fecal coliform and E. coli). Compliance is based on the presence or absence of total coliforms on a monthly basis and the total number of samples required is a function of population served. Under the current TCR, a system the size of Ware's (approximately 2,360 water consumers) would take fewer than 40 samples per month and a violation triggered when one routine/repeat sample per month is total coliform positive. Under the RTCR, there is no longer a MCL violation for multiple total coliform detections (E. coli only). Instead, the RTCR requires systems that have indication of coliform contamination in the system to assess the problem and take corrective action. The level of assessment is based on the severity or frequency of the contamination. Currently, WDPW complies with all provisions of the RTCR.

6.2.6 Lead and Copper Rule (LCR)

The Lead and Copper Rule (LCR) was promulgated in 1991 is currently in effect for all community water systems and non-transient, non-community water systems. The purpose of the LCR is to protect public health by minimizing lead and copper levels in drinking water, primarily by reducing water corrosivity.

The LCR establishes action levels (AL) of 0.015 mg/L for lead and 1.3 mg/L for copper based on 90th percentile results of tap water samples. An AL exceedance is not a violation, but can trigger other requirements that can include the following:

- Water quality parameter monitoring;
- Corrosion control treatment;
- Source water monitoring/treatment;
- Public education; and
- Lead service line replacement.

Most water systems have incorporated the Rule's requirements. However, often it is difficult for utilities to remain in compliance or to remain on reduced monitoring as source water conditions change over time, or when a new treatment is implemented for the sake of other important water quality goals. Because lead and copper solubility are so sensitive to water quality, anytime a water system makes a change in water chemistry, the change should be brought about very gradually, if possible, and monitoring sampling should be conducted in distribution taps to detect changes in lead and copper levels.

Changes to the LCR were made on October 10, 2007 that addressed the requirements for monitoring, treatment processes, reporting, public notification and education requirements, and lead service line replacement.

Additional changes were made in 2011 which reduced the maximum allowable lead content. This content that is considered to be “lead-free” is a weighted average of 0.25 percent calculated across the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixture and 0.2 percent for solder and flux. Section 1417 of the SDWA established this definition of “lead-free”. In 2013, the SDWA Section 1417 was amended by the Community Fire Safety Act to include fire hydrants within the list of exempted plumbing devices.

Currently, WDPW complies with all the provisions of the lead and copper rule.

6.2.7 Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 D/DBPR)

The Stage 2 Disinfectants and Disinfection By-Products Rule (Stage 2 D/DBPR) was finalized as of January 4, 2006. The purpose of the rule is to increase public health protection by reducing the presence of disinfection by-products in drinking water. The Stage 2 Rule applies to all community water systems that add a primary or a residual disinfectant. The WDPW system serves less than 10,000 people and is therefore a "Schedule 4" system under the Stage 2 D/DBPR.

While the Stage 2 D/DBPR rule does not change the MCL values for TTHMs and HAA5s that were established under the Stage 1 D/DBPR, it does change the way sampling results are averaged to determine compliance. Compliance determination for Stage 2 will be based upon a Locational Running Annual Average (LRAA) as opposed to the system-side running annual average (RAA) used in Stage 1. LRAAs must be met at every monitoring location while the RAA allows the system to average results over all monitoring locations. Since WDPW is a “Schedule 4”, then they were required to begin LRAA TTHM and HAA5 monitoring by October 1, 2013.

The Stage 2 D/DBP required systems to complete an Initial Distribution System Evaluation (IDSE) to identify new Stage 2 monitoring locations that best represent high-DBP locations.

The WDPW is currently in compliance with this regulation.

6.2.8 Radon Rule

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

The Radon Rule was proposed on November 2, 1999 but has not yet been finalized. It was re-scheduled to be promulgated in late 2004, but it still remains delayed. The rule is unique in that for the first time, the EPA seeks to address a health risk caused by an air and water-borne contaminant with one rulemaking.

MassDEP has already established an MMCL for Radon of 10,000 picocuries per liter (pCi/L). USEPA originally proposed an MCL of 300 pCi/L and an alternative MCL (AMCL) of 4,000 pCi/L for governments or utilities that have implemented a "multi-media mitigation (MMM) program" to lower indoor air radon from all sources. This means that treatment would not be required for supplies with radon levels between 300 and 4,000 pCi/L if either the State or WDPW were to develop and implement a MMM program. With or without a MMM program, sources with radon levels above 4,000 pCi/L would be required to provide treatment. The volatile nature of radon makes it easy to remove with exposure to the atmosphere, usually during aeration, which EPA has designated as the Best Available Technology (BAT) for radon removal.

6.2.9 Surface Water Treatment Regulations

The WDPW system is supplied entirely by groundwater and has never been classified as groundwater under the influence (GWUI) of surface water. If any of the sources become classified as GWUI in the future, then there are a number of regulations that specifically apply to surface water sources as well as to groundwater sources determined to be GWUI.

These surface water treatment regulations include the following:

- Surface Water Treatment Rule (finalized in 1989)
- Interim Enhanced Surface Water Treatment Rule (finalized in 1998)
- Filter Backwash Recycling Rule (finalized in 2001)
- Long Term 1 Enhanced Surface Water Treatment Rule (finalized in 2002)
- Long Term 2 Enhanced Surface Water Treatment Rule (promulgated in 2006)

The major requirements for these regulations can be summarized as follows:

- Pathogens:
  - 99.9% (3-log) inactivation and/or removal of *Giardia lamblia*.
  - 99.99% (4-log) inactivation and/or removal of viruses.
  - 99% (2-log) removal of *Cryptosporidium* (additional removal could be required based on *Cryptosporidium* monitoring results obtained from source monitoring required as part of the Long Term 2 Enhanced Surface Water Treatment Rule). The WDPW was to comply with the *Cryptosporidium* treatment requirements by October 1, 2012.
- Residual Disinfectants:
  - Disinfectant residual $\geq$ 0.20 mg/L at entrance to distribution system.
  - Detectable disinfectant residual in the distribution system.
- Turbidity Performance:
  - Combined filter effluent turbidity $\leq$ 0.30 Nephelometric Turbidity Units (NTU) 95% of time.
  - Maximum level of 1 NTU.
- Filter Backwash Water:
  - Required to be returned to the head of the plant for full treatment if recycling is practiced.

6.2.10 Unregulated Contaminant Monitoring Rule 3

The Contaminant Candidate List (CCL) was created under the 1996 SDWA Amendments to change the process by which priorities are set in establishing drinking water regulations. The first Contaminant Candidate List was issued in March 1998. Every five years the EPA is required to publish a list of currently unregulated contaminants in drinking water that may pose risks, and make determinations on whether or not to regulate at least five contaminants on a five year cycle, or 3½ years after each CCL is published, if EPA finds that such regulation would present a meaningful opportunity for health risk reduction.

On July 18, 2003, EPA made final determinations for a subset of contaminants on the 1998 CCL, which concluded that sufficient data and information were available to make the determination that regulation was not appropriate for the following nine (9) contaminants: Acanthamoeba, aldrin, dieldrin, hexachlorobutadiene, manganese, metribuzin, naphthalene, sodium, and sulfate.

On April 2, 2004 EPA announced its preliminary decision to carry over 51 contaminants (nine microbiological and 42 chemical contaminants or contaminant groups) from the first contaminant candidate list (CCL1), which was finalized on February 24, 2005 (70 FR 9071) into CCL2. The comment period for draft CCL2 ended on June 1, 2004 and EPA published CCL2 in February 2005.

In the process of creating the final CCL2, EPA removed a group of 23 contaminants suspected of being endocrine disruptors and 35 pesticides, because both groups of chemicals were the focus of additional data collection efforts under other programs at EPA. Both groups of chemicals have been included in the preliminary CCL (PCCL), which is the precursor to CCL3 screening and evaluation process.

Methyl-tertiary dibromoethylene (MTBE) and perchlorate are currently on the second Contaminant Candidate List. EPA did not make a regulatory determination on either perchlorate or MTBE in its CCL2 Preliminary Determinations; Proposed Rule (May 1, 2007). MTBE was not regulated at that time because EPA's health risk assessment had not been finalized. For Perchlorate, EPA is still examining whether it is appropriate to regulate based upon occurrence in public water systems, although there are currently efforts in Congress to force the regulation of Perchlorate. Occurrence and health effects data have justified the inclusion of N-nitrosodimethylamine (NDMA), enterotoxigenic *E. Coli,* in CCL3. MassDEP has already established an MMCL for Perchlorate of 2.0 µg/L. MassDEP has also included MTBE in its listing of health guidelines and SMCLs.

EPA announced the draft CCL3 in February 2008 and described the process used to develop it. This new multi-step process builds on evaluations used for previous CCLs and was based on substantial expert input and recommendations from the National Academy of Science’s National Research Council (NRC) and the National Drinking Water Advisory Council (NDWAC). The draft CCL3 includes 93 chemicals or chemical groups and 11 microbiological contaminants which are known or anticipated to occur in public water systems. The list includes chemicals used in commerce, pesticides, biological toxins, disinfection byproducts, and waterborne pathogens. EPA evaluated approximately 7,500 chemicals and microbes and selected 104 candidates for the CCL3 that have the potential to present health risks through drinking water exposure. The CCL3 was officially published in October 2009 and was established in May 2012. The final CCL 3 includes 104 chemicals or chemical groups and 12 microbiological contaminants.

The complete CCL1, CCL2, and CCL3 list of contaminants are presented in Tables 6-1, 6-2, and 6-3.

TABLE 6-1
LIST 1 CONTAMINANTS FOR UCMR 3

Assessment Monitoring (List 1 Contaminants)	
Contaminant	**Analytical Methods**
Volatile Organic Compounds	EPA 524.3
1,2,3-trichloropropane	
1,3-butadiene	
chloromethane (methyl chloride)	
1,1-dichloroethane	
bromomethane (methyl bromide)	
chlorodifluoromethane (HCFC-22)	
bromochloromethane (halon 1011)	
Synthetic Organic Compounds	EPA 522
1,4-dioxane	
Metals	EPA 200.8 Rev 5.4, ASTM D5673-10, Standard Methods 3125 (1997) (excluding chromium-6)
vanadium	
molybdenum	
cobalt	
strontium	
chromium*	
Chromium-6	EPA 218.7
chromium-6	
Oxyhalide Anion	EPA 300.1, ASTM D6581-08, Standard Methods 4110D (1997)
Chlorate	
Perfluorinated Compounds	EPA 537 Rev 1.1
perfluorooctanesulfonate acid (PFOS)	
perfluorooctanoic acid (PFOA)	
perfluorononanoic acid (PFNA)	
perfluorohexanesulfonic acid (PFHxS)	
perfluoroheptanoic acid (PFHpA)	
perfluorobutanesulfonic acid (PFBS)	

*Monitoring for total chromium- in conjunction with UCMR 3 Assessment Monitoring- is required under the authority provided in Section 1445(a)(1)(A) of SDWA

TABLE 6-2
LIST 2 CONTAINMENTS FOR UCMR 3

Screening Survey (List 2 Contaminants)	
Contaminant	**Analytical Methods**
Hormones	EPA 539
17-β-estradiol	
17-α-ethynylestradiol (ethinyl estradiol)	
16-α-hydroxyestradiol (estriol)	
equilin	
estrone	
testosterone	
4-androstene-3,17-dione	

TABLE 6-3
LIST 3 CONTAMINANTS FOR UCMR 3

Pre-Screen Testing (List 3 Contaminants)	
Contaminant	**Analytical Methods**
Microbiological	EPA 1615
enteroviruses	
noroviruses	
Microbiological Indicators	
total coliforms	
E. coli	
Enterococci	
bacteriophage	
aerobic spores	

Unregulated Contaminant Monitoring Rule 3 (UCMR 3) incorporates 30 contaminants (28 chemicals and 2 viruses). UMCR 3 was published in the Federal Register (FR) on April 16, 2012. Sampling for the UCMR 3 List 3 will occur between 2013 and 2015 for a selected 800 represented PWSs by the EPA. All samples taken from systems with 10,000 people or fewer will be paid for by the EPA.

EPA recently announced the draft CCL4 in January of 2015 which includes 100 chemicals or chemical groups and 12 microbial contaminants. The list includes chemicals used in commerce, pesticides, biological toxins, disinfection byproducts, pharmaceuticals and waterborne pathogens. The changes that were made to the final CCL3 within the draft CCL4 include:

- The addition of two nominated contaminants. These contaminants are manganese and nonylphenol.
- The removal of Perchlorate.
- The removal of five contaminants (1,3-dinitrobenzene, dimenthoate, terbufos, terbufos sulfone, and strontium).

The draft CCL4 chemical contaminants can be found in Appendix G.

6.2.11 Unregulated Contaminant Monitoring Rule 4

The fourth Unregulated Contaminant Monitoring Rule (UCMR 4) was proposed on December 11, 2015 and is anticipated to be finalized by the end of this year (2016). Then, implementation for UCMR 4 is expected to begin in 2017 with monitoring beginning in January 2018.

In accordance with the 1996 SDWA, the EPA is required issue a new list of at least 30 unregulated contaminants every five years. This list of contaminants would need to be monitored by PWSs. The UCMR 4 outlines these chemical contaminants that will need to be monitored between 2018 and 2020.

The List 1 of contaminants for UCMR 4 is presented in Table 6-4.

TABLE 6-4
LIST 1 CONTAMINANTS FOR UCMR 4

Assessment Monitoring (List 1 Contaminants)	
Contaminant	**Analytical Methods**
Cyanotoxin Chemical Contaminants	
Total microcystin	ELISA
microcystin-LA	EPA 544
microcystin-LF	EPA 544
microcystin-LR	EPA 544
microcystin-LY	EPA 544
microcystin-RR	EPA 544
microcystin-YR	EPA 544
Nodularin	EPA 544
anatoxin-a	EPA 545
cylindrospermopsin	EPA 545
Metals	EPA 200.8, ASTM D5673-10, SM 3125
Germanium	
Manganese	
Pesticides and One Pesticide Manufacturing Byproduct	EPA 525.3
alpha-hexachlorocyclohexane	
Chlorpyrifos	
Dimethipin	
Ethoprop	
Oxyfluorfen	
Profenofos	
tebuconazole	
total permethrin (cis- & trans-)	
Tribufos	
Brominated Haloacetic Acid (HAA) Groups[1]	EPA 552.3 or EPA 557
HAA5	
HAA6Br	
HAA9	
Alcohols	EPA 541
1-butanol	
2-methoxyethanol	
2-propen-1-ol	
Other Semivolatile Chemicals	EPA 530
butylated hydroxyanisole	
o-toluidine	
Quinoline	

[1] Regulated HAAs (HAA5) are included in the proposed monitoring program to gain a better understanding of co-occurrence with currently unregulated disinfection byproducts. (a) HAA5 includes: dibromoacetic acid, dichloroacetic acid, monobromoacetic acid, monochloroacetic acid, trichloroacetic acid. (b) HAA6Br includes: bromochloroacetic acid, bromodichloroacetic acid, dibromoacetic acid, dibromochloroacetic acid, monobromoacetic acid, tribromoacetic acid. (c) HAA9 includes: bromochloroacetic acid, bromodichloroacetic acid, chlorodibromoacetic acid, dibromoacetic acid, dichloroacetic acid, monobromoacetic acid, monochloroacetic acid, tribromoacetic acid, trichloroacetic acid.

UCMR 4 incorporates 30 contaminants (10 cyanotoxin chemical contaminants, 2 metals, 8 pesticides, 1 pesticide manufacturing byproduct, 3 brominated haloacetic acid groups, 3 alcohols, and 3 other semivolatile chemicals). Sampling for the UCMR 4 List 1 will occur from March 2018 through November 2020 for a randomly selected 800 surface water (SW) or groundwater under the direct influence of surface water (GWUDI) systems by the EPA. These systems would be selected for one component of UCMR 4 sampling (10 cyanotoxins or 20 additional chemicals). All samples taken from systems with 10,000 people or fewer will be paid for by the EPA.

Section 7

WRIGHT-PIERCE
Engineering a Better Environment

SECTION 7

ASSET MANAGEMENT

7.1 INTRODUCTION

Drinking water systems are comprised of many visible and hidden (i.e., buried) assets. Like many other communities, the Town of Ware has an aging water infrastructure system that is in the need of attention, whether it be through replacement and/or rehabilitation. The water system has grown to meet the needs of the town as they have arisen and continues to evolve, whether it be in response to growth, contraction, regulatory drivers or other reasons. As such, the management of the system is getting more complicated while at the same time the finances and human resources required for its management are stretched thin.

Due to this ever growing complexity, the Town should strongly consider the implementation of a formal asset management (AM) program. Although the Town is currently undergoing this master planning process, an asset management program would add another level of functionality to help it understand what it has and meet its level of service goals more efficiently.

Therefore, the purpose of this section is to introduce the concept of AM and identify some initial items the Town could begin to implement for a future AM program.

7.2 ASSET MANAGMENT

In general, an AM program would help you answer the following questions about your water system.

- What do I have?
- Where is it located?
- What condition is it in?
- How much life remains in the particular asset?
- How much will it cost to maintain and/or replace the asset?
- What Level of Service (LOS) does the system need to provide?

- Which of my assets are critical?
- What happens if they fail?
- How much capital do I need to maintain my desired LOS and when do I need it?
- How can I finance the capital needs?

If these questions cannot be easily answered, a well done and comprehensive AM plan will provide the means to do so with the flexibility to continue to do so into the future as well. Combining that with a computerized maintenance management system (CMMS) would also help a municipality provide its critical services more efficiently and cost effectively.

In summary, AM programs incorporate life-cycle cost analysis, level of service (LOS) planning and criticality (via likelihood of failure and consequence of failure analyses) to build a capital improvement plan that is sustainable and affordable. There are many customized software programs (such as Viewworks™), that are true AM programs that can help integrate these objectives too.

This master plan has used the traditional waterworks practice analyses to prioritize current and future needs in a 10-year capital improvement plan (CIP). This approach delivers a comprehensive, prioritized CIP for that period that will need to be routinely updated as improvements are made and/or new needs identified. However, the WDPW may wish to expand this methodology in the future via an AM program. To assist Town's like Ware begin or implement an AM program, the MassDEP has a recently implemented a competitive grant program that is understood to provide funding over the next several years.

7.3 AREAS FOR ASSET MANAGEMENT

Based on our initial understanding of the WDPWs system, the following items were initially identified for consideration to gather information that would be needed for the efficient creation of an AM program:

- Hydraulic Model – The Town currently has a hydraulic model which was created with the GIS compatible InfoWater hydraulic modeling software as manufactured by

Innovyze. The Town should consider further populating the model's database of water system components to also include attributes for the age of the water mains (i.e., year installed), location of valves, location of hydrants, etc. Additional information could also be included for the valves and hydrants such as their year installed, manufacturer, model, opening direction, etc.

- Geographic Information System (GIS) - Building out a GIS system with links to record documents. In doing this, the Town could efficiently access record drawings, water service tie cards, etc. from an efficient interface. Laptops, tablets, or other mobile devices could implemented be for field personnel to easily access and/or modify the information. This technique would allow for hyperlinking of engineering plans and long-term preservation of old paper document records through scanning. The GIS system could then be expanded in the future to incorporate and hyperlink photographic records, construction documents and other desirable information when resources are available.
- Computerized Maintenance Management System (CMMS) - A CMMS is a newer innovation to improve inventory management, real-time maintenance and sustainability of treatment and distribution system assets. A CMMS system is a software package that is configured to track run-time operation of assets and to plan preventative maintenance. Many vendors offer customized CMMS packages. Often a CMMS module can be added to a supervisory control and data acquisition (SCADA) system in a treatment facility or at a central operating node to track real-time operation time and data to plan preventative/routine maintenance, inventory management and operations budgeting. As the WDPW transitions into the construction of a new water treatment plant, a formal CMMS should be considered for incorporation into the project.

Section 8

Wright-Pierce
Engineering a Better Environment

SECTION 8

RECOMMENDATIONS

8.1 GENERAL

The intent of this section is to provide an overview of the recommendations made for the Ware Department of Public Works' (WDPW's) system within the previous sections of this report along with their estimated costs where applicable. The details of each recommendation can be found in the corresponding sections within this report. The prioritization and scheduling of recommendations into a ten-year Capital Improvement Program (CIP) is presented within Section 9.

8.2 WATER SUPPLY

As presented within Section 4 of this report, the WDPW's existing sources were evaluated under various scenarios utilizing standard water works practices. All sources were determined to be capable of meeting the projected average day demand (ADD) and maximum-day demand (MDD) for the planning period. But if the largest well was considered to be off-line, then the system would not be capable of meeting the projected 2025 maximum-day demands for the planning period with pumping limited to 16 hours of operation. There would be a deficit of approximately 0.031 million gallons per day (MGD). They were however, determined to be capable of meeting the projected maximum-day demands for the planning period when operated for 17 hours.

8.2.1 New Source of Supply

Possibilities for additional supply included interconnections with neighboring communities, an interconnection with a large water supplier (e.g., the Massachusetts Water Resources Authority), or the implementation of a new well source or sources. As previously noted within Section 4, the Town does not currently have any interconnections with neighboring communities or an interconnection with a large water supplier. Due to the high cost associated with the implementation of these two options, these interconnections are not desired nor recommended at this time. The last option for a new source of supply would be to implement a new well source or sources. Since the Town is currently operating their existing well sources with enough capacity to supply the projected ADD and the MDD for 2025, this option is currently not recommended. Also, it is not guaranteed that the new well source would have better water quality than the existing wells.

8.2.2 Optimization of Existing Supply

Over time, well performance is influenced by many factors that can contribute to a steady and sometimes rapid decline in hydraulic performance. When this occurs, cleaning and well redevelopment is required to remove the materials plugging the well and screen via mechanical and chemical rehabilitation. Cleaning and redevelopment of each well is recommended when the specific capacity of the well drops no more than 10% from the last cleaning. The effectiveness of a well cleaning is also reduced when the well yield is allowed to decline for too long between cleanings. This often results in the inability of the well to regain its original construction hydraulic performance. Therefore, when significant well performance is lost and/or the cleaning frequency becomes too costly, a replacement well needs to be considered.

As previously discussed in Section 2, Wells No. 2 and 3 from the Wellfield source experienced a decline in capacity over the past ten years. Therefore, the WDPW constructed two replacement wells (Wells No. 2R and 3R) in 2015. The intent is to fully replace the current existing Wells No. 2 and 3 with these replacement wells. The replacement wells were recently approved by MassDEP in 2016 and they will be connected to the water system based on the recommendations per the ongoing Treatability Study being performed by Wright-Pierce (i.e., piloting of the Barnes Street sources).

The remaining sources in the Ware water system have not shown any decline in hydraulic performance at this time, but it is recommended that the WDPW continue with a routine well cleaning and redevelopment program for its wells on an as needed basis.

8.2.3 Treatment Needs

As described within the previous sections, the Wellfield, Well No.4, and the Cistern sources are currently being chemically treated at the Pump House and the Dismal Swamp Well is being chemically treated individually. At both locations, the water is treated with potassium hydroxide (KOH) for pH adjustment and sodium hypochlorite (NaOCl) for disinfection.

Historically, iron and manganese have been causing water problems and chronic consumer complaints within the Town of Ware. Both the iron and manganese concentrations have been exceeding their corresponding SMCL of 0.30 mg/L and 0.05 mg/L, respectively. Therefore, additional treatment is desired to be implemented at the sources. Currently, Wright-Pierce is performing a Treatability Study to determine design parameters for a new water treatment plant (WTP) that would remove these secondary constituents. The process would include piloting for technology verification, then proceed with permitting and design, and finally to construct the WTP. For this entire process, the WDPW should plan for a period of approximately two to three years until the WTP is in operation.

As previously discussed in Section 4, it is recommended that the WDPW proceed with Option No. 3 which consists of treating only the Barnes Street sources. The Barnes Street sources includes the Wellfield (Wells No. 1, 2, and 3), Well No. 4, and the Cistern which when combined could supply the Town with an approved maximum daily rate of 1.80 MGD. Based on the water use projections for the planning period from Section 3 of this report, the new WTP for the Barnes Street sources would be able to reliably provide for the system's projected average-day demand of 0.79 MGD and also the system's projected maximum-day demand of 1.37 MGD.

As part of the Treatability Study, the Barnes Street sources will be pilot tested with a GreensandPlus™ media for removal of the excess iron and manganese in October of 2016. If successful results are obtained, the new WTP will be designed around this treatment.

The Dismal Swamp Well source shall remain as it currently exists and could be used as a back-up source. As noted previously, the Barnes Street sources alone can meet the Town's water demand needs and should the system grow significantly, treatment can be added at the Dismal Swamp Well (if needed).

If treatment is not provided (for removal of secondary constituents) at the sources that are used, iron and manganese would still be an issue in the Town's water system and consumer complaints will continue.

A budget for the cost to construct a new WTP to treat the Barnes Street sources will be prepared as part of the Treatability Study. However, a range of possible costs that should be anticipated for the construction of a new 1.8 mgd WTP that utilizes GreensandPlus^{TM} media for treatment is estimated to be between \$3.5M to \$5.0M.

8.3 DISTRIBUTION SYSTEM

The WDPW's distribution system was evaluated to assess its hydraulic adequacy utilizing its computerized hydraulic model. Various improvements were recommended to improve fire flow capacity, water main replacements, water storage tank mixing, and SCADA upgrades. Each is summarized in the sections that follow. Figure 8-1 presents an overview of the recommended distribution system improvements.


Data from MassGIS and Town of Ware
ISO Improvement 1
Expansion of the existing boosted pressure zone to include Upper Church Street.
Church St. Tank
Capacity: 1.5 MG
Overflow: 659 FT
Barnes Street Sources
(Wells 1,2,3,4, & Cistern)
ISO Improvement 3
Replacement of existing 12-inch cast iron water main with 12-inch ductile iron on Church St. between Prospect St. and Church St. Tank (~3,000 LF)
ISO Improvement 2
Replace existing 10-inch cast iron water main with 12-inch ductile iron on Church St. between Pleasant St. and Prospect St. (~800 LF)
ISO Improvement 4
Replace existing 6-inch cast iron water main with 8-inch ductile iron on Mechanic St. (~2,000 LF)
Legend
Tank
Well Source
Pipe Diameter
less than 4"
6"
8"
10"
12"
Proposed Improvements
Ware, MA
PROJ NO: 13471A
DATE: 10/18/2016
FIGURE: 8-1
Wright-Pierce
Engineering a Better Environment
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand).

8.3.1 ISO Fire Flows

As presented within Section 5 of this report, the system's residential Insurance Services Office (ISO) locations were adequate in terms of being able to provide the needed residential fire flows. However, a number of locations within the system were determined to be deficient. In total, the 14 ISO fire flow test locations were evaluated using the hydraulic water model and 10 were found to be deficient. By implementing the improvements for each ISO described previously in Section 5, all of the commercial deficiencies would not be solved. In order to solve these deficiencies and to provide the largest increase in available fire flow, then the following recommendations with associated capital costs are recommended to be implemented:

1. Expansion of the boosted zone around Church Street Tank to include the 10 to 11 additional homes on Upper Church Street. A range of possible costs to implement this improvement would be estimated to be between $150,000 and $200,000.
2. Replacement of approximately 800 linear feet of 10-inch cast iron pipe on Church Street between Pleasant Street and Prospect Street with new 12-inch ductile iron pipe (ISO #7). This would have an estimated capital cost of $160,000 assuming a unit capital cost of $200 per linear foot for 12-inch water main installed.
3. Replacement of approximately 3,000 linear feet of 12-inch cast iron pipe on Church Street between Prospect Street and the Church Street Tank (ISO #7). Confirmation of pipe condition is recommended prior to replacement to determine if hydraulic restriction is related to another cause (i.e. partially closed valve, mislabeled pipe size, or etc.). A total cost of $600,000 would be estimated to install the new water main assuming a unit capital cost of $200 per linear foot for 12-inch water main installed.
4. Replace approximately 2,000 linear feet of 6-inch cast iron pipe on Mechanic Street with new 8-inch ductile iron (ISO #11). This would have an estimated capital cost of $350,000 assuming a unit capital cost of $175 per linear foot for 8-inch water main installed.

A total estimated cost to complete all of these recommendations would be approximately $1,260,000 to $1,310,000. This estimate does not include any engineering design/permitting/ construction administration costs as they would vary based on actual scope. However, a 25% contingency would be suitable for initial estimating purposes.

8.3.2 Water Main Improvement Program

As previously noted in Section 5, it is recommended in the water industry to maintain an on-going water main replacement program where 1% to 2% of the total system length is replaced annually. As this approach would require large annual capital expenditures, replacing 2% of a distribution system annually can be very difficult financially. Taking into consideration the size of the WDPW system, it is recommended that at least 0.5% of the system is replaced annually. With Ware's currently system size of approximately 47 miles, approximately 1,240 linear feet per year would be recommended. Assuming a unit capital cost of $175 per linear foot of 8-inch water main installed, the total cost per year would be approximately $220,000. Based on this estimation, approximately 12,400 linear feet of new 8-inch pipe construction would be recommended to be completed over the next ten years. This would correspond to a total of approximately $2,170,000 within the a 10-year capital improvement plan period. This estimate does not include any engineering design/permitting/construction administration costs as they would vary based on actual scope. However, a 25% contingency would be suitable for initial estimating purposes.

Within the annual replacement program budget, the WDPW plans to complete a phased project to remove an older existing 6-inch cast iron water main on West Street with poor hydraulic capacity. Currently this street has 6-inch and 12-inch water mains that supply water to the customers. The project includes relocating the services from the 6-inch main to the 12-inch main and then eliminating the 6-inch main and any interconnections from the system.

8.3.3 Water Storage Tanks

Distribution storage is a valuable asset and critical component to a water distribution system. As previously discussed, adequate storage is required for a variety of operational needs such as to buffer peak demands of the system, provide volume for firefighting purposes, and volume for other emergency purposes. Properly designed storage facilities should incorporate each category of storage as required and be sited properly within the system to provide the greatest benefit to users and operators. When possible, systems should consider redundancy in storage to facilitate maintenance.

The WDPW system would have sufficient (i.e., excess) storage volume and adequate redundancy with its two water storage tanks if the booster pump station expansion is implemented as previously noted within Section 5. If not, then a new water storage tank with a usable storage volume of at least 0.57 MG would be needed. A construction cost for such a tank could vary between $1.0M and $2.0M or more depending on project specifics.

8.3.3.1 Mixing Systems

Due to the storage volume present within the WDPW's system in combination with the WDPW's operational practice of minimal tank level fluctuation, high detention times (i.e., water age) are created within the storage tanks. As high detention times can lead to detrimental water quality, it was recommended that a mixing system be implemented at each tank. As previously discussed in Section 5, there are two common types of tank mixing systems currently available for most tanks: passive and active. For passive systems, there is the TideFlex system and for active systems, there is the SolarBee Recirculation System, GridBee Recirculation System, and the PAX Mixing System. Based on each system's installation, estimated cost, and ease of future maintenance, the GridBee System would be preliminarily recommended for installation in Ware's two existing tanks as it can be easily installed in an undrained tank.

Estimated costs to implement the GridBee mixing process within the tanks is estimated to be as follows:

- 1.0 MG Anderson Road Standpipe: $50,000
- 1.5 MG Church Street Tank: $50,000

This estimate does not include any engineering design/permitting/construction administration costs.

8.3.3.2 Tank Repairs

The WDPW's two water storage tanks were last inspected in December of 2015 by Underwater Solutions Inc. (as noted within Section 2 of this report). It was determined through these inspections that both of the tanks were overall in generally good condition. There were a variety of items requiring maintenance and/or repair were identified for each of the tanks.

Summarized cost estimates from the inspection reports are as follow:

- 1.0 MG Anderson Road Standpipe: $20,000
- 1.5 MG Church Street Tank: $20,000

Underwater Solutions Inc. noted that they anticipate the interior and exterior surfaces of the tanks to be acceptable for approximately 4 to 5 more years, but after this time, the tanks would most likely require a recoating. It would cost approximately $800,000 to recoat each of the tanks (without engineering costs).

As painting of existing welded steel tanks can be costly, another option for the WDPW to consider would be the replacement of the two tanks with a newer tank. This would also allow the WDPW to determine if changing the volume of the tanks or increasing the hydraulic gradeline of the system would be possible/beneficial. It is understood that the Town has received conceptual cost estimates for two new tanks (two 800,000 gallon tanks) for approximately $1.4M (not including engineering). If desired, the Town should further pursue this analysis in additional detail.

8.3.3.3 SCADA Upgrades

Ware's water system currently does not have a modern SCADA system. As discussed previously, each source is run by a Hand/Off/Auto (HOA) switch which is ultimately controlled by a soon to be obsolete tank level telemetry. Therefore, the water system should be upgraded with a modern SCADA system. This would provide the Town with increased reliability, a higher level of service for consumers, increased efficiency, and optimized labor. A budget of $280,000 is estimated for the implementation of the new SCADA system. This budget includes communication panels with radio telemetry being implemented at each of the wells and both of the tanks, a control panel at the new Barnes Street WTP, a panel with radio telemetry at the DPW Office to be tied in remotely, and the installation and licensing costs. The budget can vary based on the scope. This estimate does not include any engineering design/permitting/construction administration costs.

In general, all costs are estimated based on limited information that is currently available and are presented as year 2016 dollars. All costs should be re-visited and revised as necessary when additional detail is available and prior to when the project is anticipated to move forward.

Section 9

SECTION 9

RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

9.1 OBJECTIVE

The Ware Department of Public Works (WDPW) has an aging infrastructure that is in need of attention, either through replacement or rehabilitation. As there are many needs that have been identified in the WDPW's future, a well laid out Capital Improvement Plan (CIP) will help the WDPW prioritize the new needs and plan for their implementation. This final section is the culmination of all others from this report and presents a ten-year CIP for the WDPW's moving forward. The estimated capital costs for the newly identified needs are presented. Routine costs for operation and maintenance are not included.

9.2 CAPITAL IMPROVEMENT PROGRAM

The proposed CIP has been developed from analyses presented in this report. A summarized description of each improvement was previously presented within Section 8. The improvements and recommendations are prioritized later in this section.

In addition to the categories of priority discussed below, the improvements can simply be classified as either Maintenance driven or Demand driven (as a result of anticipated growth). In general,

- Maintenance driven improvements are projects recommended which specifically address deficiencies in the system. The treatment of existing sources or meeting regulatory needs can be considered to be within this category.
- Demand driven improvements are projects which will be required to satisfy projected growth and associated demands.

At this time, the majority of the recommendations for the WDPW's system are maintenance driven. Over time, the WDPW may have to shift the priority of projects in order to respond to the needs of the community and/or to take advantage of opportunities such as roadway reconstruction projects or new developments as they are identified. It is important that the WDPW revisit the recommendations yearly to re-prioritize, schedule and budget the recommended projects as needs are confirmed or modified.

All of the identified improvements have been prioritized within high, intermediate, and low-priority categories that are described in more detail in the following sections.

The proposed 10-year CIP is presented within Table 9-1 at the end of this section. The initial layout is spread out within the next 10-year window based on our current understanding of needs and is subdivided within the Supply and Distribution categories. Due to their magnitude in cost, the currently on-going Treatability Study and thereafter, the new water treatment plant (WTP) for the Barnes Street sources is included.

9.2.1 High Priority Improvements

The highest priority improvements are generally the projects which have been identified for completion during the next three years and include the following:

- ***Barnes Street WTP*** - The Barnes Street WTP as it is currently underway with piloting (and a high priority driven by regulatory need for manganese removal).
- ***Tank Mixing Systems and Repairs*** - The implementation of mixing systems and tank repairs are identified as high priorities since improved mixing and turnover within the existing tanks will be important once the new water treatment plant is put on-line and significantly improved water quality is pumped into the distribution system. The repairs are also recommended to be performed at the same time as the mixing system installation so as to avoid two separate costlier periods of down time. These should be scheduled to occur prior to completion of the WTP
- ***Security Camera at Cistern*** – For additional security at the Cistern source, a security camera is intended to be installed within the next few years. This improvement can be incorporated within the Barnes Street WTP project.
- ***Well No. 4 House Acquisition*** – Currently there is a residential house located at 116 Pleasant Street that is within Well No. 4's Zone I. The house has been recently put on the

market to be sold and it would be advantageous to acquire this land. The acquisition of the house would be considered a high priority improvement since this acquisition would help protect the Town's source.

9.2.2 Intermediate Priority Improvements

The intermediate-term improvements identified are generally recommended for completion during the middle portion of the 10-year CIP (from approximately year three to year six). The intermediate term projects include the following:

- ***Tank Recoating*** – Both of the water storage tanks will need to be recoated in approximately 4 to 5 years. Since painting the existing tanks can be costly, another option for WDPW to consider would be the replacement of the two tanks. The cost would be comparable and it would also allow the WDPW to determine if changing the volume of the tanks or increasing the hydraulic gradeline of the system would be possible/beneficial.
- ***SCADA*** - The implementation of a new SCADA system is classified as an intermediate priority improvement. All of the sources are currently run by Hand/Off/Auto (HOA) switches and are controlled by tank telemetry. Upgrading the water system with SCADA would provide increased reliability, a higher level of service, increased efficiency, and reduced labor. However, this could be implemented more quickly if tied in with the WTP project.
- ***Generator at Dismal Swamp Well, Well No. 4, and Booster Pump Station*** – Should the WDPW desire to have full emergency power provisions, suitable generators would need to be installed at the Dismal Swamp Well, Well No. 4 and the Booster Pump Station at the Church Street Tank. This is considered an intermediate priority since the WDPW currently has adequate provisions for emergency power according to MassDEP requirements.

9.2.3 Low Priority Improvements

Although improvements to fire flow capabilities and other distribution system piping projects can be considered to be intermediate-term improvements, they have been allocated to the lower-priority improvements for the time being due to the large capital expenditures that the WDPW will be incurring over the next few years.

ISO Improvements:

As discussed in Section 5, four recommendations were provided to solve all of the commercial deficiencies and to provide the largest increase in available fire flow in Town. These recommendations include the expansion of the boosted zone around the Church Street Tank and the replacement of approximately 5,800 linear feet of water main. At a total value of approximately $1,260,000 to $1,310,000, these costs have been equally distributed between years 5 through 10 to provide flexibility in phasing.

Annual Water Main Improvement Program (WMIP):

Taking into consideration the size of the WDPW system, it is recommended that at least 0.5% of the system is replaced annually. With Ware's current system size of approximately 47 miles of water main, approximately 1,240 linear feet per year would be recommended. Assuming a unit capital cost of $175 per linear foot of 8-inch water main installed, the total cost per year would be approximately $220,000.

In summary, the improvement program is intended to be flexible and subject to adjustment and modification as needs change and evolve in the water system. Long-term projections should be reviewed and reevaluated periodically to assure that initial assumptions remain relevant and accurate. Specific annual scheduling of improvements within each major priority period should be reassessed annually with the WDPW's Capital Planning Committee to assure maximum financial benefit in any given year.

TABLE 9-1
RECOMMENDED TEN-YEAR CAPITAL IMPROVEMENT PROGRAM
WARE, MASSACHUSETTS

	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	Estimate	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SUPPLY											
Existing Sources											
Dismal Swamp -Generator	$200,000					$200,000					
Cistern -Security Camera	$5,000		$5,000								
Well No. 4 -Generator	$200,000						$200,000				
Well No. 4 -House Acquisition	$200,000		$200,000								
Treatment											
Barnes Street WTP	$5,000,000			$3,000,000	$2,000,000						
DISTRIBUTION											
ISO Improvements											
Various	$1,260,000					$210,000	$210,000	$210,000	$210,000	$210,000	$210,000
WMIP Improvements											
Various	$1,320,000					$220,000	$220,000	$220,000	$220,000	$220,000	$220,000
Storage Improvements											
Mixing Systems											
Anderson Road	$50,000				$50,000						
Church Street	$50,000				$50,000						
Repairs											
Anderson Road	$20,000				$20,000						
Church Street	$20,000				$20,000						
Repainting											
Anderson Road	$800,000					$800,000					
Church Street	$800,000						$800,000				
BPS - Generator	$50,000						$50,000				
SCADA Upgrades	$280,000				$280,000						
TOTAL	**$10,255,000**	**$0**	**$205,000**	**$3,000,000**	**$2,420,000**	**$1,430,000**	**$1,480,000**	**$430,000**	**$430,000**	**$430,000**	**$430,000**

Note: As noted in text, costs presented do not include engineering phase services budgets. All cost estimates are presented in 2016 dollars.

Exhibit

B

Exhibit B

The following parcels of land, and all structures and improvements thereon, currently owned by the Town of Ware Water Department, will be included in the sale of the Town's water and wastewater systems pursuant to the RFP:

1. Address: Pleasant Street, Ware, MA 01082
   Ware Assessor's Map and Lot: 62-0-44
   Acres: 1.3874

2. Address: Pleasant Street, Ware, MA 01082
   Ware Assessor's Map and Lot: 62-0-45
   Acres: 3.0774

3. Address: Eddy + Pleasant Street, Ware, MA 01082
   Ware Assessor's Map and Lot: 60-0-177
   Acres: 5.6374

4. Address: Old Gilbertville Road, Ware, MA 01082 (Church St. Water Tank)
   Ware Assessor's Map and Lot: 23-0-13
   Acres: 11.4674

5. Address: Old Gilbertville Road, Ware, MA 01082 (Anderson Rd. Water Tank)
   Ware Assessor's Map and Lot: 15-0-5
   Acres: 2.1974

6. Address: 4.5 Church Street, Ware, MA 01082
   Ware Assessor's Map and Lot: 61-0-331
   Acres: 0.5978

7. Address: 72 Gilbertville Road, Ware, MA 01082 (Dismal Swamp)
   Ware Assessor's Map and Lot: 30-44-1
   Acres: 14.6474

8. Address: 116 Pleasant Street, Ware, MA 01082
   Ware Assessor's Map and Lot: 60-0-71
   Acres: 0.7828

9. Address: 30 Robbins Road, Ware, MA 01082
   Ware Assessor's Map and Lot: 17.0.26
   Acres: 8.0004

10. Address: 22 Barnes Street, Ware, MA 01082 (Barnes Pump House)
    Ware Assessor's Map and Lot: 60-0-70
    Acres: 26.5674

Assessment Field Card

Town of Ware, Massachusetts

NO PHOTO AVAILABLE

Parcel Information

Address: PLEASANT ST
Map-Lot: 62-0-44
Patriot Account #: 3682
Owner: WARE TOWN OF
Co-Owner: WATER DEPT
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type:
Year Built:
Grade:
Frame Type:
Living Units: 0
Building Condition:
Roof Cover:
Roof Type:
Exterior Wall Type:
Pool: False

General Information

Total Acres: 1.3874
Land Use Code: 930
Neighborhood Code:
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: DTR
Utility Code 1:
Utility Code 2:
Utility Code 3:

Building Area

Gross Area: 0 sqft
Finished Area: 0 sqft
Basement Area: 0 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: sqft

Ownership History

Sale Date: 12:00:00 AM
Sale Price: $ 0
Nal Description:
Grantor (Seller):
Book/Page:

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 0
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing:
Interior Wall Type:
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type:
Heat Type:
Heat Fuel:
Percent A/C:

Assessed Value

Assessed Yard Value: $ 0
Assessed Land Value: $ 44500
Assessed Bldg Value: $0
Total Assessed Value: **$44500**

Assessment Field Card

Town of Ware, Massachusetts

Parcel Information

NO PHOTO AVAILABLE

Address: PLEASANT ST
Map-Lot: 62-0-45
Patriot Account #: 3683
Owner: WARE TOWN OF
Co-Owner: WATER DEPT
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type:
Year Built:
Grade:
Frame Type:
Living Units: 0
Building Condition:
Roof Cover:
Roof Type:
Exterior Wall Type:
Pool: False

General Information

Total Acres: 3.0774
Land Use Code: 930
Neighborhood Code:
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: DTR
Utility Code 1:
Utility Code 2:
Utility Code 3:

Building Area

Gross Area: 0 sqft
Finished Area: 0 sqft
Basement Area: 0 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: sqft

Ownership History

Sale Date: 12:00:00 AM
Sale Price: $ 0
Nal Description:
Grantor (Seller):
Book/Page:

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 0
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing:
Interior Wall Type:
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type:
Heat Type:
Heat Fuel:
Percent A/C:

Assessed Value

Assessed Yard Value: $ 0
Assessed Land Value: $ 47800
Assessed Bldg Value: $0
Total Assessed Value: **$47800**

Assessment Field Card

Town of Ware, Massachusetts

Parcel Information

NO PHOTO AVAILABLE

Address:	EDDY + PLEASANT ST
Map-Lot:	60-0-177
Patriot Account #:	3150
Owner:	WARE TOWN OF
Co-Owner:	WATER DEPT
Mailing Address:	126 MAIN ST WARE, MA 01082

Building Exterior Details

Building Type:	
Year Built:	
Grade:	
Frame Type:	
Living Units:	0
Building Condition:	
Roof Cover:	
Roof Type:	
Exterior Wall Type:	
Pool:	False

General Information

Total Acres:	5.6374
Land Use Code:	930
Neighborhood Code:	
Owner Occupied:	N
Condo Name:	
Condo Unit:	
Zone:	DTR
Utility Code 1:	
Utility Code 2:	
Utility Code 3:	

Building Area

Gross Area:	0 sqft
Finished Area:	0 sqft
Basement Area:	0 sqft
Garage Area:	0 sqft
Detached Garage:	sqft
Basement Garage:	sqft

Ownership History

Sale Date:	12:00:00 AM
Sale Price:	$ 0
Nal Description:	
Grantor (Seller):	
Book/Page:	

Building Interior

No. Total Rooms:	0
No. Bedrooms:	0
No. Full Baths:	0
No. Half Baths:	0
Bath Rating:	
No. Kitchens:	0
Kitchen Rating:	
Building Framing:	
Interior Wall Type:	
Fireplaces:	0
Solar Hot Water:	False
Central Vac:	False
Floor Type:	
Heat Type:	
Heat Fuel:	
Percent A/C:	

Assessed Value

Assessed Yard Value:	$ 0
Assessed Land Value:	$ 35600
Assessed Bldg Value:	$0
Total Assessed Value:	**$35600**

CAI Technologies

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Assessment Field Card

Town of Ware, Massachusetts

NO PHOTO AVAILABLE

Parcel Information

Address: OLD GILBERTVILLE RD
Map-Lot: 23-0-13
Patriot Account #: 722
Owner: WARE TOWN OF
Co-Owner: CHURCH ST WATER TANK
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type: RELAY BLDG
Year Built: 1997
Grade: C+
Frame Type: CONCRETE
Living Units: 0
Building Condition: Good
Roof Cover: ASPHALT SH
Roof Type: GABLE
Exterior Wall Type: CONC.PANEL
Pool: False

General Information

Total Acres: 11.4674
Land Use Code: 931
Neighborhood Code:
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: RR
Utility Code 1:
Utility Code 2:
Utility Code 3:

Building Area

Gross Area: 121 sqft
Finished Area: 121 sqft
Basement Area: 0 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: 0 sqft

Ownership History

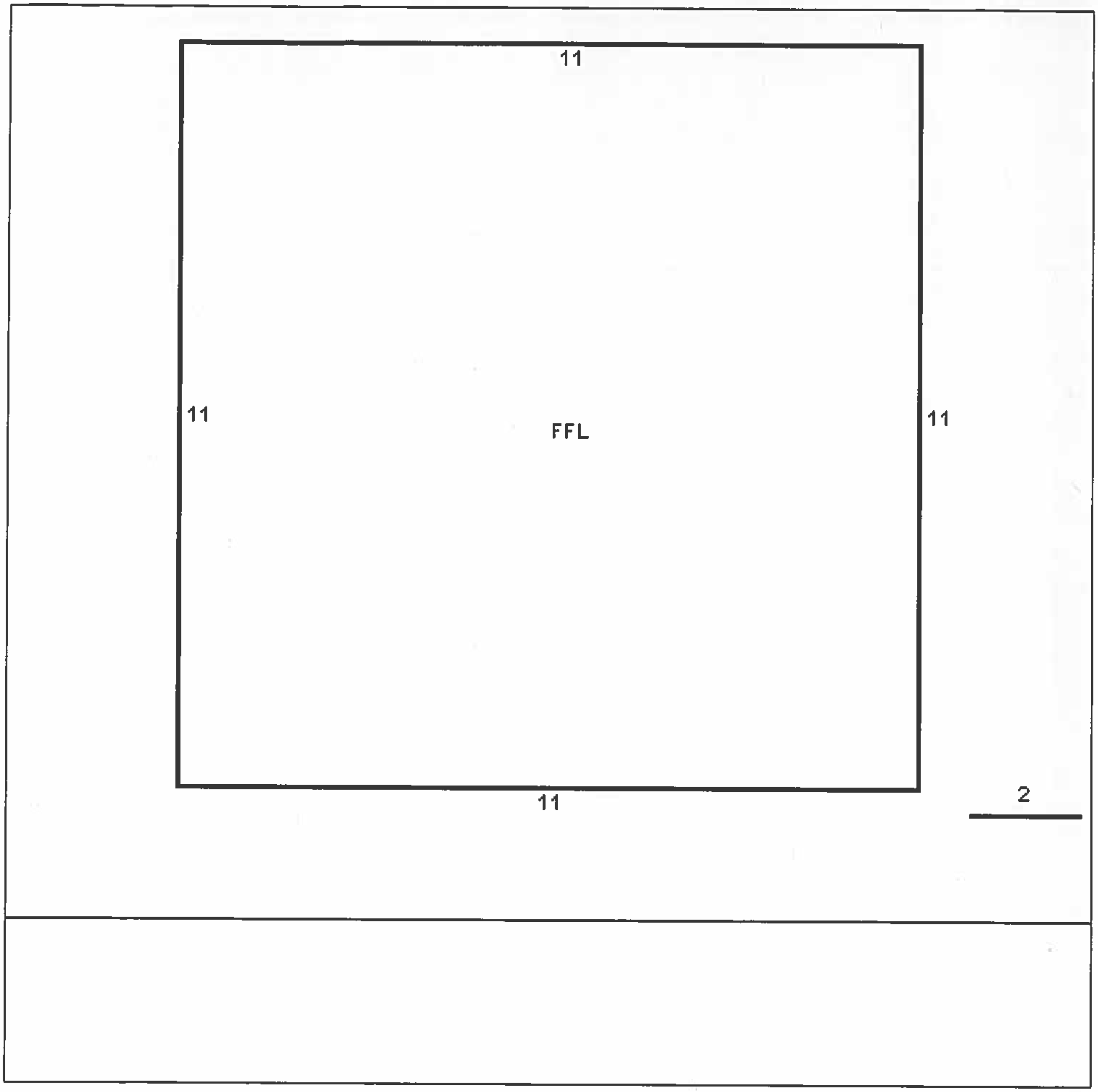
Sale Date: 12:00:00 AM
Sale Price: $ 0
Nal Description:
Grantor (Seller):
Book/Page:

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 0
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing: CONCRETE
Interior Wall Type: MINIMUM
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type: CONCRETE
Heat Type: NONE
Heat Fuel: NONE
Percent A/C: 0

Assessed Value

Assessed Yard Value: $ 1063600
Assessed Land Value: $ 77200
Assessed Bldg Value: $9500
Total Assessed Value: **$1150300**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Assessment Field Card

Town of Ware, Massachusetts

NO PHOTO AVAILABLE

Parcel Information

Address: ANDERSON RD
Map-Lot: 15-0-5
Patriot Account #: 314
Owner: WARE TOWN OF
Co-Owner: ANDERSON RD WATER TANK
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type:
Year Built:
Grade:
Frame Type:
Living Units: 0
Building Condition:
Roof Cover:
Roof Type:
Exterior Wall Type:
Pool: False

General Information

Total Acres: 2.1974
Land Use Code: 971
Neighborhood Code:
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: RR
Utility Code 1:
Utility Code 2:
Utility Code 3:

Building Area

Gross Area: 0 sqft
Finished Area: 0 sqft
Basement Area: 0 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: sqft

Ownership History

Sale Date: 11/5/1957
Sale Price: $ 0
Nal Description: OTHER
Grantor (Seller): CHROBAK PETER + SEWERA
Book/Page: 1260-374

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 0
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing:
Interior Wall Type:
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type:
Heat Type:
Heat Fuel:
Percent A/C:

Assessed Value

Assessed Yard Value: $ 431000
Assessed Land Value: $ 46000
Assessed Bldg Value: $0
Total Assessed Value: **$477000**

Assessment Field Card

Town of Waare, Massachusetts

Parcel Information

Address:	4.5 CHURCH ST
Map-Lot:	61-0-331
Patriot Account #:	3563
Owner:	WARE TOWN OF
Co-Owner:	WATER DEPT
Mailing Address:	126 MAIN ST WARE, MA 01082

Building Exterior Details

Building Type:	GARAGE
Year Built:	1890
Grade:	C
Frame Type:	WOOD
Living Units:	1
Building Condition:	Average
Roof Cover:	TAR+GRAVEL
Roof Type:	FLAT
Exterior Wall Type:	BRICK
Pool:	False

General Information

Total Acres:	0.5978
Land Use Code:	971
Neighborhood Code:	
Owner Occupied:	N
Condo Name:	
Condo Unit:	
Zone:	DTC
Utility Code 1:	
Utility Code 2:	
Utility Code 3:	

Building Area

Gross Area:	6773 sqft
Finished Area:	4446 sqft
Basement Area:	0 sqft
Garage Area:	0 sqft
Detached Garage:	sqft
Basement Garage:	0 sqft

Ownership History

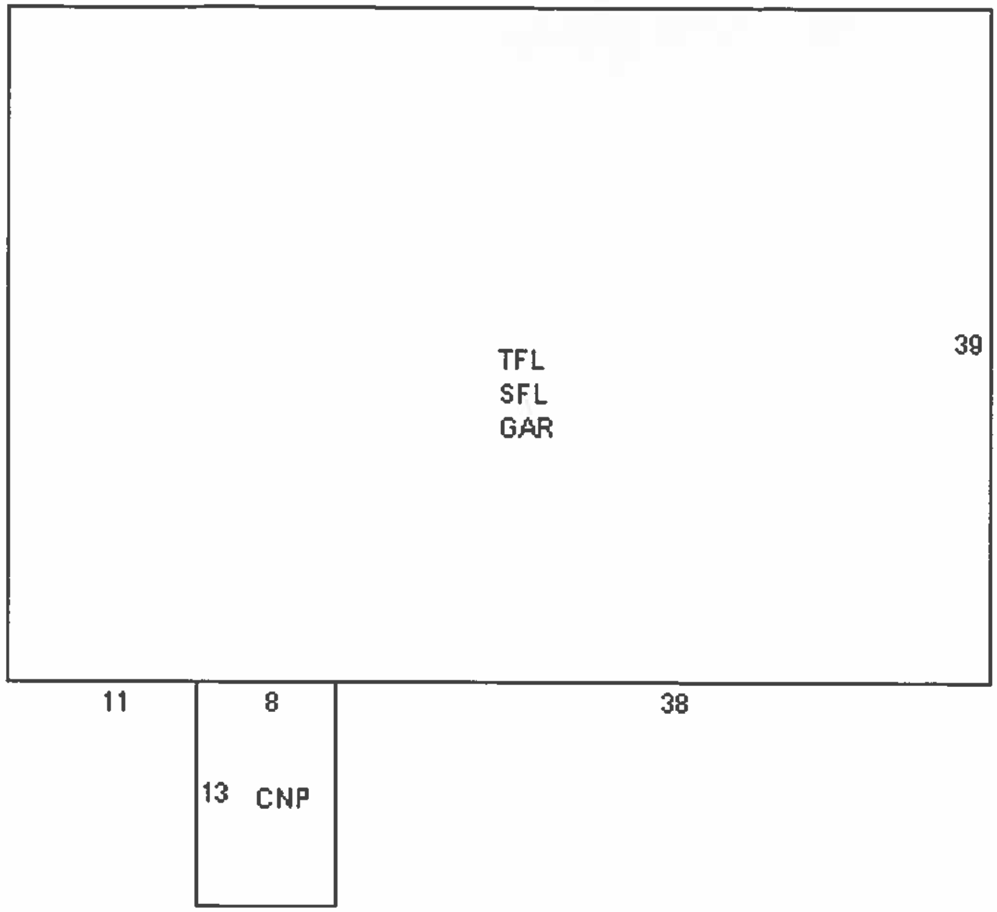
Sale Date:	12:00:00 AM
Sale Price:	$ 0
Nal Description:	
Grantor (Seller):	
Book/Page:	

Building Interior

No. Total Rooms:	0
No. Bedrooms:	0
No. Full Baths:	0
No. Half Baths:	2
Bath Rating:	
No. Kitchens:	0
Kitchen Rating:	
Building Framing:	WOOD
Interior Wall Type:	PLASTER
Fireplaces:	0
Solar Hot Water:	False
Central Vac:	False
Floor Type:	HARDWOOD
Heat Type:	FORCED H/W
Heat Fuel:	OIL
Percent A/C:	0

Assessed Value

Assessed Yard Value:	$ 10900
Assessed Land Value:	$ 62000
Assessed Bldg Value:	$119300
Total Assessed Value:	**$192200**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Assessment Field Card

Town of Ware, Massachusetts

Parcel Information

NO PHOTO AVAILABLE

Address: 72 GILBERTVILLE RD
Map-Lot: 30-44-1
Patriot Account #: 1159
Owner: WARE TOWN OF
Co-Owner: DISMAL SWAMP RT 32
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type: PMP/VLV HS
Year Built: 1998
Grade: B
Frame Type: CONCRETE
Living Units: 1
Building Condition: Good
Roof Cover: MEMBRANE/RUB
Roof Type: FLAT
Exterior Wall Type: CONC.PANEL
Pool: False

General Information

Total Acres: 14.6474
Land Use Code: 971
Neighborhood Code: 63
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: RR
Utility Code 1:
Utility Code 2:
Utility Code 3:

Building Area

Gross Area: 630 sqft
Finished Area: 630 sqft
Basement Area: 0 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: 0 sqft

Ownership History

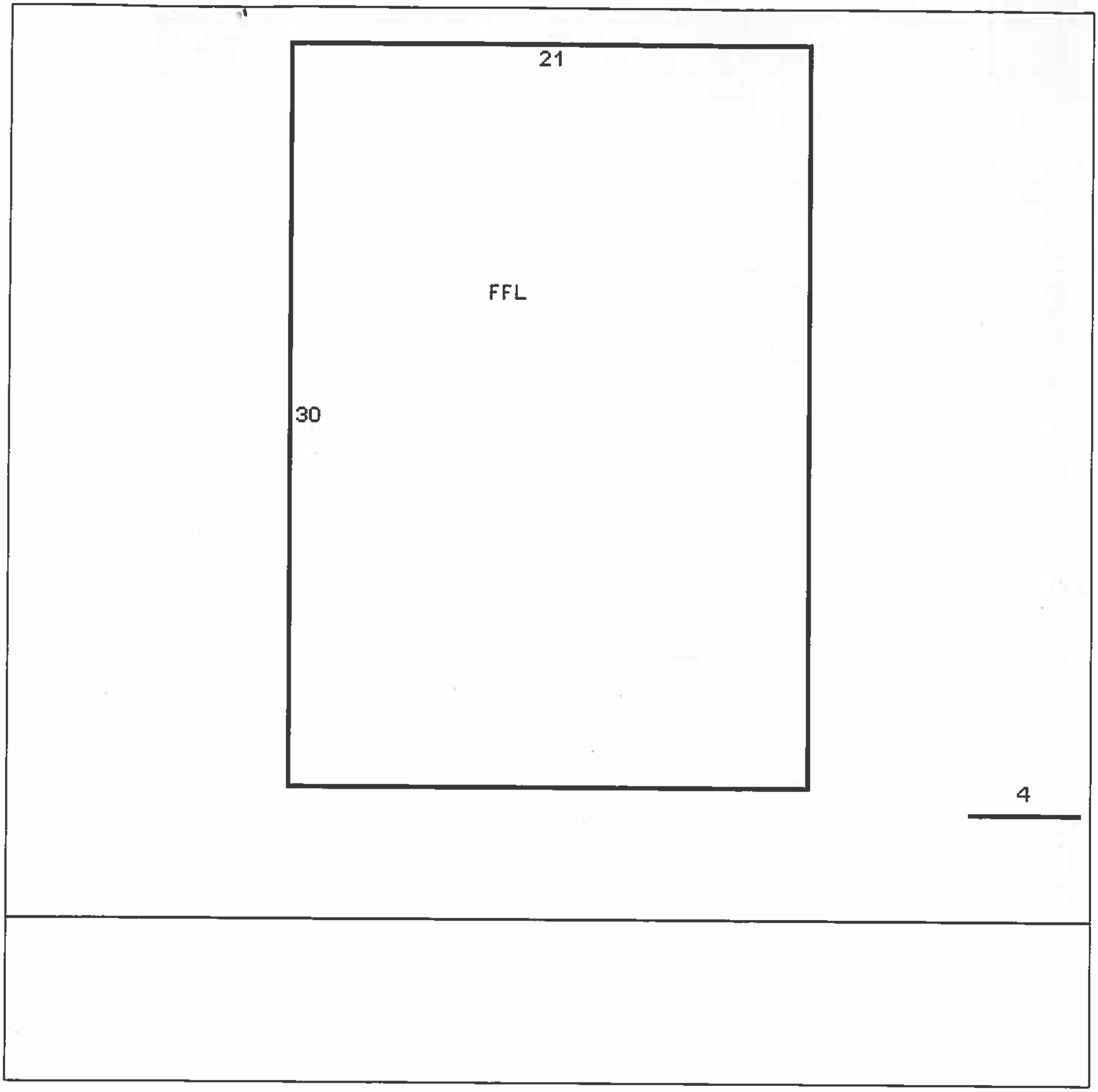
Sale Date: 5/29/1980
Sale Price: $ 1
Nal Description: BANKRUPTCY
Grantor (Seller): NENAMESECK IND PROP INC
Book/Page: 2163-307

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 0
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing: CONCRETE
Interior Wall Type: MINIMUM
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type: CONCRETE
Heat Type: NONE
Heat Fuel: NONE
Percent A/C: 0

Assessed Value

Assessed Yard Value: $ 3100
Assessed Land Value: $ 59900
Assessed Bldg Value: $43600
Total Assessed Value: **$106600**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Assessment Field Card

Town of Ware, Massachusetts

Parcel Information

Address: 116 PLEASANT ST
Map-Lot: 60-0-71
Patriot Account #: 3272
Owner: WARE TOWN OF
Co-Owner:
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type: OLD STYLE
Year Built: 1890
Grade: C
Frame Type: WOOD
Living Units: 1
Building Condition: Average
Roof Cover: ASPHALT SH
Roof Type: GABLE
Exterior Wall Type: ALUMINUM
Pool: False

General Information

Total Acres: 0.7828
Land Use Code: 931
Neighborhood Code: 26
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: DTR
Utility Code 1: WATE
Utility Code 2: SEWE
Utility Code 3:

Building Area

Gross Area: 3110 sqft
Finished Area: 1515.13 sqft
Basement Area: 625 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: 0 sqft

Ownership History

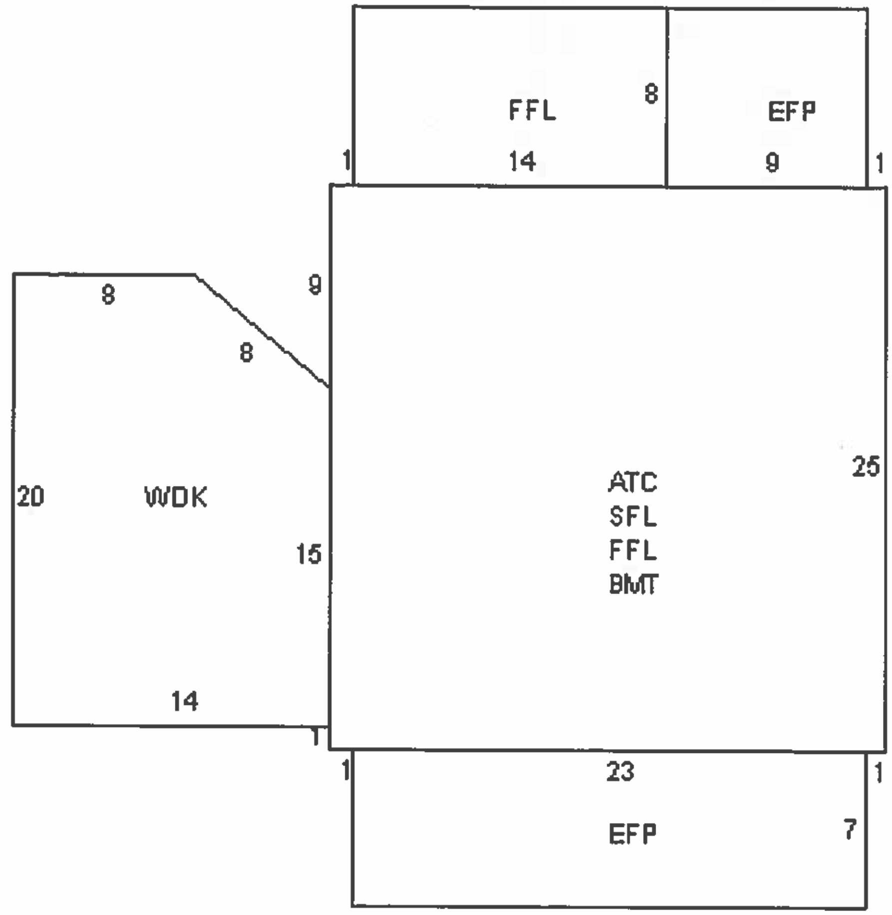
Sale Date: 10/5/2018
Sale Price: $ 120000
Nal Description: INVOLVED GOV
Grantor (Seller): MAZZAFERRO ,SUSAN J
Book/Page: 13096-66

Building Interior

No. Total Rooms: 7
No. Bedrooms: 3
No. Full Baths: 1
No. Half Baths: 0
Bath Rating: AVER
No. Kitchens: 1
Kitchen Rating: AVER
Building Framing: WOOD
Interior Wall Type: PLASTER
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type: CARPET
Heat Type: FORCED H/W
Heat Fuel: OIL
Percent A/C: 0

Assessed Value

Assessed Yard Value: $ 8800
Assessed Land Value: $ 23100
Assessed Bldg Value: $110700
Total Assessed Value: **$142600**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Assessment Field Card

Town of Ware, Massachusetts

Parcel Information

Address: 30 ROBBINS RD
Map-Lot: 17-0-26
Patriot Account #: 376
Owner: WARE TOWN OF
Co-Owner: SEWER DEPT
Mailing Address: 126 MAIN ST
P.O. BOX 89
WARE, MA 01082

Building Exterior Details

Building Type: PROCESSING
Year Built: 1984
Grade: B
Frame Type: CONCRETE
Living Units: 2
Building Condition: Average
Roof Cover: TAR+GRAVEL
Roof Type: FLAT
Exterior Wall Type: CONC BLOCK
Pool: False

General Information

Total Acres: 8.0004
Land Use Code: 971
Neighborhood Code:
Owner Occupied: N
Condo Name:
Condo Unit:
Zone: I
Utility Code 1: WATE
Utility Code 2: SEWE
Utility Code 3:

Building Area

Gross Area: 13742 sqft
Finished Area: 10874 sqft
Basement Area: 2520 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: 0 sqft

Ownership History

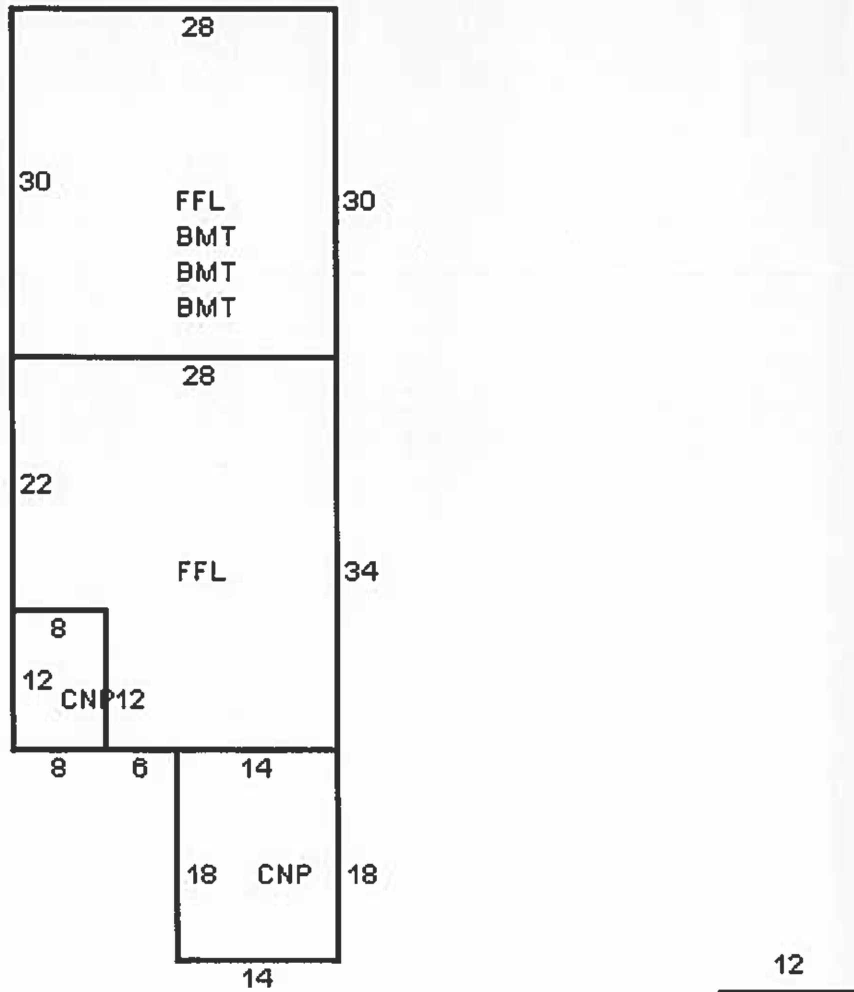
Sale Date: 12:00:00 AM
Sale Price: $ 0
Nal Description:
Grantor (Seller):
Book/Page:

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 1
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing: CONCRETE
Interior Wall Type: MINIMUM
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type: CONCRETE
Heat Type: FORCED H/A
Heat Fuel: OIL
Percent A/C: 50

Assessed Value

Assessed Yard Value: $ 1747500
Assessed Land Value: $ 157900
Assessed Bldg Value: $540600
Total Assessed Value: **$2446000**



CAI Technologies

www.cai-tech.com

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Assessment Field Card

Town of Ware, Massachusetts

Parcel Information

NO PHOTO AVAILABLE

Address: 22 BARNES ST
Map-Lot: 60-0-70
Patriot Account #: 3271
Owner: WARE TOWN OF
Co-Owner: WATER DEPT PUMP HOUSE
Mailing Address: 126 MAIN ST

WARE, MA 01082

Building Exterior Details

Building Type: PMP/VLV HS
Year Built: 1910
Grade: B
Frame Type: CONCRETE
Living Units: 1
Building Condition: Good
Roof Cover: ASPHALT SH
Roof Type: HIP
Exterior Wall Type: BRICK
Pool: False

General Information

Total Acres: 26.5674
Land Use Code: 971
Neighborhood Code: 32
Owner Occupied: Y
Condo Name:
Condo Unit:
Zone: DTR
Utility Code 1:
Utility Code 2:
Utility Code 3:

Building Area

Gross Area: 4810 sqft
Finished Area: 3246.75 sqft
Basement Area: 0 sqft
Garage Area: 0 sqft
Detached Garage: sqft
Basement Garage: 0 sqft

Ownership History

Sale Date: 12:00:00 AM
Sale Price: $ 0
Nal Description:
Grantor (Seller):
Book/Page:

Building Interior

No. Total Rooms: 0
No. Bedrooms: 0
No. Full Baths: 0
No. Half Baths: 1
Bath Rating:
No. Kitchens: 0
Kitchen Rating:
Building Framing: CONCRETE
Interior Wall Type: MINIMUM
Fireplaces: 0
Solar Hot Water: False
Central Vac: False
Floor Type: CONCRETE
Heat Type: STEAM
Heat Fuel: OIL
Percent A/C: 0

Assessed Value

Assessed Yard Value: $ 132200
Assessed Land Value: $ 66600
Assessed Bldg Value: $178900
Total Assessed Value: **$377700**

Town of Ware

Activity Schedule for Fixed Assets/Infastructure/CIP/Land

	Balance 1-Jul-21	Additions	Retirements	Depreciation	Balance 30-Jun-22
BUSINESS-TYPE ACTIVITIES - SEWER					
Land	66,700.00				66,700.00
Construction in Progress	280,974.00	(280,974.00)			-
Buildings & Improvements	265,525.43	280,974.00			546,499.43
Machinery & Equipment & Vehicles	22,335.91		-		22,335.91
Infrastructure	1,077,448.20				1,077,448.20
	1,712,983.54	-	-	-	1,712,983.54
Depreciation:					
Buildings & Improvements	98,832.60		-	75,553.40	174,386.00
Machinery & Equipment & Vehicles	22,335.91		-	-	22,335.91
Infastructure	301,166.69		-	34,145.23	335,311.92
	422,335.20	-	-	109,698.63	532,033.83
	1,290,648.34	-	-	109,698.63	1,180,949.71
BUSINESS-TYPE ACTIVITIES - WATER					
Land	326,700.00	-	-		326,700.00
Construction in Progress	337,619.11	(337,619.11)	-		-
Buildings & Improvements	11,995.00	-	-		11,995.00
Machinery & Equipment & Vehicles	152,546.91	40,674.60	-		193,221.51
Infrastructure	5,004,971.62	-	-		5,004,971.62
	5,833,832.64	(296,944.51)	-	-	5,536,888.13
Depreciation:					
Buildings & Improvements	8,396.50	-	-	2,399.00	10,795.50
Machinery & Equipment & Vehicles	129,369.91	-	-	10,689.46	140,059.37
Infastructure	1,802,624.67	-	-	113,380.58	1,916,005.25
	1,940,391.08	-	-	126,469.04	2,066,860.12

City/Town of Ware
Fixed Assets/Infastructure/Land/CIP - Other

Other

Assets	Serial/Vin #	Date Placed in Service	Cost	Useful Life	First Yr Depr (1/2)	Last Yr Depr (1/2)	Depr Oth Years
Fixed Assets:							
Buildings & Improvements:							
Influent Pumps		FY2013	106,709.93	20	2,667.75	2,667.75	5,335.50
WWTP Roof		FY2016	55,000.00	25	1,100.00	1,100.00	2,200.00
WWTP-LED Lighting		FY2018	19,025.00	5	1,902.50	1,902.50	3,805.00
WWTP-Concrete Repair		FY2018	59,600.00	20	1,490.00	1,490.00	2,980.00
WWTP-Communiter/Grinder		FY2018	25,190.50	5	2,519.05	2,519.05	5,038.10
I/I Study		FY2022	280,974.00	5	28,097.40	28,097.40	56,194.80
			546,499.43				
Machinery & Equipment & Vehicles:							
1997 Ford Pickup-utility	FTHF26HXVEC7581	Fy1997	25,671.00	1	12,835.50	12,835.50	25,671.00
1997 Ford Pickup-utility		Sold as Surplus-FY2016	(25,671.00)				
2000 Ford Pickup-Utility	FDNF21L2YEE0671	Fy2000	33,099.00	1	16,549.50	16,549.50	33,099.00
		Sold as Surplus-FY2016	(33,099.00)	1	(16,549.50)	(16,549.50)	(33,099.00)
2018 Ford F250 SuperCab 1/2	IFD7X2B61JEB7603	FY2018	22,335.91	3	3,722.65	3,722.65	7,445.30
			22,335.91				
			568,835.34				
Infastructure:							
PWED-Sewer		June-08	*119,200.00*	20	2,980.00	2,980.00	5,960.00
Sewer Lines		Fy2006	68,000.00	50	680.00	680.00	1,360.00
Aspen Street Sewer/Drainage/ Sidewalks/Streets	1/3	FY 2006	408,170.00	50	4,081.70	4,081.70	8,163.40
WWTP Upgrades		FY2017	300,675.50	20	7,516.89	7,516.89	15,033.78
Main Line Replacement-Elm Street		FY2020	123,919.60	50	1,239.20	1,239.20	2,478.39
Church Street Sewer Line Replacement		FY2020	57,483.10	50	574.83	574.83	1,149.66
			-	50	-	-	-
			-	50	-	-	-
			-	50	-	-	-
			-	50	-	-	-
			-	1	-	-	-
			1,077,448.20				
Land							
Robbins Road-Sewer Plant	17-0-26		66,700.00		*No Depreciation*		
			-		*No Depreciation*		
			66,700.00				
Construction In Progress							
Main Line Replacement-Elm Street		FY2019	5,290.00	*No Depreciation Until Put into Service(Complete)*			
Main Line Replacement-Elm Street		FY2019 - Accrual	1,740.00	*No Depreciation Until Put into Service(Complete)*			
Main Line Replacement-Elm Street		FY2020	116,889.60	*No Depreciation Until Put into Service(Complete)*			
Main Line Replacement-Elm Street		In Service	(123,919.60)	*No Depreciation Until Put into Service(Complete)*			
				No Depreciation Until Put into Service(Complete)			
				No Depreciation Until Put into Service(Complete)			
I/I Study		FY 2018	117,121.00	*No Depreciation Until Put into Service(Complete)*			
I/I Study		FY2019	151,084.00	*No Depreciation Until Put into Service(Complete)*			
I/I Study		FY2020	12,769.00	*No Depreciation Until Put into Service(Complete)*			
I/I Study		FY2022	(280,974.00)	*No Depreciation Until Put into Service(Complete)*			
				No Depreciation Until Put into Service(Complete)			
				No Depreciation Until Put into Service(Complete)			
			-				
Totals			**1,712,983.54**				

City/Town of Ware
Fixed Assets/Infrastructure/Land/CIP - Other

Other

Assets	Serial/Vin #	Date Placed in Service	Cost	Useful Life	First Yr Depr (1/2)	Last Yr Depr (1/2)	Depr Oth Years
Fixed Assets:							
Buildings & Improvements:							
Water Dept Bldg-LED Lighting		FY2018	11,995.00	5	1,199.50	1,199.50	2,399.00
				1	-	-	-
				1	-	-	-
			11,995.00				
Machinery & Equipment & Vehicles:							
2012 Ford F-250	1FTBF2B66CEB8469	Fy2012	40,836.00	5	4,083.60	4,083.60	8,167.20
2011 Ford Crown Victoria	2FABP7BV0BX12409	FY2015	27,738.00	3	4,623.00	4,623.00	9,246.00
2016 Ford Edge SE	FMPK3G96GBC5336	FY2017	28,527.00	3	4,754.50	4,754.50	9,509.00
2018 Ford F250 SuperCab	1FD7X2B61JEB76031	FY2018	22,335.91	3	3,722.65	3,722.65	7,445.30
2020 Ford F-250	1FTBF2B65LEC4943	FY2020	33,110.00	5	3,311.00	3,311.00	6,622.00
2022 Ford F-250	1FDBF2B63NEC0036	FY2022	40,674.60	5	4,067.46	4,067.46	8,134.92
			193,221.51				
			205,216.51				
Infastructure:							
North & Dale Streets - Water		FY 2003	638,158.00	50	6,381.58	6,381.58	12,763.16
West Main & Eagle - Water		FY 2003	392,840.00	50	3,928.40	3,928.40	7,856.80
West Main & Eagle - Water		FY 2004	21,950.00	50	219.50	219.50	439.00
Eagle - Water - CIP		FY 2004	603,750.86	50	6,037.51	6,037.51	12,075.02
Eagle - Water		FY 2004	24,437.00	50	244.37	244.37	488.74
Gilberthill Road Pump Station-Water		Fy2001	34,700.00	50	347.00	347.00	694.00
Gilberthill Road Well-Water		Fy2001	624,000.00	50	6,240.00	6,240.00	12,480.00
Snows Pond Dam-Water		Fy2002	241,120.00	50	2,411.20	2,411.20	4,822.40
Water Tanks rehabilitation		Fy2000	410,626.00	25	8,212.52	8,212.52	16,425.04
Water Tanks rehabilitation		Fy2004	57,000.00	25	1,140.00	1,140.00	2,280.00
PWED-Water lines		June-08	191,075.00	50	1,910.75	1,910.75	3,821.50
Chlorination-Corosion Facility		June-08	785,725.00	40	9,821.56	9,821.56	19,643.13
CDBG Maple Street Water Main		June-08	243,620.00	50	2,436.20	2,436.20	4,872.40
Replacement Wells		FY2016	146,653.41	50	1,466.53	1,466.53	2,933.07
Richfield Ave Main Replacement		FY2016	251,298.67	50	2,512.99	2,512.99	5,025.97
Main Line Replacement-Elm Street		FY2020	169,658.44	50	1,696.58	1,696.58	3,393.17
Barnes Street Pipe Loop Project		FY2020	99,899.74	50	999.00	999.00	1,997.99
Main Street Water Mains		FY2020	68,459.50	50	684.60	684.60	1,369.19
			5,004,971.62				
Land							
Church Street-Relay Building-Wter			52,800.00		***No Depreciation***		
Eddy & Pleasant Street-Water Dept.E	60-0-177		30,800.00		***No Depreciation***		
Barnes Street-Pump House-Water			64,100.00		***No Depreciation***		
Pleasant Street-Water	62-0-44		32,700.00		***No Depreciation***		
Pleasant Street-Water	62-0-45		35,400.00		***No Depreciation***		
Anderson Road-Water	15-0-5		62,400.00		***No Depreciation***		
Gilbert Hill Road-Water Tank			48,500.00		***No Depreciation***		
			-		***No Depreciation***		
			-		***No Depreciation***		
			-		***No Depreciation***		
			326,700.00				
Construction In Progress							
Water Treatment Plant		FY2018	291,539.43	***No Depreciation Until Put into Service(Complete)***			
Water Treatment Plant		FY2019	18,739.17	***No Depreciation Until Put into Service(Complete)***			
Main Line Replacement-Elm Street		FY2019	22,752.50	***No Depreciation Until Put into Service(Complete)***			
Main Line Replacement-Elm Street		FY2020	146,905.94	***No Depreciation Until Put into Service(Complete)***			
Main Line Replacement-Elm Street		In Service	(169,658.44)	***No Depreciation Until Put into Service(Complete)***			
Water Treatment Plant		FY2020	8,484.74	***No Depreciation Until Put into Service(Complete)***			
Water Treatment Plant		FY2021	18,855.77				
Water Treatment Plant - project not moving forward-write off			(337,619.11)				
			-				
Totals			5,536,888.13				

Exhibit C

Attach Wastewater Collection System Operation and Maintenance Plan

Sewer Master Plan

WARE DEPARTMENT OF PUBLIC WORKS

Ware, MA

October 2016

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SEWER MASTER PLAN

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Wright-Pierce
Engineering a Better Environment

SECTION 1

INTRODUCTION

1.1 BACKGROUND

The Town of Ware, Massachusetts is located on the eastern edge of Hampshire county bordering the southern end of the Quabbin Reservoir. Ware's population grew steadily in the 20th century, but has been stagnant over the past 20 years with a current population of 9,872 residents. The wastewater infrastructure serves approximately 55 percent of the community, which includes 23 miles of gravity sewer, one municipally owned and operated pump station, one private pump station and approximately 1,737 sewer users. The Town owns and operates a 1.0 MGD rated wastewater treatment facility (WWTF) located on Robbins Road operating under National Pollutant Discharge Elimination System (NPDES) Permit No. MA0100889 with discharge to the Ware River. Ware's sewer collection system dates back to the late 19th century and has experienced a series of expansions and improvements over the years.

1.2 SCOPE OF STUDY

This section provides a brief discussion of the scope of work involved in developing the Sewer Master Plan for the Town of Ware.

1.2.1 Review of Existing Conditions

The Town of Ware has performed several studies to identify needs within the collection and treatment systems to identify upgrades and expansions to better serve the Town. The following is a list of information reviewed and tasks performed to identify and document existing conditions as part of the Sewer Master Plan development.

- Various record drawings from past sewer expansion projects
- Site visits to existing pumping stations, WWTF and various collection system locations
- Ware WWTF flow data and Operation and Maintenance (O&M) manual
- Sewer Collection System Operation and Maintenance Manual and Map Book (completed by Tighe and Bond in July 2016)

- Rules and Regulations Governing the Town of Ware's public sewer system (adopted July, 21, 2015 and amended October 20, 2015).

Existing conditions are detailed in Section 2. Some of the existing conditions information is located in the Appendices of the report.

1.2.2 Assessment of Potential Future Sewer Service Needs

The following is a list of tasks completed and documentation reviewed to assess potential future sewer service needs for the Town of Ware.

- Sewer Interceptor Expansion Planning Study (completed by Dufresne-Henry, Inc. in April 1997)
- Conceptual Design for Sewer Expansion (developed by Robert E. Mellstrom Consulting Engineer in 2012)
- Review of Town's Open Space and Recreation Plan (completed March 3, 2016)

Possible future conditions are detailed in Section 3. Existing sewer system evaluation/assessment infrastructure (sewer system rehabilitation, for example) needs and costs are discussed in Section 4. Some of information referred to above is located in the Appendices of the report.

1.2.3 Development of Sewer Master Plan

The following is a list of tasks completed to develop the Sewer Master Plan.

- Conceptual plans for potential future expansion of the Town's sewer collection system (along Palmer Road and adjacent streets)
- Reviewed and selected methods to collect and transport wastewater
- Flow estimates from existing and future sewers
- Assessed infrastructure improvements required to handle current and potential future flows
- Prioritized infrastructure improvements based on existing information
- Prepared cost estimates for improvements to existing sewer assessment, potential sewer expansions and treatment facility improvements

- Proposed methods to finance future Capital Improvement Projects (CIP)

Recommendations are presented in Sections 3 and 4 and funding/financing options are presented in Section 5.

Section 2
Existing Conditions

SECTION 2

EXISTING CONDITIONS

This section includes a discussion of the existing conditions of Ware's sanitary sewer collection system, pumping facilities and wastewater treatment facility (WWTF); a discussion of the non-sewered area of the Town; and a summary of existing flows.

2.1 WASTEWATER COLLECTION SYSTEM

The Town of Ware sewer collection system is comprised of approximately 595 manholes, two pumping stations, three siphons and over 25.5 miles of gravity sewers. The sewer system was originally constructed in the 1890s (just 30 years post-Civil War) within the Northside neighborhood as a combined system, which consisted of direct discharge into the Ware River. The original sewer system map is included in Appendix A. The system has received upgrades and expansions since its original construction, including the 1960's construction of the WWTF and other facilities upgrades and improvements in the 1980's. The collection system consists of gravity sewers ranging from 4 to 24 inches in diameter, with the majority of the system piping being 6 to 8 inches in diameter. The collection system piping consists of vitrified clay (VC), asbestos cement (AC), polyvinyl chloride (PVC) and reinforced concrete pipes (RCP). The VC and AC piping are located in the older sections of the system, while the PVC and RCP piping are primarily newer sewers.

Ware's wastewater is predominantly residential with minor commercial sources, as well as one significant industrial user (SIU), Kanzaki Specialty Papers (KSP). KSP recently installed a pre-treatment system that has reduced solids loadings to the WWTF (KSP solids loadings to the Town's WWTF have been problematic in the past). The commercial sources of wastewater are various small businesses, restaurants, and laundry facilities located in and around Routes 32 and 9. The Town's most recent sewer expansion included a 15-inch diameter interceptor installed along the abandoned railroad bed for the Gibbs Crossing Shopping Plaza. The 15-inch diameter interceptor was completed in conjunction with a "rails-to-trails" project that includes a public walking trail as part of the sewer easement. This sewer main receives flows from the Gibbs Crossing Pump Station and has sufficient capacity for sewer expansion in the Southwest/Western portion of Town. A full size plan of the existing Ware Existing Sewer System is shown as Figure 2-1 (located in a pocket as Appendix A).

2.1.1 Non-sewered Areas

Figure 2-1 shows a significant portion of Ware is not currently served by public sewer. Developed properties in these areas are primarily zoned as residential and are served by privately-owned onsite septic systems (generally assumed to consist of a septic tank and a subsurface disposal field). It is assumed that the existing septic systems in Town are "pumped" by private septic hauler companies and septage is disposed of and treated at the Ware WWTF or other local treatment facilities.

2.2 PUMPING STATIONS

The Town owns and operates one pumping station located on Webb Court. The Town also receives wastewater from a privately owned and operated pump station within the Gibbs Crossing Shopping Plaza.

2.2.1 Webb Court Pumping Station

The Webb Court pump station (See Figure 2-2 below) is located in the middle of Webb Court off of Pulaski Street and has been in operation since 1984. This station collects residential flows from the end of Webb Court and serves approximately 10 residential properties. This station was originally constructed with a Hydromatic submersible pump. In 2012, the pump station received an upgrade, including the replacement of the pump and control systems with two free standing Environment One (E/One) semi-positive displacement grinder pumps. These pumps were installed due to pump clogging issues requiring frequent maintenance and an inadequate alarming system. This station does not have the ability to monitor or record flows.

Wastewater flows by gravity into a 4-foot diameter wetwell and is pumped by the E/One duplex submersible grinder pumps through two individual 1.5-inch diameter, 25-foot-long PVC force mains (with an approximate 15-foot static lift) into an adjacent manhole. The estimated average daily flow for this station is approximately 1,100 gpd. The control panel is located at the dead end of Webb Court about 140 feet away from the wetwell. There are two PVC electrical conduits exiting the wetwell that travel to the end of the dead end road to the pump control panel. The wetwell and pumps are shown in Figure 2-2.

FIGURE 2-2
WEBB COURT PUMPING STATION

The existing controls were replaced with an E/One T-260 alternating alarm panel, which was installed within the existing enclosure. Each pump has individual 6 conductor tray cables that run from the wetwell to the control panel (cables contain the power supply and alarm conductors). The pumps are operated by submersible level sensors located within the wetwell. The station alarming is performed locally on the control panel by red and green indicating lights and audible alarm buzzer. The Control panel is shown in Figure 2-3.

FIGURE 2-3
WEBB COURT PUMPING STATION CONTROL PANEL

2.2.2 Gibbs Crossing Pumping Station

The Gibbs Crossing Pumping Station is situated in the center of the Gibbs Crossing Shopping Plaza located off of route 32 near the Palmer Town line. The pump station was built to serve the commercial buildings within the shopping plaza, including Walmart and Lowes. This station was constructed in 2009 (approximately 7 years old). This station includes an 8-foot diameter wetwell, two 5 Hp non-clog, submersible pumps operated by submersible level transducers and backup float switches. The station also includes a pad-mounted, propane-fueled emergency generator with a buried propane tank and a control panel enclosure. The Gibbs Crossing Pumping Station site is shown in Figure 2-4.

FIGURE 2-4
GIBBS CROSSING PUMPING STATION

The pumps are designed to operate at 130 gpm at 43 feet of TDH with a 3-inch diameter discharge. The station force main is routed through an adjacent 4-foot diameter valve pit, which contains check and plug valves for each pump and a bypass pump connection. The force main increases to a 4-inch diameter Ductile Iron (DI) pipe outside the valve pit. The valve pit and pump bypass connection (with quick-disconnect) are shown below in Figure 2-5.

FIGURE 2-5
GIBBS CROSSING PUMPING STATION
VALVE PIT AND BYPASS CONNECTION

The station conveys wastewater through the 4-inch diameter DI force main and discharges into a newly constructed 15-inch diameter PVC interceptor. This pump station was also constructed with the intent of installing a pump station and sewer expansions on Palmer Road (Route 32) and surrounding streets South of the Ware River in the future. There is an additional 8-inch diameter DI force main installed as part of the project that discharges into the same manhole as the Gibbs Crossing Pumping Station 4-inch force main. The pump station design plans show that the force main was constructed to the western edge of the Gibbs Crossing property (adjacent from Walmart) with a plug for a future connection. Refer to Figure 2-6 for the pump station discharge manhole.

FIGURE 2-6
GIBBS CROSSING PUMPING STATION
DISCHARGE MANHOLE

2.3 WASTEWATER TREATMENT FACILITY (WWTF)

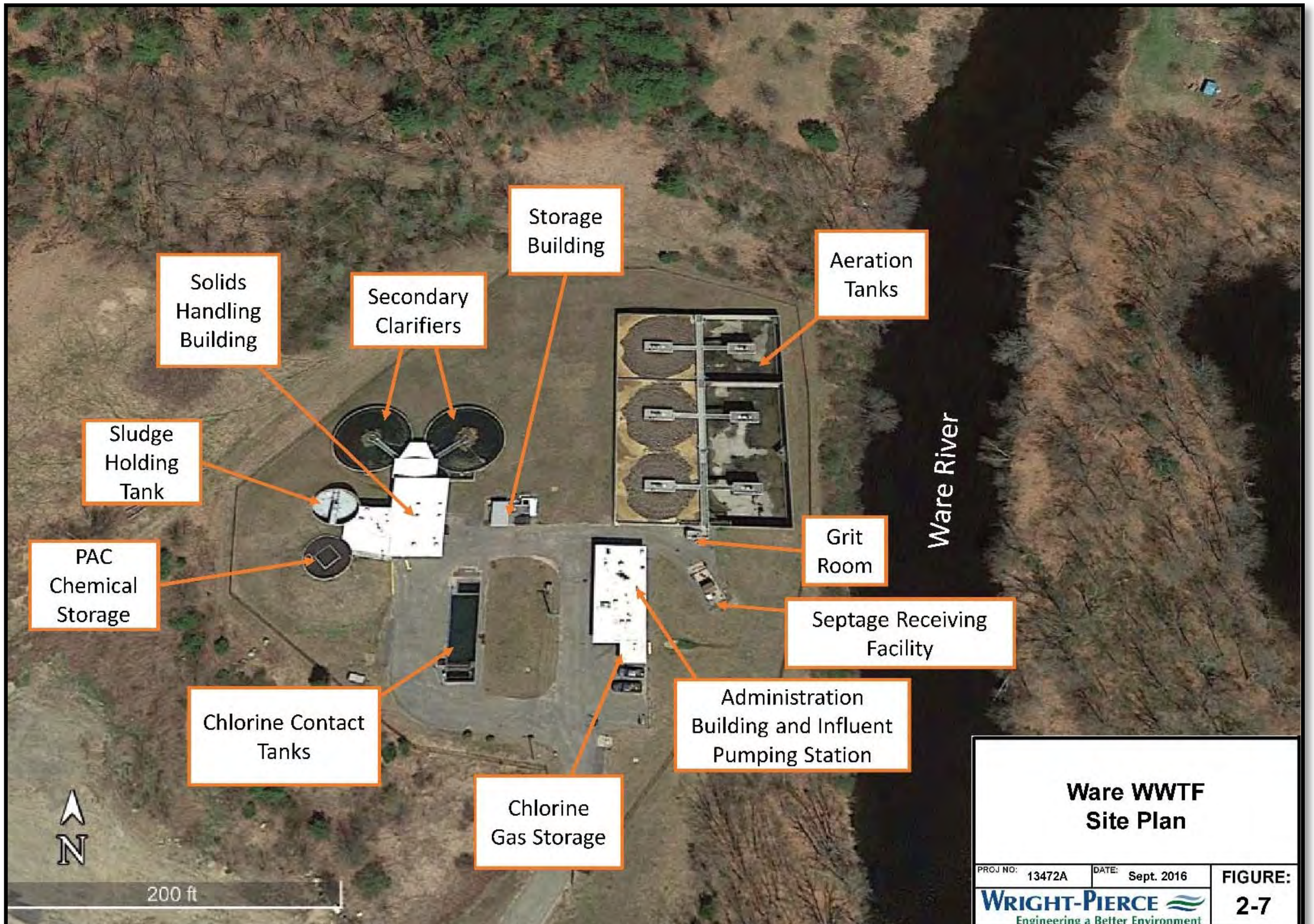
The Town of Ware existing WWTF is located on Robbins Road and was originally constructed in 1965 with a sedimentation basin and two anaerobic digesters for sludge processing. The facility underwent a major upgrade in 1984, which included secondary treatment utilizing the extended aeration - activated sludge process for biological oxygen demand (BOD) and suspended solids removal and seasonal nitrification. In 2012, the Town upgraded the influent pump station facilities, which included replacement of the pump motors, VFDs and a new control system. The existing Ware WWTF site plan is shown in Figure 2-7.

The Ware WWTF includes the following unit processes:

- Headworks with channel grinder and a bypass manual bar rack, influent pump system with two interconnecting wetwells and three 30 Hp dry pit pumps
- Septage receiving station
- Grit removal system, including two 47.5 cubic foot grit collecting channels, a grit pump, a cyclone degritter and grit cart
- Two aeration trains, each with two zones (Zone 1 - 60-feet x 60 feet with 13-foot sidewater depth and one 30 Hp mechanical aerator, Zone 2 - 120 feet x 60 feet with 13 feet sidewater depth with two 25 Hp mechanical aerators). Currently, the second aeration train is not in service, but is reportedly available for use (it is recommended that the Town double check mechanical, electrical and piping/valve operating conditions prior to putting this aeration train into service). Bags of soda ash are manually added to the influent for alkalinity addition.
- Two circular secondary clarifiers (56 - foot diameter with 15 foot sidewater depth)
- Chlorine gas disinfection system, sulfur dioxide gas dechlorination system and two chlorine contact tanks. One of these tanks is buried with a concrete cover.
- Polyaluminum Chloride (PAC) 2,000-gallon storage tank and chemical feed system for phosphorus removal located in the original facility digester room No. 1
- Three 6-inch Return Activated Sludge (RAS) Pumps, two scum pumps and two 4-inch Waste Sludge (WAS) Pumps with an 85,000-gallon sludge storage tank for offsite disposal via liquid transport.

The Ware WWTF is currently permitted to treat an average daily flow of 1.0 million gallons per day (MGD), which includes flows from domestic, commercial and industrial sources. The plant also receives hauled septage from the Town of Ware and surrounding communities. This facility discharges into the Ware River and operates under the MassDEP/EPA National Pollutant Discharge Elimination System (NPDES) Permit No. MA0100889 (renewed in 2013).

FIGURE 2-7
WARE WWTF SITE PLAN



The WWTF was originally designed for an average daily flow of 2.0 MGD and a peak flow of 5.2 MGD as part of the 1984 upgrade. The 2001 NDPES permit renewal reduced the plants rated average flow capacity to 1.0 MGD, as a result of the flows and loads not reaching the initially anticipated design criteria. The current NPDES permit (2013) limits for the Ware WWTF are shown in Table 2-1. The complete NPDES discharge permit is listed in Appendix B.

TABLE 2-1
NPDES PERMIT FINAL EFFLUENT LIMITATIONS

PARAMETER	MONTHLY AVERAGE	WEEKLY AVERAGE	DAILY MAXIMUM
Flow, MGD	1.0	—	Report
BOD_5, mg/l (lb./d)	25 (208)	25 (208)	Report
TSS, mg/l (lb./d)	25 (208)	25 (208)	Report
pH, Std. Units	—	6.5 - 8.3	—
E. coli, cfu/100 mL Apr. 1 – Oct 31	126	—	409
Residual Chlorine (ug/L) Apr. 1 – Oct. 31	116	—	200
Total Copper (ug/L)	9.0	—	17.9
Total Aluminum (ug/L)	96	—	—
Total Phosphorus mg/L (lb./d), Apr. 1 – Oct. 31	0.584 (5.38)	1.0 (9.2)	1.5 (13.8)
Total Phosphorus mg/L (lb./d), Nov. 1 – Mar. 31	1.0 (9.2)	—	Report
Dissolved Orthophosphate, Nov. 1 – Mar. 31	—	Report	—
Ammonia as N, mg/L (lb./d), June 1 – Oct. 31	1.0 (8.8)	1.0 (8.8)	1.5 (13.2)
TKN mg/L	Report	—	—
Total Nitrite, mg/L	Report	—	—

The WWTF had experienced operational difficulties with the treatment of flows generated from KSPs industrial waste stream, including reduced biological treatment capacity and additional sludge handling and disposal costs. In response, the Town issued local limits for KSPs discharge for total suspended solids, turbidity, and zinc in 2010. Based on these limits, KSP determined that they would not be able to continue discharging wastewater to the WWTF without the installation of a pretreatment system at their facility. KSP and the Town entered into negotiations to develop a solution that would be beneficial to both parties, while maintaining NPDES discharge standards and satisfying the Environmental Protection Agency's (EPAs) industrial pretreatment requirements. Both parties agreed to share the capital and operation and maintenance costs for the implementation of a tertiary treatment system at the Ware WWTF that would allow KSP to continue discharging wastewater to the Town's system without additional pretreatment performed at the KSP property.

In 2012, Wright-Pierce performed a WWTF evaluation for the Town to determine future process operational scenarios and treatment alternatives, including installation of a new tertiary treatment system to handle the high levels of suspended solids and turbidity discharged by KSP; and to treat the wastewater to an effluent total phosphorus (TP) concentration of 0.1 mg/L to meet potential future permit conditions.

In 2013, the Town moved forward with the design of a tertiary treatment system upgrade project to meet anticipated new NPDES permit regulations for total phosphorus and to continue to treat industrial solids contributed to the plant from KSP. Subsequently, the 2013 NPDES permit renewal included a seasonal phosphorus discharge phosphorus limit of 0.584 mg/L, which is higher (less stringent) than the anticipated 0.1 mg/L limit. In addition, KSP wanted a guarantee from the Town that the tertiary treatment system upgrade would effectively treat their waste stream. The Town would not provide KSP with a guarantee for the treatment of KSPs waste stream and KSP decided to build their own onsite pretreatment facility to meet the Town's local limits instead of cost sharing the tertiary treatment system upgrade with the Town.

KSPs pretreatment facility was put online in July 2015 and has reduced turbidity and improved performance at the Town's WWTF. A summary of the Town's WWTF current flows and loads for a two-year period from April 2014 to April 2016 are summarized in Table 2-2 below.

It has been three decades since the last major upgrade of the WWTF. The Town's WWTF will require upgrades in the near future due to aging process and auxiliary equipment/systems. Section 4 provides potential improvements to the Town's WWTF.

TABLE 2-2
WWTF CURRENT INFLUENT FLOWS AND LOADS
(April 2014 – April 2016)

PARAMETER	FLOW		BOD		TSS	
	MGD	P.F.[4]	mg/L	lb./day	mg/L	lb./day
Annual Average (Hydraulic)	0.57	1.00	257	1,215	347	1,640
Max. Month (BOD_5 Loading)[1]	0.60	0.98	470	2,191	504	2,349
Max. Day (BOD_5 Loading)[2]	0.47	0.83	660	2,581	407	1,683
Max. Month Flow (Hydraulic)	0.98	1.72	—	—	—	—
Peak Day Flow (Hydraulic)[3]	1.15	2.03	—	—	—	—
Peak Hourly Flow (Hydraulic)[5]	2.90	5.11	—	—	—	—

Notes:
1. Maximum 30-day rolling average BOD loadings occurred in June 2014.
2. Peak Day BOD loadings occurred July 29, 2014.
3. Maximum day flow occurred on April 4, 2015.
4. Peaking Factor equals flow divided by average daily flow.
5. Peak Flow is based on the highest recorded instantaneous flow, which occurred on March 29, 2016.

Section 3
Future Planning Conditions

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SECTION 3

FUTURE PLANNING CONDITIONS

This section includes a description of the planning area, planning period, population and growth projections, and strategies considered for possible future sewer extension projects. This section includes a description of the possible future sewer extension projects, including future flows and estimated construction costs.

3.1 FUTURE PLANNING AREAS

The Town of Ware constructed a 15-inch diameter interceptor in 2008 within an abandoned railroad path for the purposes of providing public sewer to the newly constructed Gibbs Crossing Shopping center and for providing the opportunity for additional sewer extinctions in the surrounding areas. Currently, the 15-inch diameter interceptor only receives flows from the shopping plaza via the Gibbs Crossing Pumping Station, but was designed for a "build-out" of the southwestern portion of Town due to its relatively dense population and the potential environmental needs for the Beaver Lake area. The future planning areas (potential sewer expansion areas) for the Sewer Master Plan includes seven "projects" as listed below:

1. Project 1: Longview Street Sewer Extension
2. Project 2: Meadow Heights Sewer Extension
3. Project 3: Malboeuf Road Sewer Extension
4. Project 4: Mountain View Drive Sewer Extension
5. Project 5: Palmer Road Sewer Extension
6. Project 6: Old Belchertown Road Sewer Extension
7. Project 7: Beaver Lake Area Low Pressure Sewer System

The bounds of these future planning areas were considered due to the needs for existing properties, development density, topography and economic or environmental impacts. There are a number of unsewered areas in Town with fairly large lot sizes that should easily support an onsite septic system and have topography that would require multiple pump stations to convey flow to the existing collection system. These areas were removed from further consideration for municipal sewer extension as onsite septic systems should largely be more cost-effective than extending Town sewer to a small number of residences in a large geographic area.

3.1.1 Planning Period

The planning period used for the Sewer Master Plan is 10 years. Therefore, the projections made in this Sewer Master Plan are through the year 2026. The intent is to provide a roadmap for any sewer extension; existing sewer rehabilitation and WWTF upgrade projects that may occur during the next 10 years.

3.2 POPULATION DEMOGRAPHICS AND HISTORICAL TRENDS

The population historical data discussed in this section will serve as the basis for projecting future population for the Town of Ware. To better understand the population demographics in the Town of Ware, the following primary sources of information were collected and analyzed:

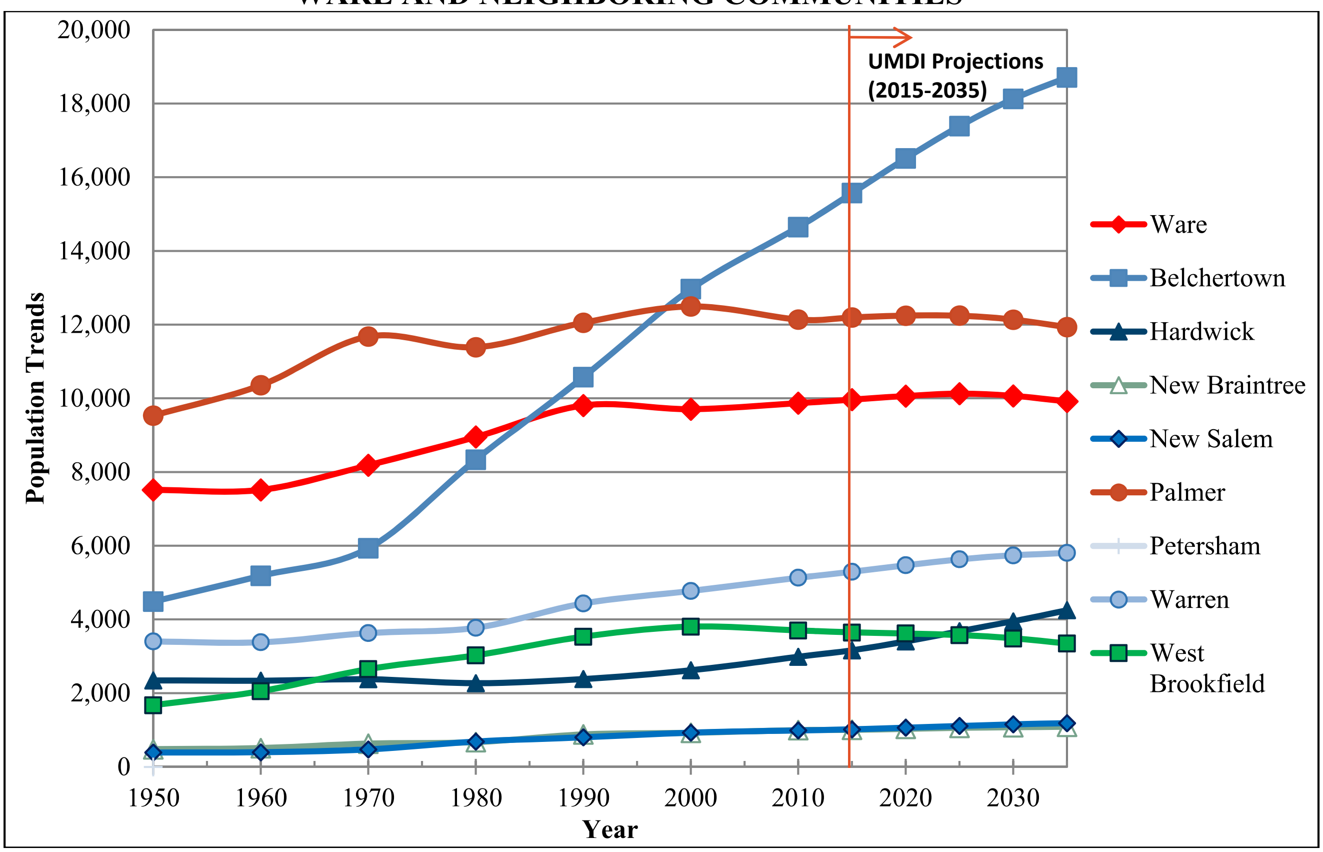
- US Bureau of Census Data
- University of Massachusetts Donahue Institute (UMDI)
- Pioneer Valley Planning Commission (PVPC)
- Massachusetts Department of Transportation (MassDOT)

The Census data includes population trends for each community in Massachusetts extending back to 1950. The population trends in Ware and its neighboring communities are presented in Table 3-1 and graphically in Figure 3-1.

TABLE 3-1
POPULATION TRENDS FOR WARE AND NEIGHBORING COMMUNITIES

Town	1950	1960	1970	1980	1990	2000	2010
Ware	7,517	7,517	8,187	8,953	9,808	9,707	9,872
Belchertown	4,487	5,186	5,936	8,339	10,579	12,968	14,649
Hardwick	2,348	2,340	2,379	2,272	2,385	2,622	2,990
New Braintree	478	509	631	671	881	927	999
New Salem	392	397	474	688	802	929	990
Palmer	9,533	10,358	11,680	11,389	12,054	12,497	12,140
Petersham	814	890	1,014	1,024	1,131	1,180	1,234
Warren	3,406	3,383	3,633	3,777	4,437	4,776	5,135
West Brookfield	1,674	2,053	2,653	3,026	3,532	3,804	3,701

FIGURE 3-1
POPULATION TRENDS AND PROJECTIONS FOR
WARE AND NEIGHBORING COMMUNITIES



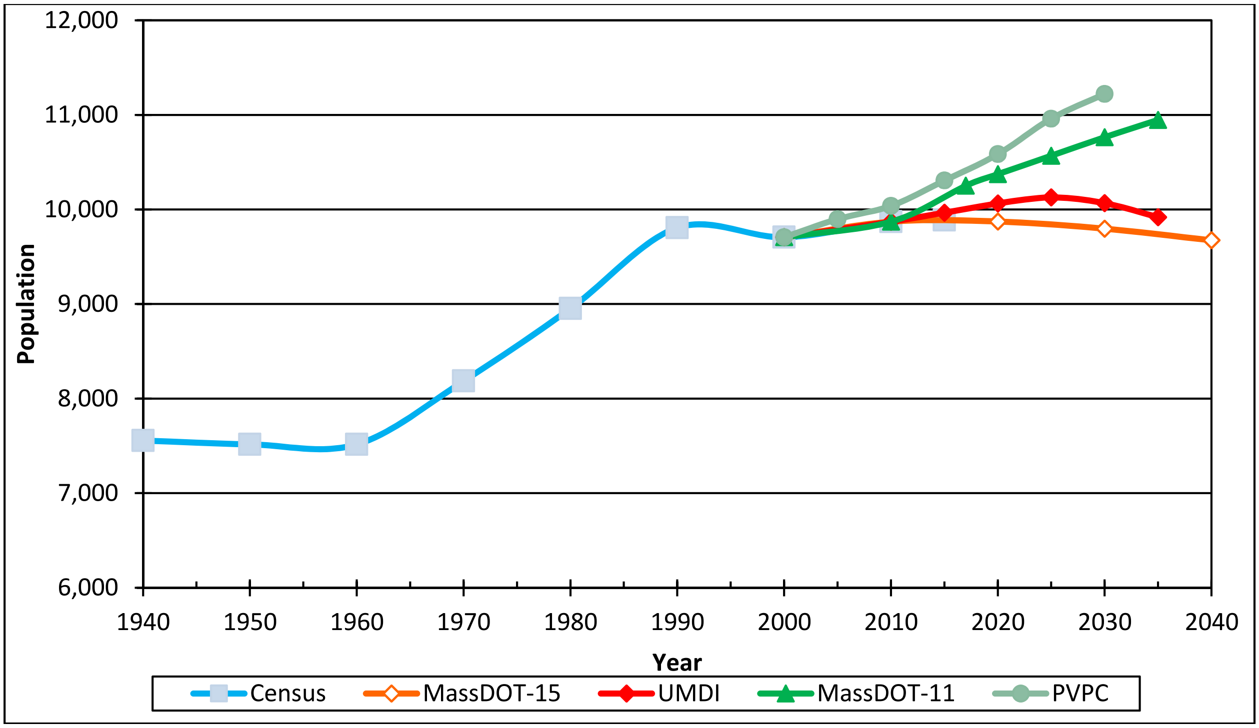
In general, smaller communities in the suburbs experienced growth during the post-World War II period from 1950's through the 1980's, when growth population began to level off in most communities. The most rapid growth during this period occurred in rural communities with abundant open space and land available for development. In response to this growth, improved land-use planning, growth management and stricter development standards led to more sustained, managed growth over the last 20-30 years for most communities. In addition, escalating property values and high housing costs may have contributed to slower growth and development in certain communities.

3.3 HISTORICAL AND PROJECTED POPULATION

According to the Census, the Town of Ware has experienced additional population growth since the early 1960s. From 1960 to 1990 the population growth was strong and generally constant at the rate of 9.1 percent per 10-years until 2000, when growth slowed significantly and became negative. At that point, growth resumed, but increased at a slower rate of approximately 0.18 percent per year through 2015. The current 2015 population as reported by UMDI is approximately 9,967 residents and the Census estimated a total population of approximately 9,888 residents in 2015.

Population projections as reported by the US Census, UMDI, MassDOT, and PVPC were reviewed for this study. The historic populations from 1940 to 2010 were provided by the US Census along with an estimated population in 2015. The UMDI projections were estimated in March of 2015, which provided projections from 2015 to 2035. Two sets of projections were used from MassDOT; an older projection from 2011 and an updated projection from 2015. The PVPC projections are from 2003. These various historic and projected populations are shown in Figure 3-2.

FIGURE 3-2
HISTORIC AND PROJECTED POPULATION



As shown in Figure 3-2, the MassDOT (2011) and PVPC projections have been higher than the actual 2010 population and increase at a rapid rate until 2030, while the UMDI and MassDOT (2015) projections only increase slightly until 2025, and then decreases to 2035 and 2040, respectively. Since the most recent projections show much slower growth, they are likely more realistic. Comparing both MassDOT (2015) and UMDI, UMDI is more conservative and likely more applicable for the Sewer Master Plan. Therefore, the UMDI projections for the next ten years, included in Table 3-2, were utilized as they appear be more closely aligned with actual population trends.

TABLE 3-2
UMDI POPULATION PROJECTIONS

Year	Projected Population
2016	9,986
2017	10,006
2018	10,025
2019	10,045
2020	10,064
2021	10,077
2022	10,090
2023	10,103
2024	10,116
2025	10,129

The UMDI projections show a slowing of growth over the next twenty years with an increase of 143 in population from 2016 to 2025. In regards to sewer service, the Town of Ware currently provides sewers to approximately 55 percent of the Town's population according to the 2016 Open Space and Recreation Plan.

3.4 WASTEWATER COLLECTION AND TREATMENT SYSTEMS

The Town's wastewater collection system primarily operates with conventional gravity sewers. There is only one municipally operated pumping station that serves a limited number of properties for Webb Court and a private pump station for a commercial shopping center (Gibbs Crossing), along with the WWTF influent pump station. Currently, the Town's collection system does not include any low pressure sewer systems, but there are some residential sewer users connected to the gravity system with individual grinder pumps. Different sewer system methods are considered for possible future expansion of the Town's collection system and are further described below.

3.4.1 Gravity Sewers and Pumping Stations

As previously discussed, the Town of Ware owns and operates 23 miles of gravity sewers, including two pumping stations and three siphons. The majority of the existing system operates with gravity sewers transporting flows to the Ware WWTF. The existing pumping stations discharge through force mains into gravity sewers that flow directly to the WWTF for treatment and effluent discharge to the Ware River.

There are areas of Town that are already developed and can benefit from expansions of the gravity system that do not require a pumping station constructed, including sections of Palmer Road (Route 32) and adjacent streets from the Gibbs Crossing Shopping Center to Hillside Drive. However, some of the streets in this area would require a pump station for transporting flows due to existing topography. There are six potential projects that would include expansions of the gravity sewer system.

3.4.2 Low Pressure Systems

Low pressure sewer systems use shallow (below frost line), small diameter common piping and individual grinder pumps at each property to pump wastewater to an existing gravity sewer. The Town does not currently utilize low pressure systems, however, there are a few properties throughout Town with privately owned sewage (E/One Series) grinder pumps that discharge directly into a gravity sewer. Low pressure sewers are an option considered for areas with fluctuating topography that would require multiple common pumping stations to serve a small area. Low pressure sewers and individual grinder pumps are a technology considered for sewering the Beaver Lake area.

3.5 FUTURE FLOW PROJECTIONS

The following is a summary of the process used to estimate future flow projections for the Sewer Master Plan as well as a description of assumptions made to estimate flows.

3.5.1 Residential Average Daily Flow Projection

TR-16 standards call for a minimum of 70 gallons per day per capita (GPDC) to be used for wastewater flow projections. The 2016 Open Space and Recreation Plan (located in Appendix E) indicates that the average household population in 2010 in Ware was 2.39 and that 61 percent of private homes are single family and 39 percent are buildings with two or more units. Therefore, for the purposes of this planning, 2.5 people per parcel has been estimated based on this data and the average daily flow for one residential parcel has been assumed to be 175 gallons per day (gpd).

3.5.1.1 Buildable Land

Developable residential lots were also considered for the future build-out condition. A residential lot is required to be at least 80,000 square feet (1.84 Acres) according to the 2016 Open Space and Recreation Plan. If a lot was large enough to be subdivided, it was estimated that 80 percent of the lot is suitable for new building purposes. The other 20 percent of each lot is set aside for roads and utilities, or is not expected to be buildable due to water features, slope, or unsuitable soils. Each potential buildable residential lot utilized a value of 175 gpd for calculating future flows.

Depending on the current lot size, existing residential lots were considered for future build-out. If an existing residential lot was at least 3.68 acres, it was split by the minimum lot size (1.84 acres). The following projects have residential lots where this occurred and was included in the analysis:

- Project 1 – two residential properties split, creating five properties
- Project 2 – three residential properties split, creating eight properties
- Project 3 – ten residential properties split, creating twenty-six properties
- Project 4 – no residential properties were large enough to split
- Project 5 – three residential properties split, creating twenty-four properties
- Project 6 – two residential properties split, creating five properties
- Project 7 – nine residential properties split, creating fifty-eight properties

3.5.2 Commercial Average Daily Flow Projection

Although the majority of the potential future sewer expansion areas are residential, there are three projects areas with existing commercial or developable commercial properties. Within the future planning areas, the majority of existing commercial lots were located on Palmer Road (Route 32) with some additional developable land described below:

- **Project 1**: This project includes providing sewers to five existing commercial properties along Palmer Road (Route 32). This includes:
  1. Gillespie Car Care
  2. Teresa’s Restaurant
  3. Sunny Side Storage LLC

4. Ware Business Center LLC
5. Remaining (fifth) existing commercial property is currently vacant

- **Project 5**: This project includes providing sewers to two existing commercial properties:
  1. Don's Auto Body on Bacon Street
  2. Ware on Earth Reality LLC on Palmer Road (Route 32)

  This potential project would also provide municipal sewer to one commercially zoned parcel that could be developed into commercial or light industrial properties.

- **Project 6**: This project includes providing sewers to one existing commercial property:
  1. Advanced Auto Parts located on Palmer Road (Route 32)

3.5.2.1 Flow per Building Area

Commercial flows are typically estimated based on square footage of building area. Commercial development can range widely in sewer use per square foot from a grocery store with very little water use, to a restaurant with a much higher flow per square foot. Typical values range from 0.03 to 0.06 gallons per day per square foot. A value of 0.06 gallons per day per square foot (gpd/sf) was selected based on the existing and potential commercial development on Palmer Road (Route 32) area.

3.5.2.2 Commercial Lot Coverage

The commercial flow estimate assumes buildings will cover at least 20 percent of the lot. This value is based on the existing development and potential developments on Palmer Road. Proposed lot coverage is higher than the existing development and accounts for "infill" development.

3.5.2.3 Flow per land Area

Flow per building area was multiplied by the percent lot coverage to get the flow potential from each lot as shown in Table 3-3.

TABLE 3-3
COMMERCIAL FLOW ESTIMATE PER ACRE

Formula	Values
(Flow per Building Area, sf)	(0.06 gpd/sf)
× (convert square feet to acres)	× (43,560 sf/acre)
× (Percent Lot Coverage)	× (20% lot coverage)
= (Flow per Land Area)	= 523 gallons per day per acre

This value was used to determine the total potential flow from each commercial parcel. For parcels already partially developed, the estimated building flow was based on the total potential flows for redevelopment of the parcel.

3.5.3 Infiltration Allowance

Infiltration is groundwater that enters the sewer system through defects in the pipes, manholes, and/or pipe joints. Infiltration in the existing sewers is already included in the existing flows. An allowance for infiltration in developed areas to be served by future gravity sewers of 250 gpd per inch-diameter-mile of sewer within the right-of-way is assumed based on TR-16 standards. An infiltration allowance has not been included for low pressure systems as there is minimal infiltration in systems with individual grinder pump stations and pressure piping. Note that when estimating peak flow rates, the peaking factor is only applied to sanitary flows and not the infiltration allowance.

3.5.4 Peaking Factors

Peaking factors are necessary in sizing wastewater infrastructure to account for diurnal and seasonal variation in wastewater flow that differs from the average. These factors are multiplied by average daily flow and infiltration is added to arrive at peak hourly flows. Factors such as the type of development, average daily flow, and proximity of the development to a collection point, such as a pump station are considered. Normal peaking factor estimates range from 3 to 6 depending on service area size based on these factors.

Current peak hourly flow to average daily flow ratios from the two existing pump stations are unavailable for the sewer master planning. Flow data for the WWTF from April 2014 through

April 2016 indicates a peaking factor of about 5. For the existing sewers and WWTF, the actual current peaking factors have been used to estimate future flow. However, for the potential future projects, the following peaking factor was used:

Average daily flows less than 100,000 GPD: PF = 6.0

The following equation was used to calculate peak daily flow (PDF) from average daily flow (ADF):

$$PDF = (ADF \times PF) + \text{Infiltration Allowance}$$

3.6 POTENTIAL SEWER EXTENSION PROJECTS

The following is a brief summary of each potential sewer expansion Project based on our evaluations, discussions with Town personnel in conjunction with the review of current GIS mapping, the 1999 Conceptual Sewer Plan Layout and the 2012 Conceptual Design for Sewer Expansion.

Included in each summary is a conceptual description of the type of sewer system to serve the Project area, the basis for the flow projections (number of residential units, assumptions made regarding any proposed future development, etc.), the projected sanitary flow and infiltration allowance, and the estimated cost of the conceptual plan for the Project area. The number of residential units was estimated based on the number of parcels in a project area unless otherwise noted. A summary of the projected average daily flows and peak flow calculations for each project are located in Appendix C.

A plan outlining all of the potential future sewer expansion Projects is shown in Figure 3-3. The boundaries of the projects are approximate only and will likely be refined during future development of a specific Project and design of the sewers to include some of the properties adjacent to the identified areas.

All of the projects are proposed in the Southwest and Western portion of Ware. The flows generated from these potential sewer expansion projects will discharge into the 15-inch diameter interceptor that currently receives flows from the Gibbs Crossing shopping plaza and then flows by gravity directly to the WWTF. Many of the projects are not dependent on another downstream project being constructed and could be constructed independently to connect directly into the 15-inch diameter interceptor.

Pumping stations (and force mains) are recommended for several of the projects. Pumping stations have been assumed to be submersible grinder type with smaller pump stations to include flows less than 50 gpm, and larger submersible non-clog pump stations with flows greater than 120 gpm. All pump stations are assumed to include a pad-mounted permanent, emergency power generator and electrical/control equipment enclosure. The Sewer Master Plan cost estimating uses one conservative cost for both small and large pumping stations.

3.6.1 Cost Estimating

Cost estimates for the conceptual sewer plans for each potential sewer expansion project are planning level estimates intended to provide order of magnitude of possible costs to serve each area. For estimating purposes, the unit prices summarized in Table 3-4 were used. Gravity sewer unit prices are applied to the estimated main line sewer lengths and include costs for manholes, service laterals to the edge of the right-of-way and pavement restoration. Ledge factors have been applied to gravity sewer and force main cost estimates. In addition to construction costs, allowances have been included as follows:

- Construction contingency and engineering (design, bidding, construction administration and field observation) services (40 percent)
- Administrative and legal costs (2 percent)

Costs are based on an ENR Index of 10,385 (August 2016).

TABLE 3-4
CONSTRUCTION COST ESTIMATE UNIT PRICES

Item Description	Unit Price
8-inch Gravity Sewer	$210/LF
12-inch Gravity Sewer	$240/LF
Force Main	$130/LF
Pump Station	$600,000/EA
Low Pressure Sewer	$130/LF
River Crossing	$100,000/EA
Railroad Crossing	$75,000/EA

3.6.2 Potential Future Sewer Extension Projects

3.6.2.1 Project 1: Longview Street Sewer Extension

This project involves constructing approximately 7,100 linear feet of 8-inch diameter gravity sewers on Longview Street, Woodland Heights, Kingsbury Lane, a portion of Palmer Road (Route 32), Westbrook Avenue and Susan Drive. It also involves constructing a pumping station on Susan Drive and approximately 1,100 linear feet of force main to convey flows generated from Westbrook Avenue and Susan drive. The force main will discharge into an existing manhole at the end of Longview Street into the existing 15-inch diameter interceptor line. Flows generated north of the existing manhole including Longview Street, Woodland Heights, Kingsbury Lane and Palmer Road will discharge into the existing sewer by gravity.

There are approximately 94 residential housing units and 5 commercial units that could be served by gravity sewer within this project area with a projected average daily flow of 23,900 gpd (sanitary flow of 21,200 gpd and infiltration flow of 2,700 gpd). The estimated cost for this project is $3,190,000. There are no other sewer expansion projects that are required to be constructed to allow this project to connect to the Town’s sewer system. Refer to Figure 3-4 for the extents of this project area.

3.6.2.2 Project 2: Meadow Heights Sewer Extension

This project involves constructing approximately 3,200 linear feet of 8-inch diameter and 1,500 linear feet of 12-inch diameter gravity sewers on Meadow Road, Meadow Heights, a small portion of Palmer Road and Dugan Road. The gravity sewers would connect to an existing manhole that is part of the 15-inch diameter interceptor sewer located in the abandoned railroad easement.

There are approximately 49 residential housing units that could be served by gravity sewer within this project with a projected average daily flow of 10,700 gpd (sanitary flow of 8,600 gpd and infiltration flow of 2,100 gpd). The estimated cost for the project is $1,470,000. There are no other projects that are required to be constructed to allow this project to connect to the Town's existing sewer system, however, this project area will receive sewer flows from Project's 6 and 7.

A force main will discharge flow from Project area 6 into a manhole on Palmer Road. The gravity sewer that receives additional flows outside of Project 2 will be 12-inched in diameter. Refer to Figure 3-5 for the extents of this project area.

3.6.2.3 Project 3: Malboeuf Road Sewer Extension

This project involves constructing approximately 10,100 linear feet of 8-inch diameter gravity sewers on Malboeuf Road, Skyview Drive, Sunnyhill Drive, a small portion of Palmer Road, Anderson Road and Desatis Drive. The gravity sewers would connect to an existing manhole that is part of the 15-inch diameter interceptor sewer located near the end of Malboeuf Road. Refer to Figure 3-6 for the extents of this project area.

There are approximately 142 residential housing units that could be served by gravity sewer within this project area with a projected average daily flow of 28,800 gpd (sanitary flow of 24,900 gpd and infiltration flow of 3,900 gpd). The estimated cost for the project is $3,030,000. There are no other projects that are required to be constructed to allow this project to connect to the Town's existing sewer system.

3.6.2.4 Project 4: Mountain View Drive Sewer Extension

This project involves constructing approximately 3,600 linear feet of 8-inch diameter sewer on Mountain View Drive and Oak Ridge Circle. It also involves constructing a pumping station on Oak Ridge Circle and approximately 400 linear feet of force main to convey flows generated from Oak Ridge Circle. The force main will discharge into an existing manhole within the sewer easement into the existing 15-inch diameter gravity sewer. Flows generated from Mountain View

Road will discharge by gravity into both sides of an existing manhole located at the low point in the center of the road. Refer to Figure 3-7 for the extents of this project area.

There are approximately 50 residential housing units that could be served by gravity sewer within this project area with a projected average daily flow of 10,200 gpd (sanitary flow of 8,800 gpd and infiltration flow of 1,400 gpd). The estimated cost for this project is $2,010,000. There are no other projects that are required to be constructed to allow for connection to the Town's existing sewer system.

3.6.2.5 Project 5: Palmer Road Sewer Extension

This project involves constructing approximately 7,700 linear feet of 8-inch diameter gravity sewers on Bacon Road and a portion of Palmer Road (Route 32). The gravity sewers in this area will require a sewer piping/railroad crossing. This project also involves constructing a pumping station on Palmer Road and approximately 1,900 linear feet of force main to convey flows generated in the area. This force main will connect to an existing plugged 8-inch diameter force main that was constructed as part of the Gibbs Crossing Pump Station project (previously discussed in Section 2). This force main will also require being constructed under the Ware River to connect to the existing plugged force main. Flows generated from this project area will discharge into the existing 15-inch diameter gravity sewer.

There are approximately 54 residential housing units and 3 commercial units that could be served by gravity sewer within this project area with a projected average daily flow of 13,100 gpd (sanitary flow of 10,100 gpd and infiltration flow of 3,000 gpd). The estimated cost for this project is $3,770,000. There are no other projects required to be constructed for this project. Refer to Figure 3-8 for the extents of this project area.

3.6.2.6 Project 6: Old Belchertown Road Sewer Extension

This project involves constructing approximately 7,600 linear feet of 8-inch diameter and 800 linear feet of 12-inch diameter gravity sewers on Williston Drive, Junior Hill Road, Pine Crest Circle, Hillside Terrace, and a portion of Palmer Road (Route 32) and Old Belchertown Road. This project also includes the construction of a pumping station that will receive flows from this project area, as well as Project 7. The Old Belchertown Road Pump Station force main would discharge into the Project 2 sewer by force main that will be approximately 2,100 feet long.

There are approximately 84 residential housing units and 1 commercial unit that could be served by gravity sewer within this project area with a projected average daily flow of 18,300 gpd (sanitary flow of 14,900 gpd and infiltration flow of 3,400 gpd). The estimated cost for this project is $3,800,000. Project 2 is required to be constructed to accommodate construction of this project. Refer to Figure 3-9 for the extents of this project area.

3.6.2.7 Project 7: Beaver Lake Area Low Pressure Sewer Extension

This project involves constructing approximately 40,100 linear feet of 1.5-inch to 4-inch diameter low pressure sewers on Lake View Circle, Shoreline Drive, Lagoon Road, Otter Circle, Coldbrook Drive, Beaver Lake Road, Beaver Road, Point View Road, Indian Hill Road, Horseshoe Circle, Lower Cove Road, Big Tree Drive, a portion of Babcock Tavern Road, Miner Road, Old Belchertown Road, Monson Turnpike Road, and Coffey Hill Road. Flows generated will connect using a low pressure sewer connection that will discharge into Project 6 sewer piping on Old Belchertown Road.

There are approximately 445 residential housing units that could be served by low pressure sewer within this project area with a projected average daily flow of 77,900 gpd (all sanitary flow, no infiltration assumed). The estimated cost for this project is $7,440,000. Project 2 and Project 6 are both required to be constructed to accommodate construction of this project. Refer to Figure 3-10 for the extents of this project area.

TABLE 3-5
POTENTIAL SEWER EXTENSION PROJECTS ESTIMATED QUANTITIES

Project	Estimated Quantities					
	Gravity Sewer (LF)		Force Main (LF)	Pump Station (EA.)	Low Pressure Sewer (LF)	Railroad & River Crossings (EA.)
	8" Dia.	12" Dia.				
1 - Longview Street Sewer Extension	7,100	-	1,100	1	-	-
2 - Meadow Heights Sewer Extension	3,200	1,500	-	-	-	-
3 - Malboeuf Road Sewer Extension	10,100	-	-	-	-	-
4 - Mountain View Drive Sewer Extension	3,600	-	400	1	-	-
5 - Palmer Road Sewer Extension	7,700	-	1,900	1	-	2
6 - Old Belchertown Road Pump Station and Sewer Extension	7,600	800	2,100	1	-	-
7 - Beaver Lake Area Low-Pressure Sewer System	-	-	-	-	40,100	-

TABLE 3-6
POTENTIAL SEWER EXTENSION PROJECTS ESTIMATED PROJECT COST

Project	Estimated Construction Costs							Administrative & Legal (2%)	Estimated Overall Project Totals
	Gravity Sewer	Force Main	Pump Station	Low Pressure Sewer	Railroad & River Crossings	Contingency* (40%)	Subtotal		
1 Longview Street Sewer Extension	$1,491,000	$143,000	$600,000	-	-	$893,600	$3,127,600	$62,600	$3,190,000
2 Meadow Heights Sewer Extension	$1,032,000	-	-	-	-	$412,800	$1,444,800	$28,900	$1,470,000
3 Malboeuf Road Sewer Extension	$2,121,000	-	-	-	-	$848,400	$2,969,400	$59,400	$3,030,000
4 Mountain View Drive Sewer Extension	$756,000	$52,000	$600,000	-	-	$563,200	$1,971,200	$39,400	$2,010,000
5 Palmer Road Sewer Extension	$1,617,000	$247,000	$600,000	-	$175,000	$1,055,600	$3,694,600	$73,900	$3,770,000
6 Old Belchertown Road Pump Station and Sewer Extension	$1,788,000	$273,000	$600,000	-	-	$1,064,400	$3,725,400	$74,500	$3,800,000
7 Beaver Lake Area Low-Pressure Sewer System	-	-	-	$5,213,000	-	$2,085,200	$7,298,200	$146,000	$7,440,000
Project Total	-	-	-	-	-	-	-	-	**$24,710,000**

*Contingency includes construction, engineering, and construction administration costs.

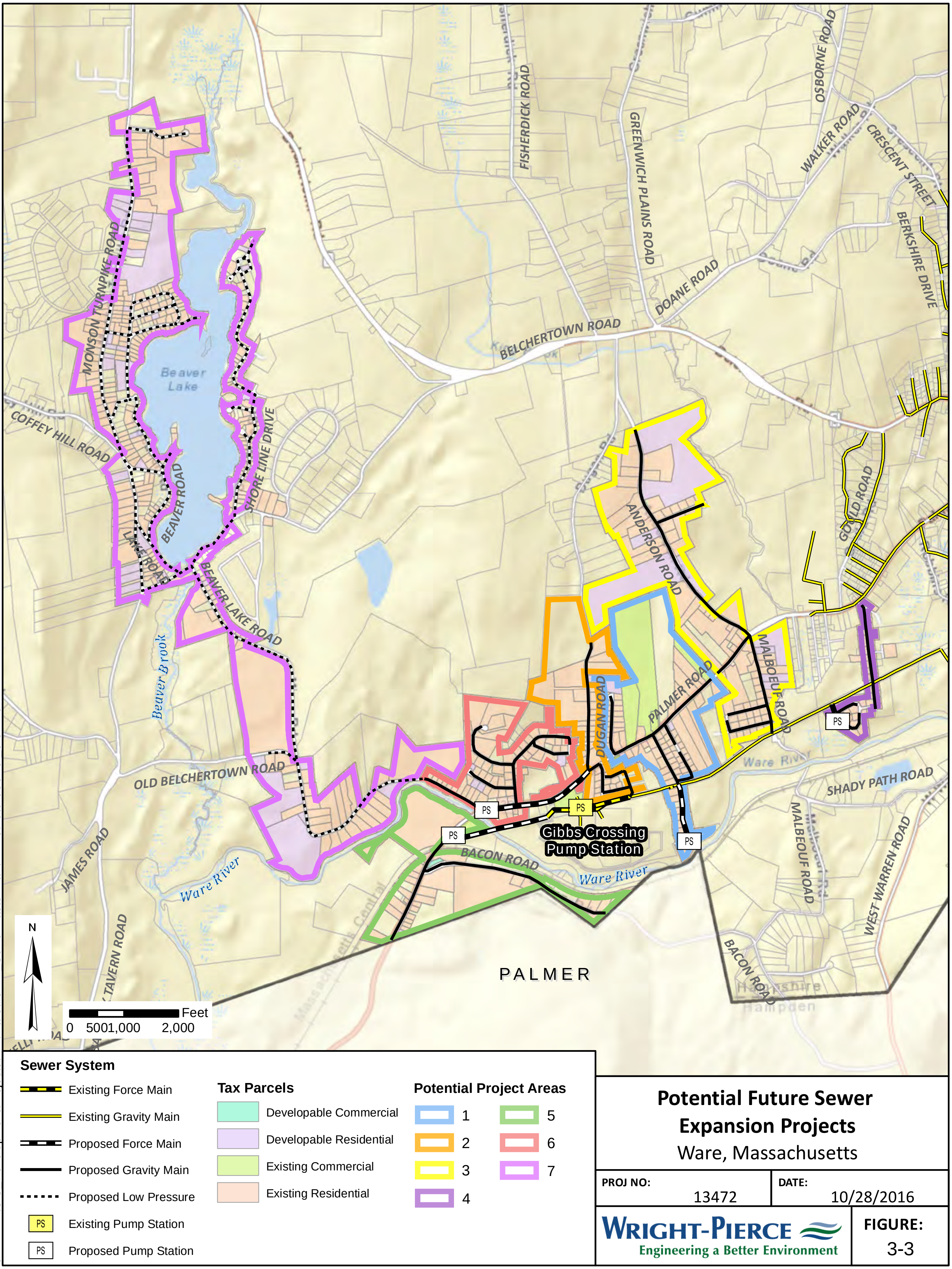
3.7 POTENTIAL FUTURE SEWER PROJECTS FLOWS SUMMARY

The potential future sewer projects presented in this report are based on current information and past sewer expansion studies provided by the Town. These projects are subject to change over time (examples being the interest from developers or existing property owners to connect to Town sewer) so there must be flexibility to account for future changes. Additionally, these projects do not specifically need to be completed in the numbering sequence presented, although two projects (6 and 7) require other projects to be completed first.

Table 3-5 below includes the amount potential additional residential and commercial sewer users and additional flows generated from each potential future sewer expansion project. The total amount of potential flows added to the Ware WWTF is 0.183 mgd. As presented in Section 2, the WWTF currently receives and average annual flow of 0.57 mgd and is permitted to treat 1.0 mgd. The potential future flows for a full build-out condition of sewer expansion Projects 1 through 7 will be approximately 0.753 mgd. The potential future sewer expansion projects could add approximately 918 new residential and 9 commercial sewer users to the Ware sewer collection system.

TABLE 3-7
POTENTIAL FUTURE SEWER EXPANSION FLOWS
(PROJECTS 1 THROUGH 7)

Project No.	Project Area Description	Residential Sewer Users	Commercial Sewer Users	Sanitary Flows (GPD)	Infiltration Flow (GPD)	Average Day Flows (GPD)
1	Longview Street Sewer Extension	94	5	21,200	2,700	23,900
2	Meadow Heights Sewer Extension	49	0	8,600	2,100	10,700
3	Malboeuf Road Sewer Extension	142	0	24,900	3,900	28,800
4	Mountain View Drive Sewer Extension	50	0	8,800	1,400	10,200
5	Palmer Road Sewer Extension	54	3	10,100	3,000	13,100
6	Old Belchertown Road Sewer Extension	84	1	14,900	3,400	18,300
7	Beaver Lake Low Pressure Sewer System	445	0	77,900	0	77,900
Total		**918**	**9**	**166,400**	**16,500**	**182,900**



Potential Future Sewer Expansion Projects
Ware, Massachusetts

PROJ NO: 13472
DATE: 10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-3

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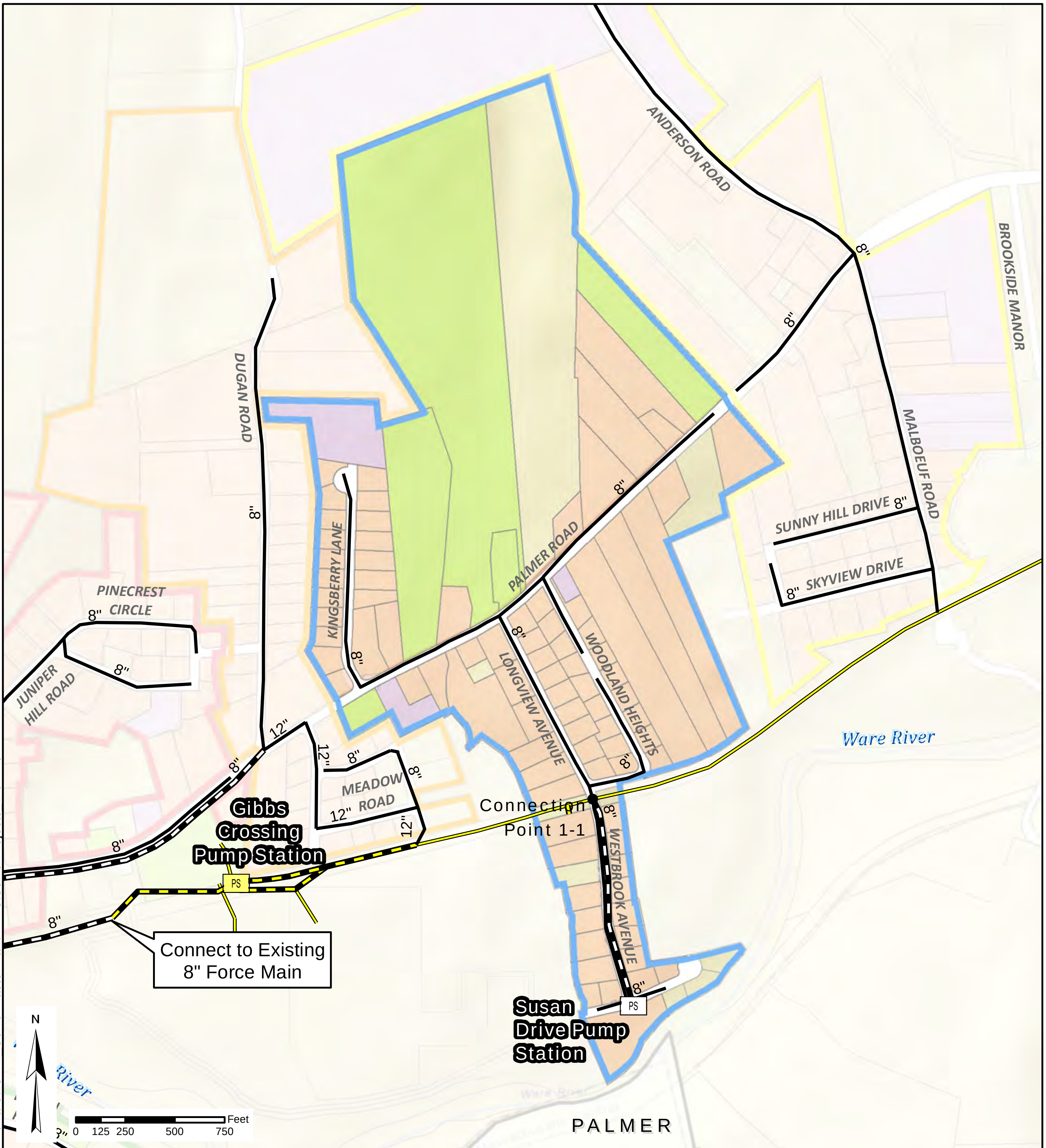

Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

1, 2, 3, 4, 5, 6, 7

Potential Future Sewer Expansion Projects

Ware, Massachusetts

Project 1

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-4

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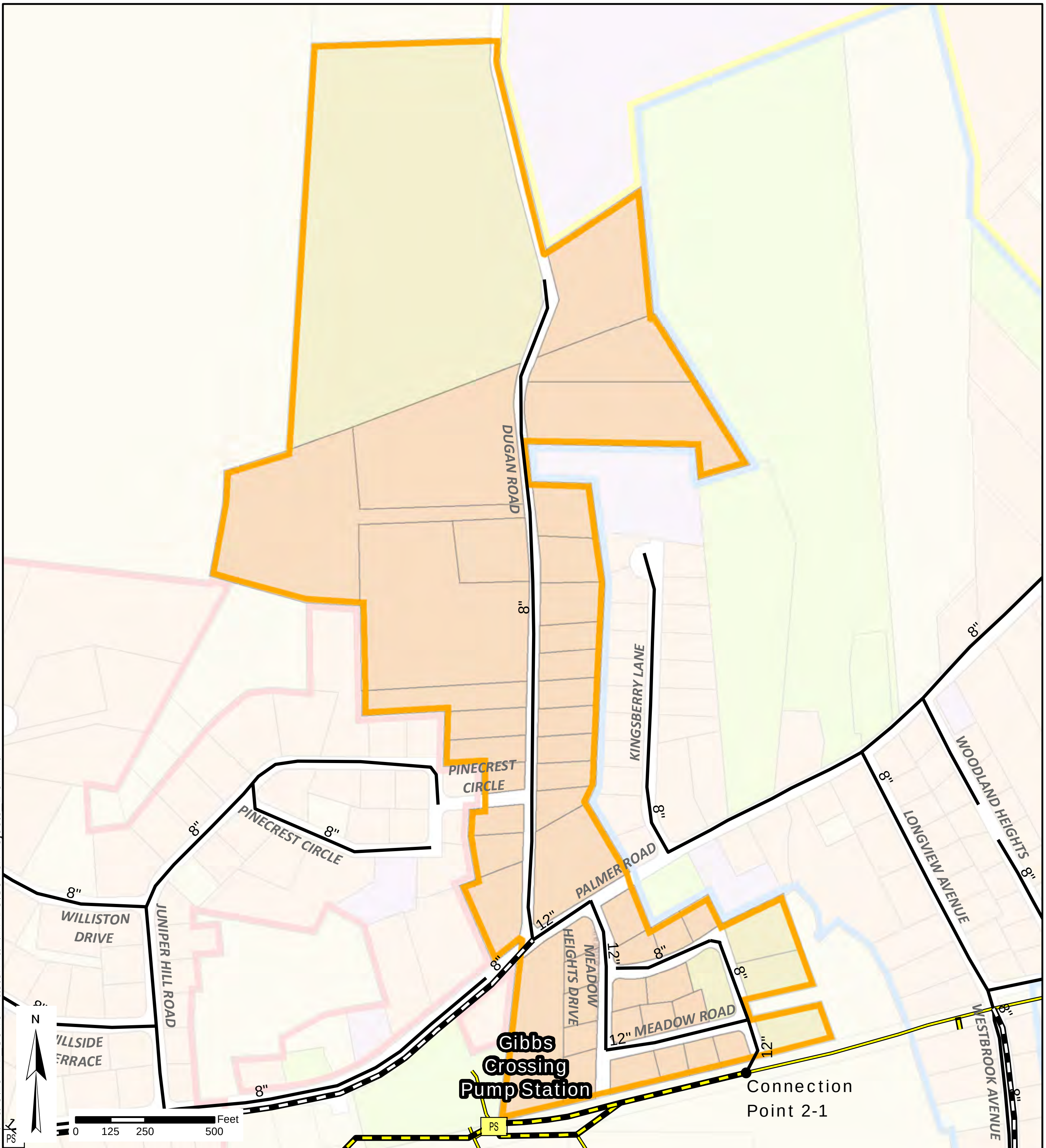

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Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

1, 2, 3, 4, 5, 6, 7

Potential Future Sewer Expansion Projects

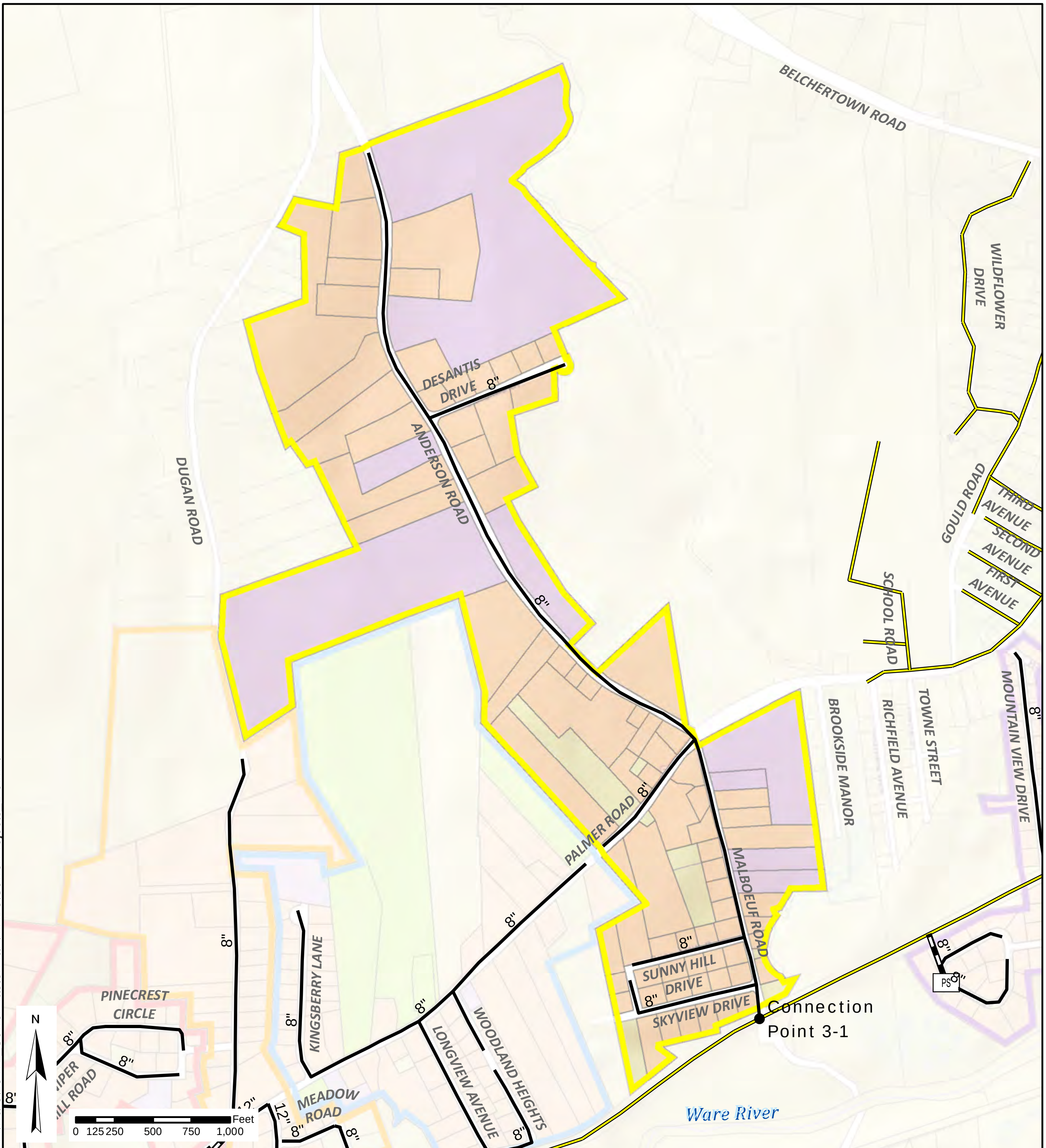
Ware, Massachusetts

Project 2

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-5



Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

1, 2, 3, 4, 5, 6, 7

Potential Future Sewer Expansion Projects

Ware, Massachusetts

Project 3

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-6

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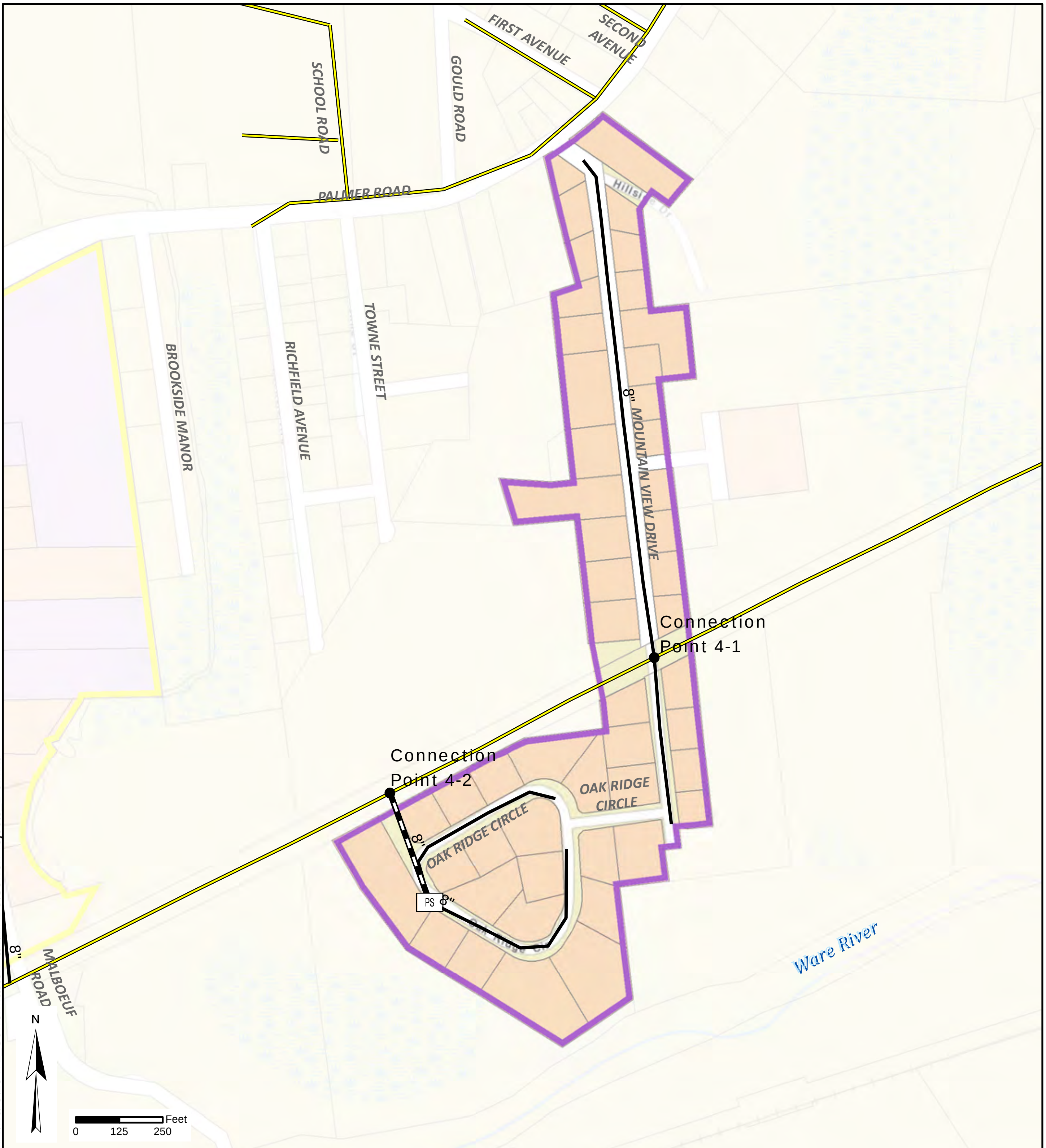

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Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

1, 2, 3, 4, 5, 6, 7

Potential Future Sewer Expansion Projects

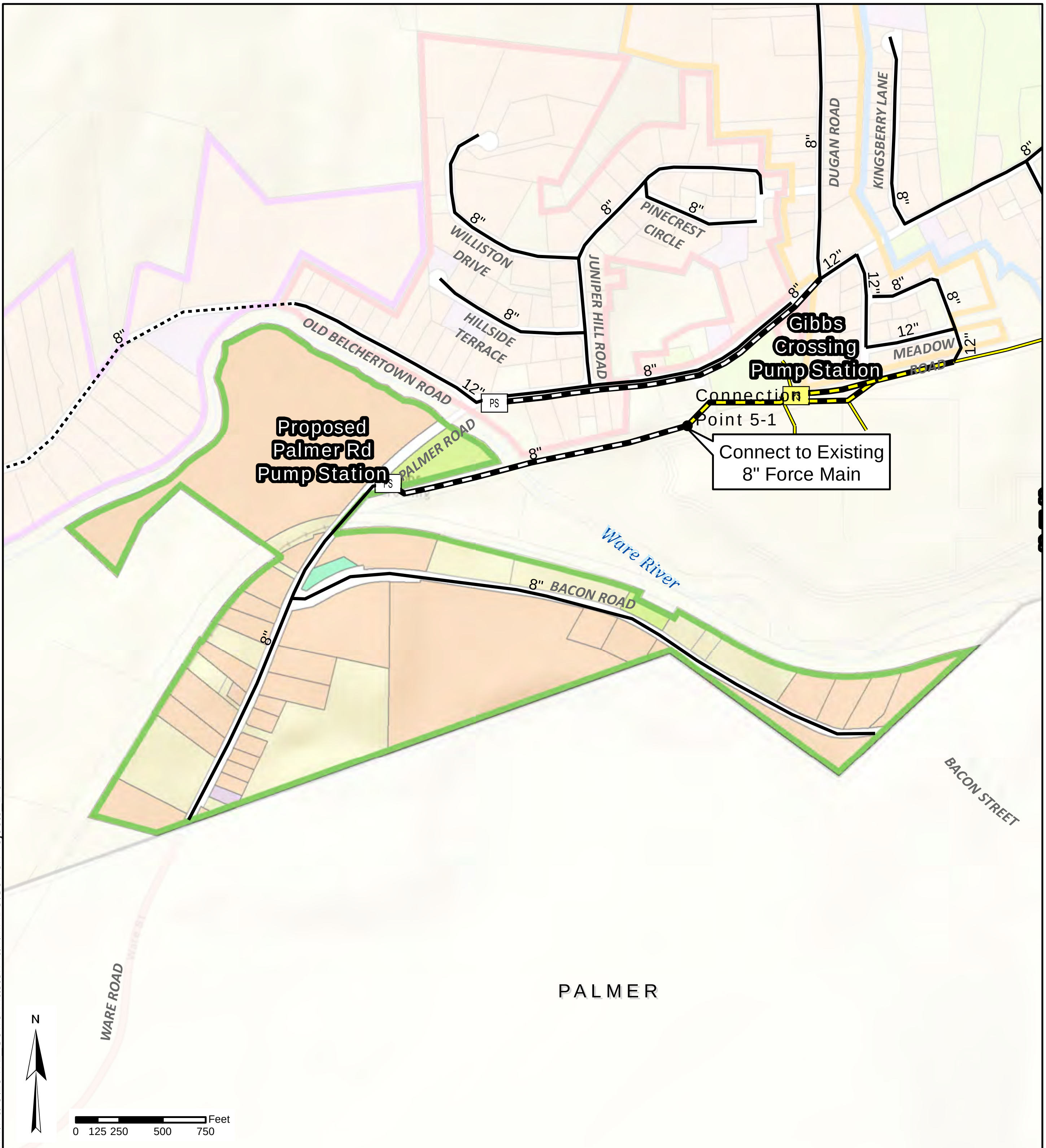
Ware, Massachusetts

Project 4

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-7



Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

1, 2, 3, 4, 5, 6, 7

Potential Future Sewer Expansion Projects

Ware, Massachusetts

Project 5

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-8

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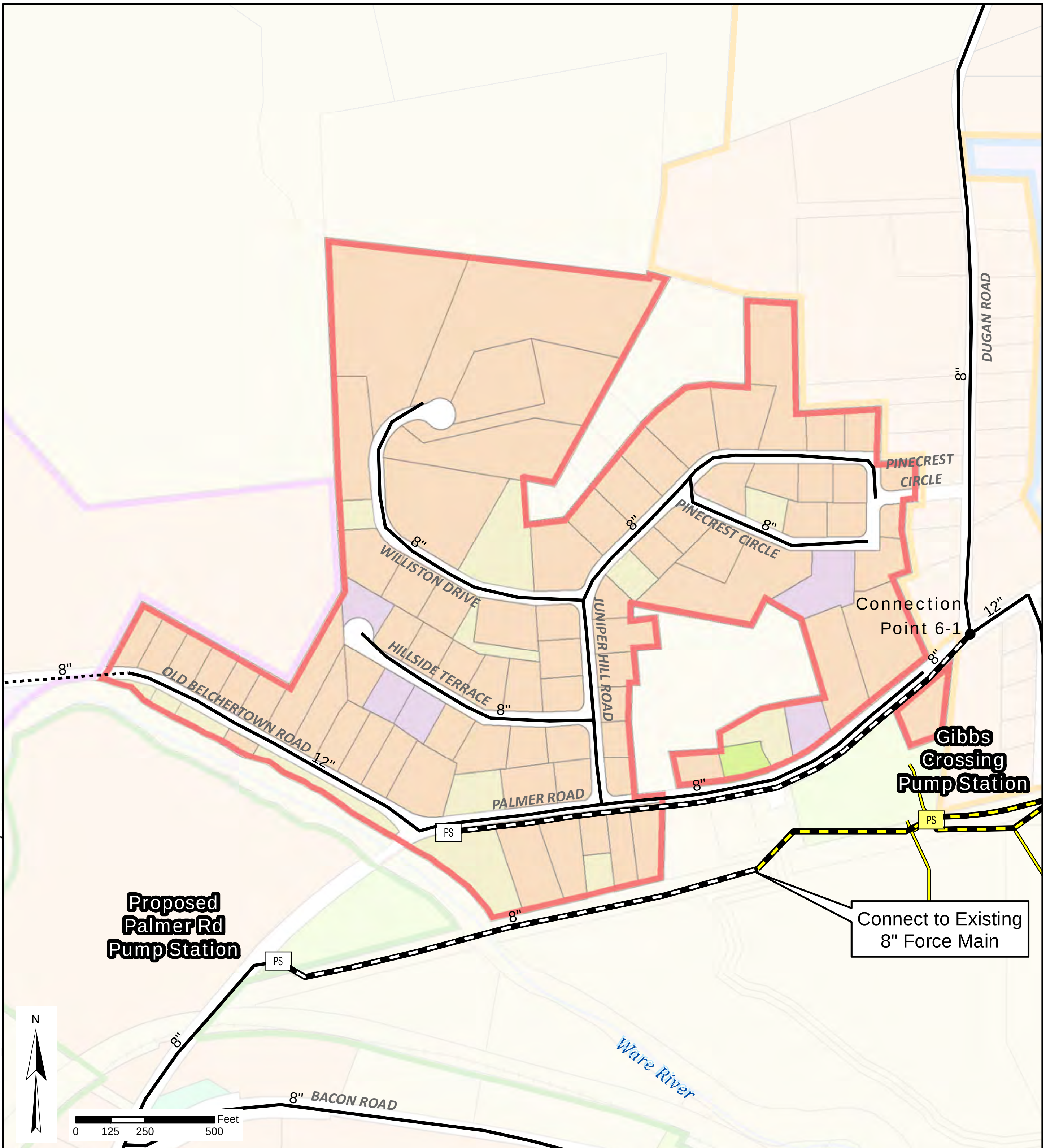

Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

1, 2, 3, 4, 5, 6, 7

Potential Future Sewer Expansion Projects

Ware, Massachusetts

Project 6

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE

Engineering a Better Environment

FIGURE: 3-9

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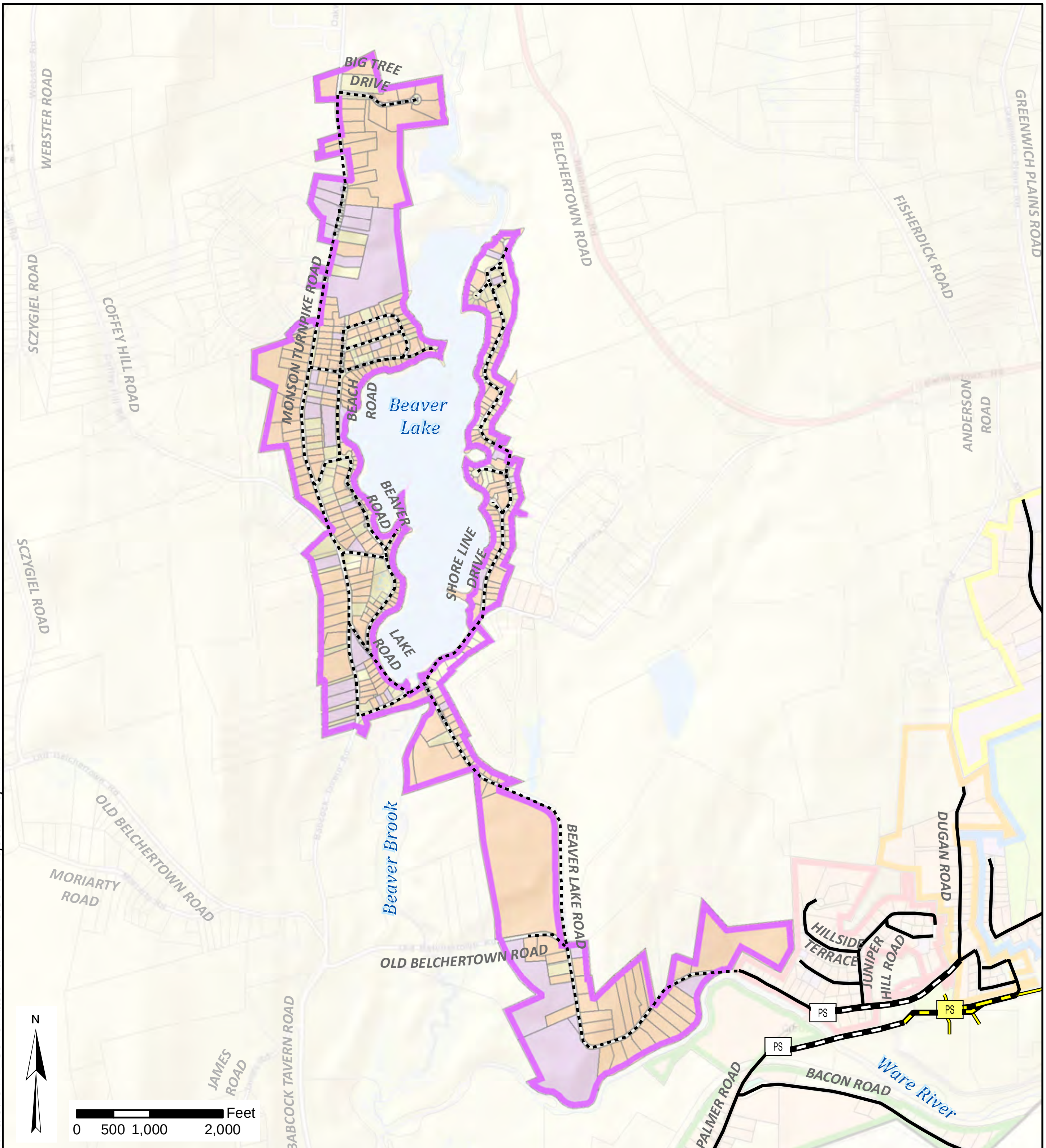

Sewer System

- Existing Force Main
- Existing Gravity Main
- Proposed Force Main
- Proposed Gravity Main
- Proposed Low Pressure
- PS Existing Pump Station
- PS Proposed Pump Station

Tax Parcels

- Developable Commercial
- Developable Residential
- Existing Commercial
- Existing Residential

Potential Project Areas

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Potential Future Sewer Expansion Projects

Ware, Massachusetts

Project 7

PROJ NO:	DATE:
13472	10/28/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-10

Section 4
Existing Wastewater Infrastructure Improvements

SECTION 4

EXISTING WASTEWATER INFRASTRUCTURE IMPROVEMENTS

4.1 WASTEWATER COLLECTION SYSTEM

This section summarizes suggestions for investigations, evaluations and improvements to the Town's existing wastewater collection system, which will be required to assess the current condition and to address known and potential future system problems. At the end of each major section (4.1 for Collection System and 4.2 for WWTF), a summary of recommendations has been provided.

The existing sewer system appears to have adequate capacity to handle projected potential future flows (flows presented in Section 3). All of the potential future sewer expansion projects will connect to the existing Gibbs Crossing interceptor, which discharges directly to the WWTF. The majority of existing wastewater infrastructure "needs" are due to the age and operations and maintenance requirements of the system.

4.1.1 Infiltration and Inflow (I/I) and Sewer System Evaluation Survey (SSES) Projects

The Town was awarded a Community Development Block Grant (CDBG) in early 2009 to conduct a planning study for the Northside Neighborhood, which included the areas in and around Church Street, North Street, Pleasant Street, Park Street, Walnut Street and Park Avenue. This area of Town was selected due to the age of the sewer system and the expectation by the Town that the sewer system would have significant infiltration and inflow in this area. The planning study was conducted in 2009 by Fay, Spofford and Thorndike (FST), and included 68 manhole inspections and 12,820 linear feet of pipe inspection (completed in December 2009). Of the 68 manholes inspected, 25-vented covers were noted and three manholes were recommended for replacement. The study also indicated that many of the manholes required repair and cleaning to remove debris and allow for better flow through the structures. A total of 87,000 gallons of infiltration/inflow were measured during these investigations.

A total of 8,000 linear feet of sewer was CCTV inspected in August 2009. The remaining piping could not be inspected due to blockages or debris within the sewer lines. During the inspection program 7,500 gallons of infiltration was estimated to be cost-effective to remove via cleaning, testing and sealing. Since the CCTV inspection was completed during the summer (August), it is assumed that infiltration rates estimated were on the "lower end" due to lower groundwater conditions. The majority of the piping inspected was noted as 6-inch diameter VCP with many open joints, which would have a high potential for excessive infiltration if groundwater were present at or above the pipe elevation and/or as a result of rain-induced infiltration (RII).

Additional I/I field activities included 12,820 linear feet of smoke testing. As a result of the smoke testing efforts, the following inflow sources were observed:

- Roof leaders connected to the system at 81 North Street
- Potential broken service laterals at 81 and 84 Church Street
- Catch basin potentially connected to the sewer at 77 and 87 Church Street

4.1.2 Previous Sewer Rehabilitation Projects

As discussed in Section 2 of the report, a large portion of the Ware wastewater collection system in the Northside Neighborhood area was constructed in the 1890s (just 30 years post- Civil War). This system was a combined wastewater and stormwater system and discharged directly into the Ware River at an outfall located off West Street, behind the present location of the Family Dollar store.

A second outfall was installed on the south shore of the Ware River near the end of Monroe Street and discharged wastewater from the South, Maple, Chestnut and Elm Street neighborhoods and Morse Avenue. Additional outfalls to the Ware River were added at Marjorie and Cummings Streets. The original Town sewer system network served the community without significant additions or improvements throughout much of the 20th century. Over the decades, some of these sewers have been replaced, repaired and/or extended, including:

- Sewer replacements and expansions on Pulaski, Parker and Main Streets in the 1980s

- In 2001 - 400 feet of pipe and three manholes were replaced on North Street
- In 2002 - 2,370 feet of pipe and eight manholes were replaced on Eagle Street
- In 2003 - 1,260 feet of pipe were treated with root control chemical on North Street
- In 2005 - 2,500 feet of pipe along (and manholes) were replaced and 1,440 feet of service laterals were installed on Pleasant Street, Aspen Street, Vigilant Street and Aspen Court
- In 2005 - 170 feet of sewers were replaced on Bellevue Avenue
- In 2007 - 800 feet of pipe and all manholes were replaced on South Street and Knox Avenue, and portions of Maple Street were inspected and repaired. Sewer manhole frames and covers, which were either vented or in poor condition were replaced with solid frames and covers on South Street, Knox Avenue, Maple Street, Morse Avenue, Milner Street, Maple Avenue and Maple Court.
- In 2008 - 790 feet of pipe and five manholes were replaced on Pine Street and 30 feet of pipe and two manholes were replaced on Grove Street. Also, five manhole frames and covers were replaced and all inverts rebuilt on Cherry Street.
- In 2011 - 500 feet of pipe received chemical root treatment, one sewer point repair, five manhole repairs, five frames and covers replacements, and one manhole invert was repaired on Park Street. The Park Street project also included the reconstruction of the roadway and installation of a new drainage system. These improvements assisted in reducing inflow and rain induced infiltration into the sewer collection system by reducing ponding along the roadway.

4.1.3 I/I, SSES and Sewer Rehabilitation Projects

Although some of the original sewer system has been replaced or repaired, many of the original sewer pipes and manholes installed in the late 1890s (just 30 years post-Civil War) are still in service and are beyond their intended design life. It is important to perform routine maintenance and inspection of a municipal sewer system to identify any deficiencies to minimize blockages, back-ups and/or sanitary sewer system overflows (SSOs) from occurring. As presented above, the Town has completed limited I/I, SSES and sewer system rehabilitation projects on the collection system. However, to our knowledge, no full system-wide I/I, SSES has been performed (or if performed, is not available to the Town and Wright-Pierce).

In 2014, MassDEP mandated that all communities with municipal sewer systems develop and implement an I/I Control Plan by December 31, 2017. The MassDEP I/I Control Plan requirement and the need for the Town to develop a long-term plan for continuing to investigate, evaluate (SSES tasks) and remove I/I from its collection system should be the number one collection system priority going forward. Accordingly, it is recommended that the Town develop and implement a collection system investigation/evaluation (I/I, SSES work) and capital improvements program (sewer rehabilitation) of the existing sewer system. The major steps are summarized below:

1. I/I Control Plan
2. SSES Tasks – Phase I and Additional Phases as necessary
3. Sewer Rehabilitation – includes review of previously completed and recommended rehabilitation tasks
4. Annual System Inspections, Evaluation and Rehabilitation as necessary once first three items are complete

<u>I/I Control Plan</u>

The following outlines a strategic and cost-effective approach for addressing the ***I/I Control Plan*** meeting MassDEP's December 2017 mandate. The existing sewer collection system consists of approximately 25.5 miles (134,640 linear feet) of gravity sewers and 595 manholes. MassDEP guidelines recommend the installation of one flow meter per 20,000 linear feet of sewer. The Town-wide I/I Control Plan recommended to commence in the Spring of 2017 will consist of the following tasks:

1. Installing up to six flow meters for a 6-month period strategically located to divide up sections of the sewer system into separate "study areas"
2. Installation of one rain gage for a 6-month period during flow metering
3. The metering and rain gage data will be evaluated and presented in a Report summarizing the total I/I measured within each study area. The study areas will be ranked based on I/I rates normalized for the total sewer inventory in each study area (gallons per day per inch diameter mile).
4. The I/I Control Plan will include recommendations for subsequent SSES phases/tasks (smoke testing, flow isolations (micro-metering), pipe CCTV inspections, manhole

inspections, building inspections and dyed-water testing/flooding) with a schedule and estimated costs for additional SSES work and sewer rehabilitation (as part of the Town's overall capital improvements program)

The ***I/I Control Plan*** is anticipated to be completed within a 9-month period (March 2017 through December 2017), including six months for collecting flow metering and rain gage data and three months for completing the evaluation and summary report. The I/I Control Plan task is estimated to cost approximately $145,000 as presented in Table 4-1 below.

SSES - Phase I

Once the I/I Control Plan is complete, Phase 1 SSES work can commence. We have developed a scope of work according to the recently updated MassDEP's I/I, SSES guidelines. The Phase I SSES work is assumed to be performed on approximately 20,000 linear feet of sewer piping and 100 manholes (approximately 20 percent of the total system piping and manholes). This assumption will be revisited and adjusted as necessary upon completion of the I/I Control Plan. The SSES field investigation work is assumed to include:

- Closed Circuit Television Inspection (CCTV) of sewer piping
- Manhole inspections (NASSCO Level 2 Inspections)
- Smoke testing
- Evaluation of data and information collected during the investigations
- Summary report recommending additional SSES phases/tasks and any cost-effective sewer rehabilitation work to reduce identified I/I and address any observed structural deficiencies.

Additional SSES phases/tasks will be developed upon completion of Phase I SSES. Phase I SSES work is estimated to be approximately $128,000 as presented in Table 4-2 below.

Sewer Rehabilitation

Upon completion of the Phase I SSES, it is recommended that the Town move into rehabilitation of identified cost-effective problem areas concurrently with additional SSES tasks. This should include newly identified cost-effective rehabilitation tasks and previously identified sewer rehabilitation tasks. It is recommended that the Town hold off on moving into rehabilitation of previously identified problems/deficiencies until the I/I Control Plan and Phase I SSES work is complete. This will allow the opportunity to revisit some of these previously identified problems and compare such to any newly identified problems. This will allow the Town to prioritize both current and older rehabilitation tasks into one overall comprehensive, cost-effective approach.

Below is a brief summary of previously identified I/I sources that may be appropriate to consider as part of the sewer rehabilitation program:

- Four sources identified during previous smoke testing efforts - recommend dyed-water testing to verify connection to the Town sewer system
    - Following dyed-water testing, Town to work with the owners on 81 North Street to remove the roof leaders from the sewer system
    - Following dyed-water testing, confirm that the catch basin in front of 77 and 87 Church Street is connected to the sewer system. Assuming this catch basin is connected to the sewer system, the Town should consider installing new drainage system piping to the existing drainage system and redirect that catch basin flow from the sewer system to the drainage system.
- The West Street siphon transfers the majority of wastewater flow across the Ware River to a 24-inch diameter interceptor, which travels along the River to the WWTF for treatment. This is an important asset of the sewer collection system which could present the Town with substantial financial burden if an emergency repair was ever necessary. It has been reported by the Town that the siphon has not been opened or cleaned in over 30 years. It was reported by the Town that an overflow/backup that occurred on West Street was the result of grease build-up in the pipe in the easement upstream of the siphon. Each siphon concrete chamber should be cleaned and inspected for structural deficiencies and FEMA floodplain code compliance. The siphon barrels should also be cleaned and CCTV inspected to determine the condition of the pipe and identify any potential maintenance and/or repairs.

Annual System Inspections, Evaluation and Rehabilitation

Once the Town has completed its I/I Control Plan, Phase I SSES work and subsequent sewer rehabilitation and additional SSES work, it is recommended that the Town plan and budget for ongoing sewer system inspections, evaluations and rehabilitation on an as-needed basis. This annual program will allow the Town to continue to evaluate and repair/upgrade its collection system in a systematic and cost/budget effective manner. Each year a collection system area identified having excessive I/I could have continued SSES work consisting of:

- Manhole inspections
- CCTV pipeline inspection
- Smoke testing, and
- Building inspections

Continuing these tasks annually, as-needed will allow the Town to continue to identify and quantify I/I sources and make necessary repairs/improvements (for I/I and structural purposes).

Additional sewer rehabilitation will be determined based on the findings of the ongoing annual SSES program.

TABLE 4-1
I/I CONTROL PLAN COST ESTIMATE

Item	Description	Unit Cost	Total Cost
1	Flow Metering (6 Meters x 6 Months = 36 Meter Months)	$3,500 per Meter Month	$126,000[1]
2	Rain Gage (1 Gage x 6 Months = 6 Rain Gage Months)	$1,500 per Rain Gage Month	$9,000
3	Project Administration and Meetings	$10,000	$10,000
		Total	**$145,000**

Notes:
1. Estimated cost includes evaluation and summary report.
2. Police details not included.

TABLE 4-2
ESTIMATED PHASE I SSES COSTS

Item	Description	Unit Cost	Total Cost
1	Pipeline Cleaning and CCTV - 20,000 Linear Feet	$3.50/LF[1]	$70,000
2	Smoke Testing - 20,000 Linear Feet	$1.00/LF	$20,000
3	Level 2 Manhole Inspections - 100 Manholes	$180/Manhole	$18,000
4	Evaluation, Analyses and Summary Report	$10,000	$10,000
5	Project Administration and Meetings	$10,000	$10,000
		Total	**$128,000**

Notes:

1. Includes light pipe cleaning.
2. Police details not included.

4.2 WASTEWATER TREATMENT FACILITY (WWTF)

As discussed in Section 2, the Ware WWTF received its last major upgrade in 1984. In 2011, a phosphorus removal tertiary system upgrade was designed, but the project was never constructed because KSP pulled its share of funding from the project to construct its own onsite pretreatment facility. The Town did replace the influent pump system motors and controls with new VFDs in 2012. The majority of the remaining unit process systems/equipment were installed during the 1984 upgrade and are over 30 years old. The typical life span for wastewater process equipment is 20 to 25 years.

It is recommended that the Town implement an upgrade to the existing WWTF within the next 5 years to replace aging process systems/equipment, as well as auxiliary systems such as mechanical HVAC/plumbing, electrical, instrumentation and control and building upgrades. Prior to implementing facility upgrades, it is recommended that the Town further define all system/equipment needs as a precursor to designing and constructing specific WWTF upgrades/improvements (including potential new permitting requirements). As part of the Sewer Master Plan, a site visit was performed at the WWTF with the Town's Operations staff to observe and discuss the current status and operating condition of the facility. Previous WWTF reports and evaluations were also reviewed and considered to assist in our evaluation and review of existing facility conditions and general needs going forward.

The following sections provide an overview of existing WWTF processes and potential improvements/upgrades to the WWTF.

4.2.1 Preliminary Treatment and Influent Pumping

As previously discussed, the influent pump system motors were replaced in 2012 and are in good working condition. VFDs were also installed to operate and control the influent pumps. The influent pump station wetwells are in good condition, however, the installation of new access hatches with proper safety grates is recommended. The plant includes a 10-inch magnetic flow meter on the discharge piping of the influent pump station for recording plant flows. This flow meter is original from 1984 and should be replaced.

The main electrical room is located directly above the influent pump room. There is an access hatch for pump removal that creates and open environment between the two spaces. The pump room ventilation system will require continuous ventilation or 6 air changes per hour in order to declassify the space. An evaluation is recommended to review the HVAC status, code compliance and needs going forward. HVAC improvements may be necessary for this are of the WWTF.

The existing grit removal system includes two independent 47.5 cubic foot capacity, 9-inch-deep grit collection channels under the walkway between the two aeration tank trains. Low flow through the channels allows the grit to settle out. A grit pump and cyclone degritter are located in the grit pump room under the stairway. The grit is pumped into a hydro-cyclone, which drains the water back to the influent wetwell and discharges grit into a cart for disposal. The grit pump motor has been replaced and the hydro-cyclone has also been rehabilitated since the last major facility upgrade. Given the configuration of the grit removal system, it is suspected that a portion of the grit is not removed via the grit channel. A more detailed evaluation for the grit removal process equipment is recommended.

4.2.2 Secondary Treatment

Aeration

The aeration tanks consist of two trains divided into two zones by a concrete baffle wall. The first zone has 0.35 million gallons of volume and the second has 0.70 million gallons of volume. A capacity analysis was conducted as part of the Master Plan, but it is suspected that sufficient capacity is available given the large aeration tank volume (approx. 2 million gallons). The concrete appears to be in good condition. The plant only operates one train at a time due to the flows being lower than designed from the 1984 upgrade (as discussed in Section 2). Currently, the second aeration train is not in service, but is reportedly available for use (it is recommended that the Town double check mechanical, electrical and piping/valve operating conditions prior to putting this aeration train into service).

Currently, there is approximately 4 feet of settled sludge within the online aeration tank. It is suspected that KSP contributed significantly to the sludge build-up in the aeration tanks prior to start-up of their new pretreatment facility.

The existing mechanical surface aerators were installed in 1984 and are nearing the end of their useful life. These aerators provide 0.6 Hp/1,000 cubic feet with typical minimum mixing values for mechanical surface aeration range from 0.6 to 1.15 Hp/1,000 cubic feet (Metcalf and Eddy, 1991). Given the age, condition and continued rag build-up problems on the mechanical aerator shafts and blades, insufficient mixing energy within the aeration tanks is a contributing factor in the settlement of solids. The settled sludge within the aeration tanks is causing a reduction in treatment volume (estimated to be 30 percent reduction). This reduction in available treatment volume/capacity has occasionally disrupted the WWTFs ability to provide seasonal nitrification.

Due to the inefficient sludge mixing, energy consumption, and age of the mechanical aerators, it is recommended to consider replacement of the mechanical aeration system with a fine-bubble diffused aeration system, which would include new blowers and diffused air grid at the bottom of the aeration tanks. The blowers could be installed within the existing Administration Building electrical room or in the current chlorine gas room. Diffused aeration would prevent solids settlement on the bottom of the tanks and provide a more efficient oxygen transfer rate and reduced energy consumption and costs (electric company energy efficiency rebate incentives may be available to the Town for this upgrade). Alternatively, a hybrid mixer-aerator system could also be considered in lieu of a fine bubble diffused aeration system. This system would eliminate the need to install a diffused aeration grid on the floor of the aeration tanks and reduce the size of the new blowers. However, it would require the installation of six new, smaller, top mounted mixers in the aeration tanks. The advantages and disadvantages of each aeration alternative should be vetted out once replacement of the existing system commences. The secondary treatment system could also be considered for conversion to a Modified Ludzak-Ettinger (MLE) process for enhanced nitrogen removal. This could be accomplished with the installation of submersible mixers and pumps within the aeration tanks.

Chemical Addition

The Ware WWTF is currently alkalinity deficient and receives supplemental alkalinity from the manual addition of 50-pound bags of soda ash prior to the aeration tanks. This process is labor intensive and time consuming. In addition, dumping 50 pounds of soda ash into the process stream creates a sludge load of alkalinity and is not efficiently adding alkalinity in a consistent manner that could enhance nitrogen removal rates. It is recommended to install a sodium hydroxide chemical storage and feed system for dedicated alkalinity addition. The sodium hydroxide (caustic) would replace the need for manual addition of (50-pound bags) soda ash and would provide a more precise alkalinity addition to secondary treatment process. Sodium hydroxide would also be used for pH adjustment for effluent discharge to the Ware River.

Clarification

The plant uses two 56-foot diameter concrete secondary clarifiers with a center scum well for final solids settling. The clarifiers settle secondary sludge to a center sump, which is either wasted into the sludge holding tank with the waste sludge pumps or pumped into the aeration tanks with the Return Activated Sludge (RAS) Pumps. Scum floating on the surface of the clarifiers is "skimmed" into the scum well with constantly rotating skimmer arms. The scum is then pumped into the sludge holding tank and mixed with waste-activated sludge for disposal. The clarifier mechanisms, RAS and Scum pumps currently do not have any reported problems, however, they were installed as part of the 1984 upgrade and are reaching the end of their useful life. It is recommended to replace the clarifier "internals" as part of future WWTF upgrades.

4.2.3 Disinfection System

The plant disinfection system includes a gas chlorination system and a sulfur dioxide dechlorination system along with two concrete chlorine contact tanks. One of the two chlorine contact tanks is a smaller buried by-pass tank with a concrete cover and is only used during repairs on the main tank. The chlorination and dechlorination systems are flow-paced by the influent flow meter and located in the administration building chlorinator room. The chlorine gas system can also be used for process/odor control of influent flow and the septage holding tank. The majority of chlorine gas systems used at wastewater treatment facilities have been phased out over the years. The Town of Ware should strongly consider immediate replacement of its chlorine gas system. Chlorine is a toxic gas that attacks the respiratory system, eyes and skin (it was originally used as a chemical weapon in World War 1). If a chlorine leak occurred at this site, fatal chlorine gas levels could be present in the immediate area. The Town's Fire Department is reluctant to enter this area of the WWTF.

Due to the unsafe nature and Risk Management Planning (RMP) requirements associated with the use of a gaseous based system, the Town has evaluated and considered upgrades of the existing disinfection facilities to either a liquid chemical-based system or Ultraviolet (UV) disinfection system. The Town could decide to retrofit the existing chlorine contact tank to include a new UV disinfection system. The UV disinfection system could likely be fit within the existing chlorine contact tank with up to three trains. The UV system would not require replacement of the existing potable water service line (see discussion below) and the by-pass chlorine contact tank could be used during the installation of the new UV system. The existing disinfection facilities would be demolished or re-purposed once the new system is operational. The existing chlorinator room could be used for storage or a location to install diffused aeration system blowers. The UV system would remove the use of chlorine and total residual chlorine (TRC) in the plant's effluent (the NPDES permit would be modified to remove the TRC requirement).

Alternatively, the Town could upgrade the existing disinfection system to a bulk chemical storage disinfection system utilizing liquid sodium hypochlorite (for chlorination) and sodium bisulfite (for dechlorination) system. These systems do not have the potential to produce chlorine gas, significantly reducing their safety concerns. However, other personnel safety concerns do exist due to the corrosive nature of both of these chemicals. Furthermore, based on information from the Town's Fire Chief, these systems will require a potable water sprinkler fire suppression system due to the chemical quantities required. In order to supply the required flows for a sprinkler system the existing water main servicing the WWTF would need to be replaced with a larger diameter pipe from the WWTF to West Street (approximately 0.5 miles in length and estimated to cost nearly $1 M). A chemical fire suppression system is an alternative the Town would like to pursue, however, the Town's fire chief has stated that he will only accept a water sprinkler fire suppression system.

Use of a UV system is typically more costly than a liquid chlorination/dechlorination system from both a capital and O&M cost standpoint (UV systems typically use significantly more electricity than liquid systems). However, with the need for a larger diameter water main extension to the WWTF for Fire protection purposes (as noted above), the 20-year present worth cost for a UV system will likely be comparable, or perhaps even lower than a liquid system. Use of a UV system eliminates significant safety concerns associated with chemical handling.

4.2.4 Solids Handling Facilities

The current solids handling facilities consist of two waste sludge pumps and an 85,000-gallon storage tank retrofitted from the old digester and sludge mixer. As previously mentioned, the RAS pumps recycle secondary sludge from the clarifiers to the aeration tanks for biological treatment and the waste sludge pumps transfer WAS from the clarifiers to the sludge storage tanks. The waste sludge pumps pump liquid sludge into tanker trucks (8,000 gallons per load) for disposal on an as needed basis. Connection to the trucks is provided by a flexible hose and cam-lock coupling connection. A dewatering pump is used to remove water from the settled sludge in the storage tank allowing supernatant to be removed. This is difficult to regulate and requires constant monitoring. At the present time there is no efficient way of removing built-up grease, rags or grit from the sludge storage tank and its mixer.

The plant does not currently operate any dewatering equipment and disposes 1.5-2 percent solids content sludge. The 1984 upgrade included the installation of the sludge storage tank, two belt filter presses, two filter feed pumps (currently used as waste sludge pumps), a polymer make-up unit and a sludge conveyor. This system has been abandoned and the belt filter presses and conveyor were demolished. The filter press room is now used for storage, including soda ash bags and other equipment.

It is recommended that the WWTF consider the addition of a sludge thickening process as part of a future facility upgrade. A Gravity Belt Thickener (GBT) could be installed within the old filter press room, which would increase the sludge solids content to 7-8 percent significantly reducing sludge disposal volumes and costs for the Town. The existing waste sludge pumps could be used for pumping sludge to the GBT. These pumps were installed in 1984 and would require further evaluation and may require replacement. Two new dedicated thickened sludge pumps would be required to pump thickened sludge.

The existing plant water pumps would also need to be upgraded in order to provide necessary plant water flow and pressure for the sludge thickening facilities improvements (will also provide plant water for other systems throughout the WWTF).

Implementing new solids thickening facilities could result in a capital cost payback in as little as 3-5 years. A detailed cost-benefit analysis could be conducted for sludge thickening at the Ware WWTF.

4.2.5 Ware WWTF Improvements

A description of potential WWTF improvements are listed below:

- ***Demolition Work*** – Includes the demolition of the existing systems required for installation of new recommended equipment and sewer utilities at the WWTF.
- ***Site Work*** – Includes site piping, paving, grading and drainage and other items as required.
- ***Influent Pump Station Modifications*** – Installation of new access hatches with safety grating for each wetwell and replacement of the influent flow meter.
- ***Diffused Aeration System*** – Installation of three positive displacement type blowers, air piping, control valves and 9-inch diameter membrane diffuser grids for both aeration tanks. A hybrid mixer-aerator system could be considered as an alternative to a diffused aeration system.

- ***Secondary Clarifier Improvements*** – Replacement of the both 56-foot diameter secondary clarifier mechanical mechanisms (complete "internals" replacement).
- ***Sodium Hydroxide Chemical Storage and Feed System*** – Installation of a 1,000-gallon storage tank, two peristaltic chemical feed pumps and piping within a secondary containment area (replaces manual soda ash addition approach).
- ***RAS, Waste Sludge and Scum Pump Replacements*** – Includes replacement of three RAS pumps, two waste sludge pumps, one scum pump and process piping and valves as required.
- ***Sludge Thickening System*** – Includes the installation of a Gravity Belt Thickener (GBT) and two sludge feed pumps that will be installed in the Solids Handling Building. Includes associated piping, valves and other ancillary systems/equipment.
- ***Thickened Sludge Transfer Pumps –*** Includes the installation of two new thickened sludge transfer pumps and associated process piping and valves for pumping thickened sludge into a storage tank and loading tanker trucks for off-site disposal.
- ***Plant Water Pump System*** – Includes replacement of the existing plant water pumps with a new skid-mounted packaged type, plant water pump system and associated piping and valves and flow meter.
- ***UV Disinfection System*** – Includes the installation of a new UV Disinfection system that will be installed within the existing Chlorine Contact Tank (assumes UV system is utilized, not a liquid disinfection type system). Ultraviolet Trasmittance (UVT) testing on the Ware WWTF wastewater stream will be necessary to evaluate/confirm that the required disinfection can be achieved using this process (make sure use of current and future chemicals and industrial wastewater discharge to the WWTF (KSP discharge, for example), are not problematic).
- ***Building System Improvements*** – Includes required building system improvements such as doors, windows, roofing, flooring and/or walls for the Administration and Solids Handling Buildings as required. The Solids Handling Building does have a new roof (installed in 2015).
- ***Mechanical (HVAC/Plumbing)*** – Includes the renovation of existing HVAC and plumbing systems within the Administration and Solids Handling Buildings. Bring WWTF buildings/areas into NFPA 820 compliance.

- ***Instrumentation and Control Improvements*** – Includes the installation of a complete SCADA hardware and software system upgrade and associated devices including tank level monitoring equipment and DO analyzers.
- ***Electrical*** – Installation of new Motor Control Center (MCCs), replacement of energy efficient interior and site lighting, control panels throughout plant as required to meet designated NEMA classified space. Includes electrical systems as necessary to support new system/equipment improvements.

4.2.6 Ware WWTF Upgrade Estimated Costs

As previously discussed, the Ware WWTF has not gone through a major upgrade since 1984 and would benefit from various upgrades and improvements. The typical life span for process systems is 20-25 years with the majority of the unit process systems now over 30 years old. A breakdown of the potential WWTF improvements cost estimates is summarized in Table 4-3 below.

Potential WWTF upgrades and improvements are estimated to cost approximately $6,390,000 based on potential improvements described. These are intended to be planning level cost estimates for Town budgeting purposes.

The contingency and engineering services cost estimate is approximately 40 percent of the conceptual construction cost estimate. This cost is intended to cover all engineering services including, preliminary and final design, bidding, construction administration phase and field observation services, and miscellaneous unidentified changes that may be determined during the design and construction phase of the project (construction contingencies). The construction contingency is typically reduced as a project proceeds through the final planning and design phases and is ultimately ready for bidding.

Administration and legal fees cost estimate is approximately 2 percent of the conceptual cost estimate and is for administration, legal and bonding costs that may be included in the project.

TABLE 4-3
WARE WWTF UPGRADES
CONCEPTUAL PROJECT COST ESTIMATE

Description	Amount
Construction Cost	
Demolition Work	$100,000
Site Work	$200,000
Influent Pump Station Modifications	$100,000
Diffused Aeration System	$800,000
Secondary Clarifier Improvements	$400,000
Sodium Hydroxide Chemical Storage and Feed System	$200,000
RAS, Waste Sludge and Scum Pump Replacements	$300,000
Sludge Thickening System	$700,000
Thickened Sludge Transfer Pumps	$200,000
Plant Water Pump System	$100,000
UV Disinfection System	$500,000
Building System Improvements	$150,000
Mechanical HVAC/Plumbing	$200,000
Instrumentation and Control Improvements	$150,000
Electrical Improvements	$400,000
Construction Cost Subtotal	**$4,500,000**
Construction Contingency and Engineering Services (40%)	$1,800,000
Administration and Legal Fees (2%)	$90,000
Total Project Cost	**$6,390,000**

Section 5
Wastewater System Funding, Financing and Implementation Schedule

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SECTION 5

WASTEWATER SYSTEM FUNDING, FINANCING AND IMPLEMENTATION SCHEDULE

5.1 CURRENT WASTEWATER FUNDING

The Town of Ware owns, operates and maintains the existing wastewater collection, pumping, and treatment system as an enterprise fund; that is, the costs to operate, maintain, and perform capital upgrades to the system are funded by the system users, not the entire tax base of Ware. Proportionate shares of the revenue come from residential and commercial users, with smaller amounts derived from sewer connection and septage disposal fees. The Town of Ware rate payers have funded the bulk of capital improvements of the wastewater system over past years. For Fiscal Year 2017, the sewer enterprise fund is expected to receive revenue of $797,000, with the majority of funds coming from the users ($690,000). The 2017 operating budget is $759,729, which leaves $40,359 in escrow for capital expenditures. The Town does not currently have any annual bond payments for past capital improvements projects.

The Ware WWTF also receives revenue from “trucked-in” septage from within town and other surrounding communities. Septage is accepted at the WWTF within the Town of Ware for $0.10 per gallon and from outside of town for $0.12 per gallon.

In general, the Town’s Sewer Enterprise fund does not participate in funding projects that serve existing residential neighborhoods that are currently served by on-site subsurface disposal systems unless there are substantial environmental concerns. If these projects are constructed, property owners that are served fund the projects through a betterment assessment by the Town (100% of the project cost paid for by properties that abut the new sewer system). Sewer assessments are determined utilizing the total number of existing residential sewer units to be served, or the residential equivalent of commercial or industrial sources further described in Section 5.2.3.

5.2 FUNDING ALTERNATIVES

There are a number of funding alternatives available for the potential sewer expansion projects outlined in this Sewer Master Plan. Some of the alternatives described below are currently utilized by the Town.

5.2.1 Sewer User Charge

The Town currently assesses a sewer user charge to all sewer users to pay for all of the annual operating, maintenance, and capital expenses of the collection and treatment facilities in Ware. The Town of Ware annually establishes equitable and just user charges for the use of the wastewater facilities to be paid by every owner of an establishment whose building connects directly or indirectly into the municipal sewer system.

A current base charge of $40.50 (2016) per quarter is charged for all active accounts. This base charge covers the first 500 cubic feet measured by the water meter for the structure. Sewer fees defined in Section 2 of the Town's regulations is $4.30 (2016) per hundred cubic feet beyond the first 500 cubic feet as measured by the water meter for the structure. The rules and regulations governing the Town of Ware's public sewer system adopted July 21, 2015 and amended October 20, 2015 are included in Appendix D.

5.2.2 Sewer Connection Fees

Any time a new sewer user connects to the existing collection system, the Town assesses a sewer connection charge. This includes two different fees, the application and inspection fee (currently $200), as well as a connection fee (see list below).

- Residential: $2,250
- Commercial: $5,000
- Industrial: $10,000
- Subdivision: $2,500 including residential fees for individual lots

The purpose of the connection fee, or system development charge, is to ensure that new users "purchase" their portion of the existing wastewater infrastructure that was funded by others. The rules and regulations require that any property within 150 feet of a sewer connect to the sewer and pay the sewer connection charge unless exempted by this regulation. Since this fee is intended for buy-in to existing infrastructure, it is not recommended that these funds be used to fund sewer extension projects.

5.2.3 Public Sewer Extension Charges

Section 16 of the Town's rules and regulations allows for extension of sewer by assessing the owners of land abutting a public sewer line installed by the Town by a rate based upon the "uniform unit" betterment method. Sewer assessments are determined utilizing the total number of residential sewer units to be served, or the residential equivalent of commercial, industrial, or semi-public uses and are levied as betterment assessments or alternatively sewer privilege fees. The rate is determined by user class and applies to all lands developed or undeveloped abutting a sewered street.

The total assessments do not exceed the local share of the total sewer project cost, which includes total costs of engineering, survey, design, construction, land acquisition, construction engineering services, legal services and all related contingencies, less all state and federal aid received and other contributions to the project cost from other sources. The betterment payment for an assessed property is based upon the total number of sewer units designated for said property at the time of assessment. Property owners have the option to finance betterment payments. The interest rate charged by the Town is the rate being charged to the Town for the sewer construction project bond, plus any interest required by Massachusetts General Laws.

For the seven potential public sewer extension Projects included in the Master Plan, the betterment assessment will range depending on the total project cost and the total number of potential sewer users within the project area. Table 5-1 below lists estimated betterment assessments for each potential Project based on the number of existing and developable residential, commercial/industrial parcels within the project limits. Table 5-1 also includes estimates of connection and new sewer user fees for full build-out of the project areas, which would equate to approximately $2.318 million in connection fees and approximately $150,500 in annual revenue

TABLE 5-1

ESTIMATED SEWER BETTERMENT ASSESSMENTS, CONNECTION FEES AND BASE SEWER USER REVENUE

Project No.	Project Area Description	Total No. of Sewer Users	Project Cost	Cost Per User (Betterment)	Connection Fees[1]	Base Annual Revenue[2]
1	Longview Street Sewer Extension	99	$3,190,000	$32,300	$247,500	$16,100
2	Meadow Heights Sewer Extension	49	$1,470,000	$30,000	$122,500	$8,000
3	Malboeuf Road Sewer Extension	142	$3,030,000	$21,400	$355,000	$23,100
4	Mountain View Drive Sewer Extension	50	$2,010,000	$40,200	$125,000	$8,100
5	Palmer Road Sewer Extension	57	$3,770,000	$66,200	$142,500	$9,300
6	Old Belchertown Road Sewer Extension	85	$3,800,000	$44,700	$212,500	$13,800
7	Beaver Lake Low-Pressure Sewer System	445	$7,440,000	$16,700	$1,113,000	$72,100
Total		**927**	**$24,710,000**	-	**$2,318,000**	**$150,500**

Notes:

1. Connection fees are based on residential fee of $2,500 per connection.
2. Base sewer user revenue based on $40.50 per quarter for the first 500 cubic feet (measured by the structure water meter). Additional sewer user revenue of $4.30 per 100 cubic feet (measured by the structure water meter) above the base sewer user revenue is not included.

from user fees for the Town (could be used for Capital Improvements Program (CIP) I/I and Sewer Rehabilitation projects).

5.2.4 Private Sewer Extension Charges

When a developer or a person other than the Town of Ware, or duly authorized representative of the Town, constructs a sewer extension to the public sewer system, the Town assesses a sewer privilege fee in lieu of a betterment assessment with respect to each sewer unit to be served by said sewer extension. The sewer privilege fee is currently equivalent to $7,500 per residential unit and non-residential units are currently $7,500 multiplied by the sewer unit calculation in Section 16.3(B)(2) of the Town’s rules and regulations. Sewer privilege fees are levied at the time of connection to the public sewer system. Sewer Privilege Fees are paid as a lump sum at the time of the connection.

5.3 WASTEWATER GRANT AND /OR LOAN OPPERTUNITIES

There are a number of grant and loan programs available to support wastewater projects. Two programs the Town is eligible for are the United States Department of Agriculture (USDA) Rural Development (RD) combination Grant/Loan program and the State Revolving Loan Fund (SRF) loan program.

5.3.1 USDA Rural Development (RD)

The USDA RD grant and loan program is available for the planning, design, and construction of municipal wastewater infrastructure projects for communities with a population less than 10,000 (Town of Ware is currently just under this population threshold). Grant amounts and loan interest rates vary depending on the availability of funds, the median household income of the municipality, and the projected user rates resulting from the project. The main eligibility criterion is median household income (MHI). Specifically, if the municipality's MHI is below the State average, then it qualifies for up to 45 percent grant funding; however, if the municipality's MHI is below 80% of the State average, then it qualifies for up to 75 percent grant funding. The State average MHI based on the 2014 Census ACS 1-year survey was $69,160. Based on the 2010 Census results, the Town of Ware’s MHI was $38,894 in 2014 dollars. Accordingly, it is anticipated that the Town could qualify for up to 45 percent grant funding and a 40-year low interest rate loan. It should be noted however, that USDA RD grants in recent years have averaged approximately 20 percent of the project cost, even if a community qualifies for a higher grant percentage.

5.3.2 State Revolving Loan Fund (SRF)

The Massachusetts Department of Environmental Protection (DEP) administers the Clean Water SRF loan program, which provides loans for wastewater projects at a subsidized interest rate, as well as the possibility of a "grant", usually in the form of principal forgiveness. In order to qualify for an SRF loan, a project (or projects) must be placed on DEP Intended Use Plan (IUP), which is done annually. This is a competitive process and not all projects qualify for SRF loan funding. Every summer (usually August), a Project Evaluation Form (PEF) must be prepared and submitted to DEP. DEP then reviews and scores each PEF submitted and develops a draft IUP that is issued in the Fall of that same year. After a public comment period and hearing, DEP issues a final IUP typically at the beginning of the following year. If a project is listed on the final IUP, it is eligible for SRF loan funding. Other requirements need to be met to receive this loan, including submittal of an SFR loan application and local appropriation of project funding by the community by June 30^{th} of the following year.

SRF loans have some eligibility requirements such as contractors and consultants being required to meet specific disadvantaged business enterprises (DBE), Minority Business Enterprises (MBE) and Women Business Enterprises (WBE) percentages, adhering to federal wage rates, and complying with the requirements of American Iron and Steel Act. More recently, supplemental requirements, such as the development of a Fiscal Sustainability Plan (FSP) or Asset Management Plan, is required.

It is recommended that the Town consider utilizing USDA RD and/or SRF loan program funding for future WWTF system capital improvements projects. Many municipalities have successfully applied for, qualified for, and utilized SRF loan and/or USDA RD funding.

5.4 AD VALOREN TAXES/TOWN BONDS

Another alternative for funding sewer system projects is through taxation. Occasionally, municipalities have used this approach for sewer extension projects to serve a public facility such as a school, a library or a fire station or to improve an environmentally compromised area. Another example would be the extension of sewer or improvements to sewer infrastructure to serve an area targeted for economic development that would benefit the Town. As the project benefits the entire Town rather than just a select area, the Town may choose to pay the debt service through taxation rather than placing the burden on just the existing sewer user base.

One benefit of this alternative for the sewer users is that the cost for a given project is spread out over a much wider base (entire community rather than only current sewer users). Ad valorem taxes are not a common approach for wastewater facilities, but there are some municipalities that use this alternative.

5.5 CAPITAL IMPROVEMENT PLAN FUNDING/FINANCING

Funding for wastewater system O&M and capital improvements can be provided with different strategies as noted above. The Town should pursue grant and low-interest loan opportunities as detailed above to assist with capital improvements projects. Betterments should be utilized for potential sewer extension projects. Sewer user charges need to be reviewed and adjusted on a routine basis to make sure the wastewater system O&M budget is properly funded and to assist with system improvements. Sewer user fees and/or taxation can be used to assist in funding/financing system improvements projects. Wright-Pierce will perform a sewer "rate study" independent of the Sewer Master Plan to assist in developing a funding/financing plan to operate, maintain and improve the wastewater system.

5.5.1 Capital Improvements Plan

Wastewater system capital improvements should be planned, funded/financed and implemented over a specified period of time. There are three categories of wastewater system "needs" for the Town of Ware:

- Existing Collection System Improvements

- Wastewater Treatment Facility Improvements

- Sewer System Extension Projects

These are listed in recommended priority. Regulatory drivers and system age and other needs are driving the existing collection system improvements as a top priority. Facility age, O&M needs, code compliance and other "drivers" are reasons for WWTF improvements. Potential Sewer System Extension projects will be driven by the "need" and desire of the residents and property owners and overall Town project coordination for each of the seven Project Areas. An overall implementation schedule is shown in the table below for the Town to use for planning and budgeting purposes.

TABLE 5-2

IMPLEMENTATION SCHEDULE

Project/Task	Start Date	Finish Date
Existing Collection System		
I/I Control Plan	Spring 2017	December 2017
Phase I SSES	Spring 2018	December 2018
Phase II SSES	2019	2020
Sewer Rehabilitation Projects	2018	2022
Ongoing SSES and Rehabilitation	Annually	Annually
WWTF Improvements[1]	2018	2021
Sewer Extension Projects		
Projects 1 through 7	As Necessary	As Necessary

Notes:

1. WWTF improvements could be separated into multiple phases and spread over several years for budgeting purposes.
2. Ongoing SSES and rehabilitation work to commence in 2023 and the be performed annually.

A more specific 10-year Capital Improvements Plan (CIP) is shown in Table 5-3. Priority is I/I, SSES work, followed by WWTF Improvements. Sewer extension projects to be completed by Town as determined necessary.

TABLE 5-3
RECOMMENDED TEN-YEAR CAPITAL IMPROVEMENT PROGRAM - WASTEWATER SYSTEM
WARE, MASSACHUSETTS

	Total Cost Estimate	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Year 6 2022	Year 7 2023	Year 8 2024	Year 9 2025	Year 10 2026
Existing Collection System											
I/I Control Plan	$145,000	$145,000									
Phase I SSES	$128,000		$128,000								
Phase II SSES	$200,000			$100,000	$100,000						
Sewer Rehabilitation[1]	$1,000,000		$200,000	$200,000	$200,000	$200,000	$200,000				
Ongoing SSES and Rehab.[1]	$200,000							$50,000	$50,000	$50,000	$50,000
WWTF Improvements											
Overall WWTF Upgrades[4]	$6,390,000		$500,000	$1,890,000	$2,000,000	$2,000,000					
(UV, sludge thickening, etc.)											
Sewer Extension Projects											
Project No. 1 – Longview Street[2]	$3,190,000					$638,000	$2,552,000				
Project No. 2 – Meadow Heights[2]	$1,470,000							$294,000	$1,176,000		
Project No. 3 – Malboeuf Road[2]	$3,030,000									$606,000	$2,424,000
Project No. 4 – Mountain View[3]	$2,010,000										
Project No. 5 – Palmer Road[3]	$3,770,000										
Project No. 6 – Old Belchertown[3]	$3,800,000										
Project No. 7 – Beaver Lake[3]	$7,440,000										
TOTAL	**$32,773,000**	**$145,000**	**$828,000**	**$2,190,000**	**$2,300,000**	**$2,838,000**	**$2,752,000**	**$344,000**	**$1,226,000**	**$656,000**	**$2,474,000**

Notes:

1. Sewer rehabilitation and ongoing SSES and sewer rehabilitation costs are very preliminary estimates and need to be updated/refined after I/I and Phase I and II SSES work is complete.
2. 20 percent of project cost estimated to be incurred in year 1 and 80 percent of cost in year 2.
3. Sewer extension projects 4, 5, 6 and 7 are assumed to occur beyond the 10-year project horizon, if at all.
4. WWTF improvements assumed to be completed as one phase and to be completed over a 4-year period.
5. All estimated costs are project costs, including engineering, administration, construction and contingencies.
6. Phase II SSES costs are very preliminary estimates and need to be refined/adjusted after completion of Phase I SSES work.

APPENDIX A

Existing Ware Wastewater Collection System Plan


Parcel data and town boundaries from MassGIS. Sewer data from Tighe & Bond. Basemap provided be Esri.
PELHAM
NEW SALEM
PETERSHAM
BARRE
HARDWICK
NEW BRAINTREE
NORTH BROOKFIELD
WARE
BELCHERTOWN
WEST BROOKFIELD
GRANBY
LUDLOW
PALMER
WARREN
BROOKFIELD
WEST BROOKFIELD
WARREN
PALMER
PALMER
Gravity Sewer Mains
Asbestos Cement
Poly Vinyl Chloride
Vitrified Clay
Other or Unknown
Existing Force Main
Sewer Manhole
Tax Parcel
Town Boundary
N
0 150 300 600 900 1,200 1,500 1,800
Feet
Existing Sewer System
Ware, MA
PROJ NO: 13472A
DATE: 10/21/2016
FIGURE: 2-1
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APPENDIX B

Ware WWTF NPDES Permit

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§ 26-53),

Town of Ware
Department of Public Works

is authorized to discharge from the facility located at

Ware Wastewater Treatment Plant
30 Robbins Road
Ware, MA 01082

to receiving water named

Ware River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit will become effective on the first day of the calendar month immediately following sixty days after signature.*

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit supersedes the permit issued on May 1, 2007.

This permit consists of 18 pages in Part I Part I including effluent limitations and monitoring requirements, 25 pages in Part II including General Conditions and Definitions, Attachment A – 2007 Revised Freshwater Chronic Toxicity Test Protocol, Attachment B - Reassessment of Technically Based Local Limits, Attachment C - NPDES Permit Requirement for Industrial Pretreatment Annual Report, and Attachment D - Summary of Required Report Submittals.

Signed this day of

___________________________	___________________________
Director	Director
Office of Ecosystem Protection	Massachusetts Wastewater Management Program
Environmental Protection Agency	Department of Environmental Protection
Boston, MA	Commonwealth of Massachusetts
	Boston, MA

* Pursuant to 40 CFR 124.15(b)(3), if no comments requesting a change to the draft permit are received, the permit will become effective upon the date of signature.

PART I

A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number **001** to the Ware River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**					**MONITORING REQUIREMENTS**[3]	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**
FLOW[2]	*********	*********	1.0 MGD	*********	Report MGD	CONTINUOUS	RECORDER
FLOW[2]	*********	*********	Report MGD	*********	*********	CONTINUOUS	RECORDER
BOD_5 [4]	208 lbs/Day	208 lbs/Day	25 mg/L	25 mg/L	Report mg/l	1/WEEK	24-HOUR COMPOSITE[5]
TSS[4]	208 lbs/Day	208 lbs/Day	25 mg/L	25 mg/L	Report mg/l	1/WEEK	24-HOUR COMPOSITE[5]
pH RANGE[1]	6.5 - 8.3 SU (SEE PERMIT PARAGRAPH I.A.1.b.)					1/DAY	GRAB
ESCHERICHIA COLI [1,6] April 1st – October 31st	*********	**********	126 cfu/100 mL	*********	409 cfu/100 mL	1/WEEK	GRAB
TOTAL RESIDUAL CHLORINE[1,7] April 1st – October 31st	*********	**********	116 µg/L	*********	200 µg/L	1/DAY	GRAB
TOTAL COPPER[8]	*********	**********	9.0 µg/L	*********	17.9 µg/L	1/MONTH	24-HOUR COMPOSITE[5]
TOTAL ALUMINUM[9]	*********	**********	96 µg/L	*********	*********	1/MONTH	24-HOUR COMPOSITE[5]

CONTINUED FROM PREVIOUS PAGE

A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from treated effluent from outfall serial number **001** to the Ware River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**					**MONITORING REQUIREMENTS[3]**	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**
TOTAL PHOSPHORUS April 1st - October 31st	*********	*********	584 µg/L	1.0 mg/L	1.5 mg/L	2/WEEK	24-HOUR COMPOSITE[5]
TOTAL PHOSPHORUS November 1st - March 31st	*********	*********	1.0 mg/L	*********	Report mg/L	1/WEEK	24-HOUR COMPOSITE[5]
ORTHO-PHOSPHORUS, DISSOLVED November 1st - March 31st	*********	*********	*********	Report mg/L	*********	1/WEEK	24-HOUR COMPOSITE[5]
AMMONIA-NITROGEN June 1st – October 31st	*********	*********	1.0 mg/L	1.0 mg/L	1.5 mg/L	1/WEEK	24-HOUR COMPOSITE[5]
TOTAL KJELDAHL NITROGEN	*********	*********	Report mg/L	*********	*********	1/MONTH	24-HOUR COMPOSITE[5]
TOTAL NITRATE NITROGEN	*********	*********	Report mg/L	*********	*********	1/MONTH	24-HOUR COMPOSITE[5]
TOTAL NITRITE NITROGEN	*********	*********	Report mg/L	*********	*********	1/MONTH	24-HOUR COMPOSITE[5]
WHOLE EFFLUENT TOXICITY [10, 11, 12,13] Acute LC_{50} Chronic C-NOEC Aluminum Cadmium Chromium Copper Lead Nickel Zinc Hardness	 ≥ 100% ≥10% Report maximum daily µg/L Report maximum daily µg/L Report maximum daily µg/L Report maximum daily µg/L Report maximum daily µg/L Report maximum daily µg/L Report maximum daily µg/L Report maximum daily mg/L					4/YEAR	24-HOUR COMPOSITE[5]

Footnotes:

1. Required for State Certification.

2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value will be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.

3. Effluent sampling shall be of the discharge from the dechlorination chamber. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

   A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the week each month. Occasional deviations from the routine sampling program are allowed, but the reason for the deviation shall be documented in correspondence appended to the applicable discharge monitoring report.

   All samples shall be tested using the analytical methods found in 40 CFR § 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR § 136.

4. Sampling required for influent and effluent.

5. 24-hour composite samples will consist of at least twenty-four (24) grab samples taken during one consecutive 24 hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

6. The monthly average limit for *E. coli* is expressed as a geometric mean. *E. coli* monitoring shall be conducted concurrently with a total residual chlorine sample.

7. Total residual chlorine monitoring is required whenever chlorine is added to the treatment. The limitations are in effect from April 1st through October 31st. The permittee is not authorized to discharge chlorine during the winter months.

   The minimum level (ML) for total residual chlorine is defined as 20 μg/L. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of <u>Standard Methods for the Examination of Water and Wastewater,</u> Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine. For effluent limitations less than 20 μg/L, compliance/non-compliance will be determined based on the ML. Sample results of 20 μg/L or less shall be reported as zero on the discharge monitoring report.

   Chlorination and dechlorination systems shall include an alarm system for indicating system interruptions or malfunctions. Any interruption or malfunction of the chlorine dosing system that may have resulted in levels of chlorine that were inadequate for achieving effective disinfection, or interruptions or malfunctions of the dechlorination system that may have resulted in excessive levels of chlorine in the final effluent shall be reported with the monthly DMRs. The report shall include the date and time of the interruption or malfunction, the nature of the problem, and the estimated amount of time that the reduced levels of chlorine or dechlorination chemicals occurred.

8. The minimum level (ML) for copper is defined as 3 µg/L. This value is the minimum level for copper using the Furnace Atomic Absorption analytical method (EPA Method 220.2). This method or other EPA-approved method with an equivalent or lower ML shall be used for effluent limitations less than 3 µg/L. Sampling results of 3 µg/L or less shall be reported as zero on the Discharge Monitoring Report.

9. The aluminum sample shall be taken concurrently with one of the total phosphorus samples.

10. The permittee shall conduct chronic (and modified acute) toxicity tests *four* times per year. The chronic test may be used to calculate the acute LC_{50} at the 48 hour exposure interval. The permittee shall test the daphnid, Ceriodaphnia dubia, only. Toxicity test samples shall be collected during the months of February, May, August and November. The test results shall be submitted by the last day of the month following the completion of the test. The results are due March 31, June 30, September 30 and December 31, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit.

Test Dates in	**Submit Results By:**	**Test Species**	**Acute Limit LC_{50}**	**Chronic Limit C-NOEC**
February May August November	March 31 June 30 September 30 December 31	Ceriodaphnia dubia (daphnid)	≥ 100%	≥ 10%

11. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.

12. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction,

based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing. As described in the EPA WET Method Manual EPA 821-R-02-013, Section 10.2.6.2, all test results are to be reviewed and reported in accordance with EPA guidance on the evaluation of the concentration-response relationship. The 10% or greater" limit is defined as a sample which is composed of 10% (or greater) effluent, the remainder being dilution water.

13. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in **Attachment A (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER** in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the Self-Implementing Alternative Dilution Water Guidance, which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, which may be found on the EPA Region I web site at http://www.epa.gov/Region1/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in **Attachment A**. Any modification or revocation to this guidance will be transmitted to the permittees. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in **Attachment A**.

Part I.A.1. (Continued)

a. The discharge shall not cause a violation of the water quality standards of the receiving waters.

b. The pH of the effluent shall not be less than 6.5 or greater than 8.3 at any time.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall not contain a visible oil sheen, foam, or floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.

f. The permittee shall minimize the use of chlorine while maintaining adequate bacterial control.

g. The results of sampling for any parameter done in accordance with EPA approved methods above its required frequency must also be reported.

h. If the average annual flow in any calendar year exceeds 80 percent of the facility's design flow, the permittee shall submit a report to MassDEP by March 31 of the following calendar year describing its plans for further flow increases and describing how it will maintain compliance with the flow limit and all other effluent limitations and conditions.

2. All POTWs must provide adequate notice to the Director of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and

b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For purposes of this paragraph, adequate notice shall include information on:

(1) The quantity and quality of effluent introduced into the POTW; and

(2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Prohibitions Concerning Interference and Pass Through:

   a. Pollutants introduced into POTW's by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.

4. Toxics Control

   a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

   b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

5. Numerical Effluent Limitations for Toxicants

   EPA or MassDEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

B. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfall(s) listed in Part I.A.1. of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs), are not authorized by this permit and shall be reported to EPA and MassDEP in accordance with Section D.1.e.(1) of the General Requirements of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes DEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at http://www.mass.gov/dep/water/approvals/surffms.htm#sso.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions. The permittee is required to complete the following activities for the collection system which it owns:

1. Maintenance Staff

The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. Provisions to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

2. Preventive Maintenance Program

The permittee shall maintain an ongoing preventive maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges. Plans and programs to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

3. Infiltration/Inflow

The permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant's effluent limitations. Plans and programs to control I/I shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

4. Collection System Mapping

Within 30 months of the effective date of this permit, the permittee shall prepare a map of the sewer collection system it owns (see page 1 of this permit for the effective date). The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions and shall be kept up to date and available for review by federal, state, or local agencies. Such map(s) shall include, but not be limited to the following:

a. All sanitary sewer lines and related manholes;
b. All combined sewer lines, related manholes, and catch basins;
c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain systems (e.g. combination manholes);
d. All outfalls, including the treatment plant outfall(s), CSOs, and any known or suspected SSOs, including stormwater outfalls that are connected to combination manholes;
e. All pump stations and force mains;
f. The wastewater treatment facility(ies);
g. All surface waters (labeled);

h. Other major appurtenances such as inverted siphons and air release valves;
i. A numbering system which uniquely identifies manholes, catch basins, overflow points, regulators and outfalls;
j. The scale and a north arrow; and
k. The pipe diameter, date of installation, type of material, distance between manholes, and the direction of flow.

5. Collection System Operation and Maintenance Plan

The permittee shall develop and implement a Collection System Operation and Maintenance Plan.

a. Within six (6) months of the effective date of the permit, the permittee shall submit to EPA and MassDEP

(1) A description of the collection system management goals, staffing, information management, and legal authorities;
(2) A description of the collection system and the overall condition of the collection system including a list of all pump stations and a description of recent studies and construction activities; and
(3) A schedule for the development and implementation of the full Collection System O & M Plan including the elements in paragraphs b.1. through b.8. below.

b. The full Collection System O & M Plan shall be completed, implemented and submitted to EPA and MassDEP within twenty four (24) months from the effective date of this permit. The Plan shall include:

(1) The required submittal from paragraph 5.a. above, updated to reflect current information;
(2) A preventive maintenance and monitoring program for the collection system;
(3) Description of sufficient staffing necessary to properly operate and maintain the sanitary sewer collection system and how the operation and maintenance program is staffed;
(4) Description of funding, the source(s) of funding and provisions for funding sufficient for implementing the plan;
(5) Identification of known and suspected overflows and back-ups, including manholes. A description of the cause of the identified overflows and back-ups, corrective actions taken, and a plan for addressing the overflows and back-ups consistent with the requirements of this permit;
(6) A description of the permittee's programs for preventing I/I related effluent violations and all unauthorized discharges of wastewater, including overflows and by-passes and the ongoing program to identify

and remove sources of I/I. The program shall include an inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts; and

(7) An educational public outreach program for all aspects of I/I control, particularly private inflow.

(8) An Overflow Emergency Response Plan to protect public health from overflows and unanticipated bypasses or upsets that exceed any effluent limitation in the permit.

6. Annual Reporting Requirement

The permittee shall submit a summary report of activities related to the implementation of its Collection System O & M Plan during the previous calendar year. The report shall be submitted to EPA and MassDEP annually by March 31. The summary report shall, at a minimum, include:

a. A description of the staffing levels maintained during the year;
b. A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year;
c. Expenditures for any collection system maintenance activities and corrective actions taken during the previous year;
d. A map with areas identified for investigation/action in the coming year;
e. If treatment plant flow has reached 80% of its design flow [0.8 MGD] based on the annual average flow during the reporting year, or there have been capacity related overflows, submit a calculation of the maximum daily, weekly, and monthly infiltration and the maximum daily, weekly, and monthly inflow for the reporting year; and
f. A summary of unauthorized discharges during the past year and their causes and a report of any corrective actions taken as a result of the unauthorized discharges reported pursuant to the Unauthorized Discharges section of this permit.

7. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee shall provide an alternative power source(s) sufficient to operate the portion of the publicly owned treatment works[1] it owns and operates.

1 As defined at 40 CFR §122.2, which references the definition at 40 CFR §403.3

D. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices, including EPA regulations promulgated at 40 CFR Part 503, which prescribe "Standards for the Use or Disposal of Sewage Sludge" pursuant to Section 405(d) of the CWA, 33 U.S.C. § 1345(d).

2. If both state and federal requirements apply to the permittee's sludge use and/or disposal practices, the permittee shall comply with the more stringent of the applicable requirements.

3. The requirements and technical standards of 40 CFR Part 503 apply to the following sludge use or disposal practices.

   a. Land application - the use of sewage sludge to condition or fertilize the soil

   b. Surface disposal - the placement of sewage sludge in a sludge only landfill

   c. Sewage sludge incineration in a sludge only incinerator

4. The requirements of 40 CFR Part 503 do not apply to facilities which dispose of sludge in a municipal solid waste landfill. 40 CFR § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons, reed beds), or are otherwise excluded under 40 CFR § 503.6.

5. The 40 CFR Part 503 requirements including the following elements:

   - General requirements
   - Pollutant limitations
   - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
   - Management practices
   - Record keeping
   - Monitoring
   - Reporting

   Which of the 40 CFR Part 503 requirements apply to the permittee will depend upon the use or disposal practice followed and upon the quality of material produced by a facility. The EPA Region 1 Guidance document, "EPA Region 1 - NPDES Permit Sludge Compliance Guidance" (November 4, 1999), may be used by the permittee to assist it in determining the applicable requirements.[2]

6. The sludge shall be monitored for pollutant concentrations (all Part 503 methods) and pathogen reduction and vector attraction reduction (land application and surface disposal) at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year

less than 290	1/ year
290 to less than 1,500	1 /quarter
1,500 to less than 15,000	6 /year
15,000 +	1 /month

Sampling of the sewage sludge shall use the procedures detailed in 40 CFR 503.8.

7. Under 40 CFR § 503.9(r), the permittee is a "person who prepares sewage sludge" because it "is … the person who generates sewage sludge during the treatment of domestic sewage in a treatment works …." If the permittee contracts with *another* "person who prepares sewage sludge" under 40 CFR § 503.9(r) – i.e., with "a person who derives a material from sewage sludge" – for use or disposal of the sludge, then compliance with Part 503 requirements is the responsibility of the contractor engaged for that purpose. If the permittee does not engage a "person who prepares sewage sludge," as defined in 40 CFR § 503.9(r), for use or disposal, then the permittee remains responsible to ensure that the applicable requirements in Part 503 are met. 40 CFR § 503.7. If the ultimate use or disposal method is land application, the permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

8. The permittee shall submit an annual report containing the information specified in the 40 CFR Part 503 requirements (§ 503.18 (land application), § 503.28 (surface disposal), or § 503.48 (incineration)) by **February 19** (*see also* "EPA Region 1 - NPDES Permit Sludge Compliance Guidance"). Reports shall be submitted to the address contained in the reporting section of the permit. If the permittee engages a contractor or contractors for sludge preparation and ultimate use or disposal, the annual report need contain only the following information:

   a. Name and address of contractor(s) responsible for sludge preparation, use or disposal
   b. Quantity of sludge (in dry metric tons) from the POTW that is transferred to the sludge contractor(s), and the method(s) by which the contractor will prepare and use or dispose of the sewage sludge.

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2 This guidance document is available upon request from EPA Region 1 and may also be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf

E. INDUSTRIAL USERS AND PRETREATMENT PROGRAM

1. The permittee shall develop and enforce specific effluent limits (local limits) for Industrial User(s), and all other users, as appropriate, which together with appropriate changes in the POTW Treatment Plant's Facilities or operation, are necessary to ensure continued compliance with the POTW's NPDES permit or sludge use or disposal practices. Specific local limits shall not be developed and enforced without individual notice to persons or groups who have requested such notice and an opportunity to respond. Within 120 days of the effective date of this permit, the permittee shall prepare and submit a written technical evaluation to the EPA analyzing the need to revise local limits. As part of this evaluation, the permittee shall assess how the POTW performs with respect to influent and effluent of pollutants, water quality concerns, sludge quality, sludge processing concerns/inhibition, biomonitoring results, activated sludge inhibition, worker health and safety and collection system concerns. In preparing this evaluation, the permittee shall complete and submit the attached form (Attachment B) with the technical evaluation to assist in determining whether existing local limits need to be revised. Justifications and conclusions should be based on actual plant data if available and should be included in the report. Should the evaluation reveal the need to revise local limits, the permittee shall complete the revisions within 120 days of notification by EPA and submit the revisions to EPA for approval. The Permittee shall carry out the local limits revisions in accordance with EPA's Local Limit Development Guidance (July 2004).

2. The permittee shall implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, procedures, and financial provisions described in the permittee's approved Pretreatment Program, and the General Pretreatment Regulations, 40 CFR 403. At a minimum, the permittee must perform the following duties to properly implement the Industrial Pretreatment Program (IPP):

    a. Carry out inspection, surveillance, and monitoring procedures which will determine independent of information supplied by the industrial user, whether the industrial user is in compliance with the Pretreatment Standards. At a minimum, all significant industrial users shall be sampled and inspected at the frequency established in the approved IPP but in no case less than once per year and maintain adequate records.

    b. Issue or renew all necessary industrial user control mechanisms within 90 days of their expiration date or within 180 days after the industry has been determined to be a significant industrial user.

    c. Obtain appropriate remedies for noncompliance by any industrial user with any pretreatment standard and/or requirement.

    d. Maintain an adequate revenue structure for continued implementation of the Pretreatment Program.

3. The permittee shall provide the EPA and MassDEP with an annual report describing the permittee's pretreatment program activities for the twelve (12) month period ending 60 days prior to the due date in accordance with 403.12(i). The annual report shall be consistent with the format described in Attachment D of this permit and shall be submitted no later than **March 1** of each year.

4. The permittee must obtain approval from EPA prior to making any significant changes to the industrial pretreatment program in accordance with 40 CFR 403.18(c).

5. The permittee must assure that applicable National Categorical Pretreatment Standards are met by all categorical industrial users of the POTW. These standards are published in the Federal Regulations at 40 CFR 405 et. seq.

6. The permittee must modify its pretreatment program, if necessary, to conform to all changes in the Federal Regulations that pertain to the implementation and enforcement of the industrial pretreatment program. The permittee must provide EPA, in writing, within 180 days of this permit's effective date proposed changes, if applicable, to the permittee's pretreatment program deemed necessary to assure conformity with current Federal Regulations. At a minimum, the permittee must address in its written submission the following areas: (1) Enforcement response plan; (2) revised sewer use ordinances; and (3) slug control evaluations. The permittee will implement these proposed changes pending EPA Region 1's approval under 40 CFR 403.18. This submission is separate and distinct from any local limits analysis submission described in Part I.E.1.

F. SPECIAL CONDITIONS

<u>Optimizing Nitrogen Removal Efficiency</u> - Within **one year of the effective date of the permit**, the permittee shall complete an evaluation of alternative methods of operating the existing wastewater treatment facility to optimize the removal of nitrogen, and submit a report to EPA and MassDEP documenting this evaluation and presenting a description of recommended operational changes. The methods to be evaluated include, but are not limited to, operational changes designed to enhance nitrification (seasonal and year round), incorporation of anoxic zones, septage receiving policies and procedures, and side stream management. The permittee shall implement the recommended operational changes to maintain the mass discharge of total nitrogen less than the existing annual average discharge load. The annual average total nitrogen load from this facility (2004-2005) is estimated to be 58 lbs/day.

After submittal of the Initial Nitrogen Optimization Report, the permittee shall also submit an annual report to EPA and MassDEP, **by February 1 each year**, that summarizes activities related to optimizing nitrogen removal efficiencies, documents the annual nitrogen discharge load from the facility, and tracks trends relative to the previous year.

G. MONITORING AND REPORTING

For a period of one year from the effective date of the permit, the permittee may either submit monitoring data and other reports to EPA in hard copy form or report electronically using NetDMR, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

a. Submittal of Reports Using NetDMR

NetDMR is accessed from: http://www.epa.gov/netdmr. **Within one year of the effective date of this permit**, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

DMRs shall be submitted electronically to EPA no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA, including the MassDEP Monthly Operations and Maintenance Report, as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

b. Submittal of NetDMR Opt-Out Requests

Opt-out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under this permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt-out request and such request be approved by EPA. All opt-out requests should be sent to the following addresses:

<u>Attn: NetDMR Coordinator</u>
U.S. Environmental Protection Agency, Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

And

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2^{nd} Floor
Worcester, Massachusetts 01608

c. Submittal of Reports in Hard Copy Form

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15^{th} day of the month following the completed reporting period. All reports required under this permit, including MassDEP Monthly Operation and Maintenance Reports, shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

MassDEP – Western Region
Bureau of Resource Protection
436 Dwight Street, Suite 402
Springfield, MA 01103

Copies of toxicity tests and nitrogen optimization reports only to:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2^{nd} Floor
Worcester, Massachusetts 01608

Any verbal reports, if required in **Parts I** and/or **II** of this permit, shall be made to both

EPA-New England and to MassDEP.

H. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and 314 C.M.R. 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.

2. This authorization also incorporates the state water quality certification issued by MassDEP under § 401(a) of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L. c. 21, § 27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.

3. Each agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of this permit as issued by the other agency, unless and until each agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared invalid, illegal or otherwise issued in violation of state law such permit shall remain in full force and effect under federal law as a NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of federal law, this permit shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

Summary of Required Report Submittals

This table is a summary of the reports required to be submitted under this NPDES permit as an aid to the permittee(s). If there are any discrepancies between the permit and this summary, the permittee(s) shall follow the permit requirements. The addresses are for the submittal of hard copies.

When the permittee begins reporting using NetDMR, submittal of hard copies of many of the required reports will not be necessary. See permit conditions for details.

1 U.S. Environmental Protection Agency Water Technical Unit (OES04-SMR) 5 Post Office Square - Suite 100 Boston, MA 02109-3912	**2** MassDEP Surface Water Discharge Permit Program 627 Main Street, 2nd Floor Worcester, Massachusetts 01608
3 MassDEP - Western Regional Office Bureau of Resource Protection 436 Dwight Street, Suite 402 Springfield, MA 01103	

Requirement	**Due Date**	**Addressees**
Toxicity test samples shall be collected during the months of February, May August and November [Part I.A. Footnote 9]	Results shall be submitted by March 31, June 30, September 30 and December 31of each year	1 and 2
If the average annual flow in any calendar year exceeds 80% of the facility's design flow, the permittee shall submit a report to MassDEP. [Part I.A.1.h.]	By March 31 of the following calendar year	1, 2 and 3
Notification of Sanitary Sewer Overflows [Part I.B.]	Within 24 hours of SSO event.	1 and 3
The permittee shall prepare a map of the sewer collection system it owns. [Part 1.C.4.]	Within 30 months of the effective date of this permit	1, 2, and 3
The permittee shall develop and implement a Collection System Operation and Maintenance Plan. [Part 1.C.5.a.]	Within six (6) months of the effective date of the permit, the permittee shall submit to EPA and MassDEP	1, 2, and 3

The full Collection System O&M Plan shall be submitted and implemented to EPA and MassDEP. [Part 1.C.5.b.]	Within twenty four (24) months from the effective date of this permit.	1, 2, and 3
The permittee shall submit a summary report of activities related to the implementation of its Collection System O & M Plan during the previous calendar year. [Part 1.C.6.]	The report shall be submitted to EPA and MassDEP annually by March 31	1, 2, and 3
Annual Sludge Report [Part I.D.8.]	Annually by February 19	1, 2, and 3
Initial Nitrogen Optimization Report [Part I.E] Nitrogen Optimization Annual Report	Within one year of the effective date. Annually by February 1, following submittal of Initial Nitrogen Optimization Report.	1, 2, and 3 1, 2, and 3
Annual report describing the permittee's pretreatment program activities. [Part I.E.3.]	The report shall be submitted to EPA and MassDEP annually by March 1	1, 2, and 3
Monitoring results obtained during each calendar month shall be summarized and reported on Discharge Monitoring Report Form(s) [Part I.F.1.a.]	Postmarked or submitted electronically no later than the 15th day of the following month.	1, 2, and 3

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION 1
FIVE POST OFFICE SQUARE, SUITE 100
BOSTON, MASSACHUSETTS 02109-3912**

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES PURSUANT TO THE CLEAN WATER ACT (CWA)

NPDES PERMIT NUMBER: MA0100889

PUBLIC NOTICE START AND END DATES: March 8, 2013 – April 6, 2013

NAME AND MAILING ADDRESS OF APPLICANT:

Town of Ware
Department of Public Works
4 ½ Church Street
Ware, Massachusetts 01082

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Ware Wastewater Treatment Plant
30 Robbins Road
Ware, Massachusetts 01082

RECEIVING WATER(S):

Ware River (Segment MA 36-06)
Chicopee River Basin

RECEIVING WATER CLASSIFICATION(S): B - Warm Water Fishery, CSO*

* Although this segment is classified as a CSO (combined sewer overflow) in the 2006 standards, there are currently no CSOs in this segment. Future standards will reflect this fact.

Table of Contents

1. Proposed Action, Type of Facility, and Discharge Location

The facility's discharge outfalls are listed below:

Outfall	Description of Discharge	Receiving water	Outfall Location
001	Treated Effluent	Ware River	42º 15' 1" N 72° 15' 1" W

The above named applicant has applied to the U.S. Environmental Protection Agency ("EPA") for the reissuance of its NPDES permit to discharge into the designated receiving waters. The facility collects and treats domestic wastewater, septage, and industrial wastewater. The discharge from this secondary wastewater treatment facility is via Outfall 001 to the Ware River (See Figure 1 – Facility Location Map).

The Town of Ware Wastewater Treatment Plant (WWTP) is a 1.0 million gallon per day (MGD) secondary wastewater treatment facility located in Ware, Massachusetts, serving a population of about 5,500. There is one industrial user contributing wastewater to this facility: Kanzaki Specialty Papers, which contributes approximately 54,500 gallons per day of process wastewater from paper coating operations.

The collection system is 100% separate sanitary sewers.

2. Description of Discharge

A quantitative description of the discharge based on recent monitoring data from July 2009 through June 2012 is shown in Appendix A.

3. Receiving Water Description

3.1 Designated Use

The Ware River is a Class B (Warm Water Fishery) waterbody. The Massachusetts Surface Water Quality Standards (MA SWQS) at 314 CMR 4.05(3)(b) state that Class B waters shall have the following designated uses:

"These waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value."

The Chicopee River Basin 2003 Water Quality Assessment Report indicates that the river segment receiving the Ware WWTP's discharge is attaining its uses for aquatic life and aesthetics with other uses not assessed. This river segment is listed the Massachusetts Year 2010 Integrated List of Waters [Clean Water Act, Section 303(d) list] as impaired and requiring a TMDL for fecal coliform. The

2003 assessment included an "Alert" status for the aquatic life use because of ongoing chronic and acute toxicity results from Ware WWTP's WET test. The assessment also noted sedimentation, undercut banks, and trash deposits on this segment.

The limits in the draft permit are based on information in the application, the existing permit, discharge monitoring reports, and a site visit.

3.2 Flow and Dilution Factor

The design flow of the facility is 1.0 MGD (1.55 cfs) and is unchanged since issuance of the current permit.

Water quality based limitations are established with the use of a calculated available dilution. 314 CMR 4.03(3)(a) requires that effluent dilution be calculated based on the receiving water 7Q10. The 7Q10 is the lowest observed mean river flow for 7 consecutive days, recorded over a 10-year recurrence interval. EPA calculated the 7Q10 and 30Q10 based on the flow at USGS gage 01173000 plus flow from the 90 square miles between the gage and the Ware outfall. This flow was calculated as follows:

7Q10 at USGS 011723000, Ware River at Intake Works Near Barre, MA = 5.84 cubic feet per second (cfs)
Drainage Area = 96.3 square miles

7Q10 at USGS 01173500, Ware River at Gibbs Crossing, MA = 15.8 cfs
Drainage Area = 197 square miles

Flow factor for area between USGS 01173000 and USGS01173500 =

(15.8 cfs – 5.84 cfs)/(197 sq. mi. – 96.3 sq. mi.) = 10 cfs/100.7 sq. mi. = 0.099 cfs/sq. mi.

Drainage Area at Outfall = 186 square miles

7Q10 = 5.84 cfs + 0.099 cfs/sq. mi x (186 sq. mi. – 96.3 sq. mi.) = **14.7 cfs = 9.49 MGD**

Ware WWTP design flow = 1.0 MGD x 1.55 cfs/MGD = 1.55 cfs

Dilution Factor = (Facility Flow + 7Q10)/Facility Flow
Dilution Factor = (1.55 cfs + 14.7 cfs)/1.55 cfs = **10.5**

4. Limitations and Conditions

The effluent limitations of the draft permit, the monitoring requirements, and any implementation schedule (if required) may be found in the draft permit.

5. Permit Basis: Statutory and Regulatory Authority

The Clean Water Act (CWA or the Act) prohibits the discharge of pollutants to waters of the United States without an NPDES permit unless such a discharge is otherwise authorized by the Act. An NPDES permit is used to implement technology-based and water quality-based effluent limitations as well as other requirements including monitoring and reporting. This draft NPDES permit was developed in accordance with statutory and regulatory authorities established pursuant to the Act. The regulations governing the NPDES program are found in 40 CFR Parts 122, 124 and 125.

Under Section 301(b)(1)(B) of the CWA, publicly owned treatment works (POTWs) had to achieve effluent limitations based upon secondary treatment by July 1, 1977. The secondary treatment requirements are set forth in 40 CFR Part 133. The regulations describe the secondary treatment requirements for biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. The average monthly and average weekly BOD_5 and TSS limitations are based on the requirements of 40 CFR §133.102. Numerical limitations for pH and *E. coli* are based on state certification requirements under Section 401(a)(1) of the CWA as described in 40 CFR §124.53 and state water quality standards in 314 CMR 4.05(3)(b) 3 and 4, respectively.

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The MA SWQS, 314 CMR 4.00, include requirements for the regulation and control of toxic constituents and also require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless site specific criteria are established. The State will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained.

The permit must also limit any pollutant or pollutant parameter (conventional, non-conventional toxic, and whole effluent toxicity) that is or may be discharged at a level that causes, or has reasonable potential to cause or contribute to an excursion above any water quality criterion [40 CFR §122.44(d)(1)]. An excursion occurs if the projected or actual instream concentrations exceed the applicable criterion. In determining reasonable potential, EPA considers existing controls on point and non-point sources of pollution, variability of the pollutant in the effluent, sensitivity of the species to toxicity and, where appropriate, the dilution of the effluent in the receiving water.

Also note that according to EPA regulations 40 CFR §122.44(l), when a permit is reissued, effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards or conditions in the previous permit, unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued. Additionally, MassDEP has developed and adopted a statewide antidegradation policy to maintain and protect existing in-stream water quality. The Massachusetts Antidegradation Provisions are found at 314 CMR 4.04. No lowering of water quality is allowed, except in accordance with the antidegradation provisions.

The limits in the draft permit are based on information in the application, the existing permit, a site visit, discharge monitoring reports, and toxicity test results.

6. Explanation of the Permit's Effluent Limitation(s)

6.1 Facility Information

The Ware WWTP is an advanced wastewater treatment facility with a design flow of 1.0 MGD, which discharges to the Ware River. The wastewater treatment consists of a grit removal chamber, aeration tanks, chemical addition for phosphorus removal, two secondary clarifiers, chlorination and dechlorination. Liquid sludge (290 metric tons per year) is stored in a holding tank at the WWTP and is pumped directly into tankers and transported offsite for incineration.

The facility's location and flow schematic are shown on Figures 1 and 2 of this fact sheet.

6.2 Permitted Outfalls

The outfall regulated in the draft permit is named 001.

6.3 Derivation of Effluent Limits under the Federal CWA and/or the Commonwealth of Massachusetts

BOD_5 and TSS

Under Section 301(b)(1)(B) of the CWA, POTWs had to achieve effluent limitations based on secondary treatment by July 1, 1977. The secondary treatment requirements for biochemical oxygen demand (BOD_5) and total suspended solids (TSS) are in 40 CFR §133. The 30-day average percent removal limit of at least 85% for BOD_5 and TSS is based on the requirements in 40 CFR §133.102.

The limits from the current permit, which are 25 mg/L average monthly and 25 mg/L average weekly and are based on water quality considerations. These limits, which are more stringent than secondary treatment requirements, will be carried over to the draft permit. The mass limits calculations for BOD_5 and TSS are below, and are also the same as the current permit. Monitoring frequency is once per week. From July 2009 through June 2012, Ware had one exceedance of its BOD limits, when the reported value for monthly average loading was 210 lbs/day, above the permit limit of 208 lbs/day. There were no exceedances of the TSS limits during that time period.

Mass limits: Flow x Concentration x Conversion Factor = lbs/day

Average monthly/weekly limit: 1.0 MGD x 25 mg/L x 8.34(lb)(L)/(mg)(gal) = 208 lbs/day

pH

The draft permit includes pH limitations that are required by state water quality standards and are at least as stringent as pH limitations set forth at 40 CFR § 133.102(c). The pH of the effluent shall not be less than 6.5 or greater than 8.3 standard units at any time. No violations of the pH limit occurred from July 2009 through June 2012. Monitoring frequency is once per day.

Escherichia coli

The current permit includes seasonal (April 1st – October 31st) limits for fecal coliform of 200 cfu/100 mL geometric monthly mean and 400 cfu/100 mL maximum daily value. From July 2009 through June 2012, there were three violations of the maximum daily limit and one violation of the geometric monthly mean limit (see Appendix A). The current permit also requires that an *Escherichia coli (E. coli)* sample be taken once per month from April through October concurrent with the fecal coliform sample, but does not include a limit.

The Commonwealth of Massachusetts promulgated *E. coli* criteria in the SWQS (314 CMR 4.00) on December 29, 2006, replacing fecal coliform bacteria criteria. These new criteria were approved by EPA on September 19, 2007.

The draft permit therefore includes *E. coli* limits and does not include fecal coliform limits or monitoring requirements. The *E. coli* limits for Outfall 001 proposed in the draft permit are in effect from April 1st through October 31st of each year. The limits are 126 colony forming units per 100 ml (cfu/100 ml) geometric monthly mean and 409 cfu/100 ml maximum daily value (this is the 90% distribution of the geometric mean of 126 cfu/100 ml). The past monitoring indicates that these limits would have been exceeded only once (April 2011). The proposed *E. coli* monitoring frequency in the draft permit is once per week and is consistent with the prior fecal coliform monitoring.

Total Residual Chlorine

The draft permit includes total residual chlorine (TRC) limitations, which are seasonal and are based on state water quality standards. Since the draft permit includes seasonal monitoring requirements and limitations for total chlorine residual, the permittee is not authorized to use or discharge chlorine from November 1st through March 31st. Chlorine compounds produced by the chlorination of wastewater can be extremely toxic to aquatic life. The water quality criteria established for chlorine are 19 µg/L daily maximum and 11 µg/l monthly average in the receiving water (see National Recommended Water Quality Criteria: 2002). Given a dilution factor of 10.5, the residual chlorine limits have been set at 200 µg/L daily maximum and 116 µg/L monthly average.

Total Residual Chlorine Limitations:

(acute criteria * dilution factor) = Acute limit (Maximum Daily)
(19 µg/L x 10.5) = 200 µg/L

(chronic criteria * dilution factor) = Chronic limit (Monthly Average)
(11 µg/L x 10.5) = 116 µg/L

These limits are slightly more stringent than the limits in the current permit because of the reduced dilution factor. Past effluent data indicates that the facility has routinely achieved the proposed monthly average limit, but would have occasionally exceeded the more stringent maximum daily limit.

The permit also includes a requirement that the chlorination and dechlorination systems include alarms for indicating system interruptions or malfunctions and that interruptions or malfunctions be reported with the monthly compliance reports. This requirement is intended to supplement the grab sampling requirements for chlorine and bacteria and is a recognition of the limitations of a grab sampling program for determining consistent compliance with permit limits.

Total Nitrogen

Excessive nitrogen loadings are causing significant water quality problems in Long Island Sound, including low dissolved oxygen. In December 2000, the Connecticut Department of Environmental Protection (CT DEP) completed a total maximum daily load (TMDL) for addressing nitrogen-driven eutrophication impacts in Long Island Sound. The TMDL included a waste load allocation (WLA) for point sources and a load allocation (LA) for non-point sources. The point source WLA for out-of-basin sources (Massachusetts, New Hampshire and Vermont wastewater facilities discharging to the Connecticut, Housatonic and Thames River watersheds) requires an aggregate 25% reduction from the baseline total nitrogen loading estimated in the TMDL.

The baseline total nitrogen point source loadings estimated for the Connecticut, Housatonic, and Thames River watersheds were 21,672 lbs/day, 3,286 lbs/day, and 1,253 lbs/day respectively (see table below). The estimated current point source total nitrogen loadings for the Connecticut, Housatonic, and Thames Rivers respectively are 13,836 lbs/day, 2,151 lbs/day, and 1,015 lbs/day, based on recent information and including all POTWs in the watershed. The following table summarizes the estimated baseline loadings, TMDL target loadings, and estimated current loadings:

Basin	Baseline Loading[1]	TMDL Target[2]	Current Loading[3]
	(lbs/day)	(lbs/day)	(lbs/day)
Connecticut River	21,672	16,254	13,836
Housatonic River	3,286	2,464	2,151
Thames River	1,253	940	1,015
Totals	26,211	19,657	17,002

The estimated current loading for the Ware WWTP used in the above analysis was 58 lbs/day, based upon a total nitrogen concentration of 9.4 mg/l and the average flow of 0.74 MGD (9.4 mg/L *0.74 MGD * 8.34), as indicated in the Facility's 2004 through 2005 DMRs. A review of the DMRs from July 2009 through June 2012 indicate that the monthly average total nitrogen load varied from 21 lbs/day to 154 lbs/day with an average value of 76 lbs/day, (refer to Appendix A for TKN and nitrite and nitrate monitoring results) which is more than the estimated loading of 58 lbs/day. Based on a review of the data, total nitrogen levels in the effluent have risen, and it appears that the facility is not denitrifying as effectively in recent years as it was during the baseline years. The permittee has indicated that the reduction in denitrification effectiveness indicated may be partly due to the buildup of solids from Kanzaki Specialty Papers in the aeration basins.

To ensure that the aggregate nitrogen loading from out-of-basin point sources does not exceed the TMDL target of a 25% reduction over 2004-2005 baseline loadings, EPA intends to include a permit condition for all existing treatment facilities in Massachusetts and New Hampshire that discharge to the Connecticut, Housatonic, and Thames River watersheds, requiring the permittees to evaluate alternative methods of operating their treatment plants to optimize the removal of nitrogen, and to

[1] Estimated loading from TMDL (see Appendix 3 to CT DEP "Report on Nitrogen Loads to Long Island Sound", April 1998).
[2] 25% reduction
[3] Estimated current loading from 2004 – 2005 DMR data.

describe previous and ongoing optimization efforts. Facilities not currently engaged in optimization efforts will also be required to implement optimization measures sufficient to ensure that their nitrogen loads do not increase above the 2004-2005 baseline, and that their aggregate 25% reduction is maintained. Such a requirement has been included in this permit.

Specifically, the permit requires an evaluation of alternative methods of operating the existing wastewater treatment facility to control total nitrogen levels, including, but not limited to, operational changes designed to enhance nitrification (seasonal and year-round), incorporation of anoxic zones, septage receiving policies and procedures, and side stream management. This evaluation is required to be completed and submitted to EPA and MassDEP within one year of the effective date of the permit, along with a description of past and ongoing optimization efforts. The permit also requires implementation of optimization methods sufficient to ensure that there is no increase in total nitrogen compared to the existing average daily load. The permit requires annual reports to be submitted that summarize progress and activities related to optimizing nitrogen removal efficiencies, document the annual nitrogen discharge load from the facility, and track trends relative to previous years.

The agencies will annually update the estimate of all out-of-basin total nitrogen loads and may incorporate total nitrogen limits in future permit modifications or reissuances as necessary to address increases in discharge loads, a revised TMDL, or other new information that may warrant the incorporation of numeric permit limits. There have been significant efforts by the New England Water Pollution Control Commission (NEIWPCC) work group and others since completion of the 2000 TMDL, which are anticipated to result in revised wasteload allocations for in-basin and out-of-basin facilities. Although not a permit requirement, EPA strongly recommends that permittees consider alternatives for further enhancing nitrogen reduction in their facility planning.

Ammonia-Nitrogen

High levels of ammonia in the water column can be toxic to fish by making it more difficult for fish to excrete this chemical via passive diffusion from gill tissues. Ammonia toxicity varies with pH and temperature. Ammonia can also lower dissolved oxygen levels by conversion to nitrate/nitrate, which consumes oxygen.

The current permit includes a monthly average limit of 1 mg/l, a weekly average limit of 1 mg/l and a maximum daily limit of 1.5 mg/l during the period from June through October. These limits were established to limit the instream oxygen demand resulting from the nitrification of ammonia to nitrates. The 2007 Fact Sheet evaluated these limits and verified that they were in accordance with the 1999 Update of Ambient Water Quality Criteria for Ammonia (EPA-822-R-014, December 1999 and 64 FR 71974). Monitoring data indicates that these limits are consistently achieved (one violation of the weekly average limit- September 2011).

The limits proposed in the draft permit are the same as those in the current permit. The draft permit includes a monthly average limit of 1 mg/l, a weekly average limit of 1 mg/l and a maximum daily limit of 1.5 mg/l during the period from June through October, and the proposed monitoring frequency is once per week.

Phosphorus

State water quality standards require any point source discharge containing nutrients in concentrations that encourage eutrophication or growth of weeds or algae be provided with the highest and best practicable treatment to remove such nutrients. Phosphorus and other nutrients promote the growth of nuisance algae and aquatic plants. When these plants and algae undergo their decay processes, they generate strong odors, depress dissolved oxygen levels in the river, and impair benthic habitat.

The MA SWQS (314 CMR 4.00) do not contain numerical criteria for total phosphorus. The narrative criteria for nutrients is found at 314 CMR 4.05(5)(c), which states that

> *"Unless naturally occurring, all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses and shall not exceed the site specific criteria developed in a TMDL or as otherwise established by the Department pursuant to 314 CMR 4.00. Any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment as determined by the Department, including, where necessary, highest and best practical treatment (HBPT) for POTWs and BAT for non POTWs, to remove such nutrients to ensure protection of existing and designated uses".*

EPA has published national guidance documents that contain recommended total phosphorus criteria and other indicators of eutrophication. EPA's Quality Criteria for Water 1986 (the Gold Book) recommends, to control eutrophication, that in-stream phosphorus concentrations should be less than 100 µg/l (0.100 mg/l) in streams or other flowing waters not discharging directly to lakes or impoundments and less than 50 µg/l in flowing waters discharging to lakes or impoundments.

More recently, EPA released Ecoregional Nutrient Criteria, established as part of an effort to reduce problems associated with excess nutrients in water bodies in specific areas of the country. The ecoregion-specific criteria represent conditions in waters minimally impacted by human activities, and thus representative of water without cultural eutrophication. The Ware Wastewater Treatment Plant is within Ecoregion XIV, Eastern Coastal Plain, Northeastern Coastal Zone. Recommended criteria for this Ecoregion[4] include a total phosphorus criteria of 23.75 µg/l (0.024 mg/l).

EPA has typically applied the Gold Book criterion because it was developed from an effects-based approach versus the reference conditions-based approach used to develop the ecoregion criteria. The effects-based approach is taken because it is more directly associated with an impairment to a designated use (e.g. fishing). The effects-based approach provides a threshold value above which water quality impairments are likely to occur. It applies empirical observations of a causal variable (i.e. phosphorus) and a response variable (i.e. algal growth) associated with designated use impairments. Referenced-base values are statistically derived from a comparison within a population of rivers in the same ecoregional class. They are a quantitative set of river characteristics (physical, chemical, and biological) that represent minimally impacted conditions.

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[4] Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion XIV, published in December, 2001

The current permit limits the Ware WWTP effluent to 1 mg/L total phosphorus as a monthly average year-round. The current permit also includes limits of 1.0 mg/L as a weekly average and 1.5 mg/L maximum daily from April through October. From July 2009 through June 2012, there was one violation of the weekly average and daily maximum phosphorus limits, in June 2012 when both results were reported as 1.6 mg/L.

The phosphorus limit calculated for the current permit did not account for upstream concentration of phosphorus when setting effluent limitations. Accounting for upstream concentrations is necessary to ensure that the discharge from the Ware treatment plant does not cause or contribute to an exceedance of water quality standards. The limit has been recalculated to account for the upstream concentration.

The 2003 Chicopee River Watershed Water Quality Assessment (2003 WQA) presented ambient phosphorus concentrations at Upper Church Street, Ware, upstream on the Ware River from the Ware WWTP. During low flow conditions that year, the instream phosphorus concentration was 49 µg/l.

The box below shows the necessary water quality based effluent limitation at an upstream concentration of 49 µg/l under 7Q10 conditions. This analysis shows that an effluent average monthly limitation of 584 µg/L is necessary. The maximum daily seasonal limitation of 1.5 mg/l from the current permit has been maintained to avoid backsliding as has the winter average monthly limitation of 1.0 mg/l.

Average Monthly Phosphorus Limit

$$Q_sC_s = Q_dC_d + Q_rC_r$$

Where

C_s	=	Concentration below outfall	=	100 µg/l
Q_s	=	Streamflow below outfall (effluent + upstream)	=	16.25 cfs
Q_d	=	Discharge flow	=	1.55 cfs
C_d	=	Discharge concentration	=	?
Q_r	=	Upstream flow	=	14.7 cfs
C_r	=	Upstream concentration	=	49 µg/l

Therefore,

$$C_d = \frac{(16.25 \text{ cfs} \times 100\ \mu g/l) - (14.7 \text{ cfs} \times 49\ \mu g/l)}{1.55 \text{ cfs}}$$

$$= 584\ \mu g/l$$

To ensure attainment of water quality standards, the draft permit contains a monthly average limit of 584 µg/L, a weekly average limit of 1.0 mg/L, and a maximum daily limit of 1.5 mg/l for the growing season months of April through October, with a monitoring frequency of twice per week. The draft permit carries forward the monthly average limit of 1 mg/l for the non-growing season months of November through March. The monitoring frequency from November through March is once per week. Past performance indicates that Ware WWTP already meets the new summer phosphorus limit on a routine basis.

If new water quality data or the completion of a total maximum daily load analysis (TMDL) indicates the need for more stringent limits, EPA and DEP may exercise the reopener clause of Part II A.4. of this permit and modify the phosphorus numerical limits.

The current permit includes a monitoring requirement for ortho-phosphorus during the winter period of November through March. The draft permit continues this required monitoring as it is necessary to identify whether the particulate fraction remains low and to further understand the physical dynamics of phosphorus in the non-growing season. Without the continued ortho-phosphate monitoring requirement, EPA and MassDEP cannot ensure that the loads authorized in the winter period are sufficiently protective of standards, specifically that the higher loads will not cause or contribute to instream eutrophication.

Metals

Certain metals in water can be toxic to aquatic life. The Clean Water Act requires EPA to limit toxic metal concentrations in the effluent when metal discharges may result in an exceedance of water quality criteria. An evaluation of the concentration of metals in the facility's effluent (from Whole Effluent Toxicity reports submitted between November 2008 and February 2012) was used to determine reasonable potential for toxicity caused by aluminum, cadmium, chromium, copper, lead, nickel and zinc.

Metals may be present in both dissolved and particulate forms in the water column. However, extensive studies suggest that it is the dissolved fraction that is biologically available, and therefore, presents the greatest risk of toxicity to aquatic life inhabiting the water column. This conclusion is widely accepted by the scientific community both within and outside of EPA (Water Quality Standards Handbook: Second Edition, Chapter 3.6 and Appendix J, EPA 1994 [EPA 823-B-94-005a]. Also see http://www.epa.gov/waterscience/standards/ handbook/chapter03.html#section6). As a result, water quality criteria are established in terms of dissolved metals.

However, many inorganic components of domestic wastewater, including metals, are in the particulate form, and differences in the chemical composition between the effluent and the receiving water affects the partitioning of metals between the particulate and dissolved fractions as the effluent mixes with the receiving water, often resulting in a transition from the particulate to dissolved form (*The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (USEPA 1996 [EPA-823-B96-007]). Consequently, quantifying only the dissolved fraction of metals in the effluent prior to discharge may not accurately reflect the biologically-available portion of metals in the receiving water. Regulations at 40 CFR 122.45(c) require, with limited exceptions, that metals limits in NPDES permits be expressed as total recoverable metals.

The facility's effluent concentrations (from Appendix A) were characterized assuming a lognormal distribution in order to determine the estimated 95th percentile of the daily maximum. For metals with hardness-based water quality criteria, the criteria were determined using the equations in 2002 National Recommended Water Quality Criteria, using the appropriate factors for the individual metals (see table below). The downstream hardness was calculated to be 23.1 mg/l as $CaCO_3$, using a mass balance equation with the design flow, receiving water at 7Q10, an upstream median hardness of 20 mg/l as $CaCO_3$ and an effluent median hardness of 52 mg/l as $CaCO_3$.

Hardness Analysis

$$Q_sC_s = Q_dC_d + Q_rC_r$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.55 cfs
C_d	=	Discharge concentration	=	52 mg/L
Q_s	=	Upstream flow	=	14.7 cfs
C_s	=	Upstream concentration	=	20 mg/L
Q_r	=	Streamflow below outfall (effluent + upstream)	=	16.25 cfs

Therefore,

$$C_r = \frac{(1.55 \text{ cfs x } 52 \text{ mg/L}) + (14.7 \text{ cfs x } 20 \text{ mg/L})}{16.25 \text{ cfs}}$$

$$= 23.1 \text{ mg/l}$$

The following table presents the factors used to determine the acute and chronic total recoverable criteria for each metal:

Table 1. Parameters for Calculating Total Recoverable Metals Criteria
Hardness = 23.1 mg/L

Metal	Parameters				Total Recoverable Criteria	
	ma	ba	mc	bc	Acute Criteria (CMC) (ug/L)	Chronic Criteria (CCC) (ug/L)
Aluminum	—	—	—	—	750.00	87.00
Cadmium	1.1280	3.6867	0.7852	2.7150	0.87	0.78
Chromium III	0.819	3.7256	0.819	0.6848	543.01	25.95
Copper	0.9422	1.7000	0.8545	-1.702	3.52	2.67
Lead	1.273	-1.46	1.273	-4.705	12.64	0.49
Nickel	0.846	2.255	0.846	0.0584	135.82	15.10
Zinc	0.8473	0.884	0.8473	0.884	34.62	34.62

*Acute Criteria (CMC) = exp{ma*ln(hardness)+ba}
**Chronic Criteria (CCC) = exp{mc*ln(hardness)+bc}

In order to determine whether the effluent has the reasonable potential to cause or contribute to an exceedance above the in-stream water quality criteria for each metal, the following mass balance is used to project in-stream metal concentrations downstream from the discharge.

$$Q_d C_d + Q_S C_S = Q_r C_r$$

rewritten as:

$$C_r = \frac{Q_d C_d + Q_S C_S}{Q_r}$$

where:

Q_d = effluent flow (design flow = 1.0 MGD = 1.55 cfs)
C_d = effluent metals concentration in µg/L (95th percentile)
Q_S = stream flow upstream (7Q10 upstream = 14.7 cfs)
C_S = background in-stream metals concentration in µg/L (median)
Q_r = resultant in-stream flow, after discharge ($Q_S + Q_d$ = 16.25 cfs)
C_r = resultant in-stream concentration in µg/L

Reasonable potential is then determined by comparing this resultant in-stream concentration (for both acute and chronic conditions) with the criteria for each metal. In EPA's Technical Support Document for Water Quality Based Toxics Control, EPA/505/2-90-001, March 1991, commonly known as the "TSD", box 3-2 describes the statistical approach in determining if there is reasonable potential for an excursion above the maximum allowable concentration (criteria). If there is reasonable potential (for either acute or chronic conditions), the appropriate limit is then calculated by rearranging the above mass balance to solve for the effluent concentration (C_d) using the criterion as the resultant in-stream concentration (C_r). See the table below for the results of this analysis with respect to aluminum, cadmium, chromium, copper, lead, nickel and zinc.

Because there is reasonable potential for the discharge of aluminum and copper from Ware WWTP to cause or contribute to a violation of water quality standards, the draft permit includes limits for these two metals. The draft permit proposes a monthly average aluminum limit of 96 µg/L. For copper, the draft permit contains a maximum daily effluent limit of 17.9 µg/L and an average monthly limit of 9.0 µg/L. The proposed monitoring frequency for both metals is once per month. Also, see Appendix B for the aluminum calculations, and Appendix C for the copper calculations.

Table 2. Reasonable Potential Analysis for Metals

Metal	Qd	Cd (95th Percentile)	Qs	Cs (Median)	Qr = Qs + Qd	Cr = (QdCd+QsCs)/Q_R	Criteria		Reasonable Potential	Limit = (QrCr-QsCs)/Qd	
	cfs	µg/L	cfs	µg/L	cfs	µg/L	Acute (µg/L)	Chronic (µg/L)	Cr > Criteria	Acute (µg/L)	Chronic (µg/L)
Aluminum	1.55	200.7	14.7	86	16.25	96.9	750	87	**Y**	N/A	**96**
Cadmium		0		0		0	0.865	0.779	N	N/A	N/A
Chromium		0		0		0	543.01	25.95	N	N/A	N/A
Copper		23.1		2		4.01	3.52	2.67	**Y**	**17.9**	**9.0**
Lead		0		0		0	12.64	0.49	N	N/A	N/A
Nickel		5		0		0.48	135.82	15.10	N	N/A	N/A
Zinc		140		16		27.8	34.62	34.62	N	N/A	N/A

Whole Effluent Toxicity

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The MA SWQS at 314 CMR 4.05(5)(c) include the following narrative and require that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria: All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife.

The toxicity limits in the current permit are C-NOEC ≥ 7% and LC50 ≥ 100% and were established using the MassDEP *Implementation Policy for the Control of Toxic Pollutants in Surface* Waters, dated February 23, 1990 (the "Policy"). The Policy requires that the C-NOEC must equal or exceed the receiving water concentration (RWC) of the effluent, which is the inverse of the dilution factor. From August 2009 through February 2012, there were no exceedances of the acute toxicity limit. There were two violations of the chronic toxicity limit, in May 2010 and February 2011, when the C-NOEC was 6.25% effluent.

National studies conducted by the EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents, aromatic hydrocarbons and others. Based on the potential for toxicity from domestic sources, the state narrative water quality criterion, the limited dilution at the discharge location, and in accordance with EPA national and regional policy and 40 C.F.R.§ 122.44(d), the draft permit includes whole effluent chronic and acute toxicity limitations. (See also "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 49 Fed. Reg. 9016 March 9, 1984, and EPA's "Technical Support Document for Water Quality-Based Toxics Control", September, 1991.)

C-NOEC ≥ RWC = 1/dilution factor

=1/10.5
=0.095 (10%)

The draft permit requires quarterly chronic and acute toxicity tests using only the species *Ceriodaphnia dubia*. The acute toxicity endpoint, expressed as LC50, must equal or exceed 100% effluent. The chronic toxicity endpoint, expressed as C-NOEC (no effect concentration), must equal or exceed 10% effluent. The chronic toxicity limit in the draft permit is more stringent than that of the current permit due to the change in dilution factor. The tests must be performed in accordance with the test procedures and protocols specified in **Permit Attachment A**. The tests will be conducted four times a year, during the following months: February, May, August, and November.

Although the Ware WWTP has only two chronic toxicity exceedances, several other chronic tests have indicated chronic toxicity in the 50% and 25% effluent samples. EPA expects that POTWs with secondary treatment should have no chronic toxicity in the 100% effluent sample on a regular basis. The agencies will be monitoring the Ware WWTP's WET test results over the next permit term to determine if the pattern of chronic toxicity continues, and if so, require additional evaluation or WET testing to determine the source of toxicity. These requirements may include a toxicity identification evaluation (TIE) and/or a toxicity reduction evaluation (TRE).

7. Sludge

Section 405(d) of the Clean Water Act (CWA) requires that EPA develop technical standards regulating the use and disposal of sewage sludge. These regulations were signed on November 25, 1992, published in the Federal Register on February 19, 1993, and became effective on March 22, 1993. Domestic sludge that is land applied, disposed of in a surface disposal unit, or fired in a sewage sludge incinerator is subject to Part 503 technical standards and to State Env-Wq 800 standards. Part 503 regulations have a self-implementing provision, however, the CWA requires implementation through permits. Domestic sludge which is disposed of in municipal solid waste landfills are in compliance with Part 503 regulations provided the sludge meets the quality criteria of the landfill and the landfill meets the requirements of 40 CFR Part 258.

The draft permit has been conditioned to ensure that sewage sludge use and disposal practices meet the CWA Section 405(d) Technical Standards. In addition, EPA-New England has prepared a 72-page document entitled "EPA Region I NPDES Permit Sludge Compliance Guidance" for use by the permittee in determining their appropriate sludge conditions for their chosen method of sewage sludge use or disposal practices. This guidance document is available upon request from EPA Region 1 and may be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf. The permittee is required to submit an annual report to EPA-New England and NHDES-WD, by February 19th each year, containing the information specified in the Sludge Compliance Guidance document for their chosen method of sewage sludge use or disposal practices.

8. Pretreatment

Ware WWTP has one non-categorical significant industrial user (SIU), Kanzaki Specialty Papers (Kanzaki). Kanzaki is considered non-categorical because it is not within any of the industries for which EPA has promulgated pretreatment standards. Ware WWTP reported in its reissuance application that influent from this user causes problems with the treatment works, due to large amounts of inorganic solids. Planned upgrades to the WWTP, partially financed by Kanzaki, will improve solids handling at the facility. A new tertiary treatment system will remove solids with less interference to the treatment system. Also, Kanzaki plans to install a flow equalization tank, which will reduce the variability in the flow they contribute to the Ware WWTP.

The permittee is required to administer a pretreatment program based on the authority granted under 40 § 122.44(j), 40 CFR § 403 and section 307 of the CWA. In accordance with 40 § 403, the permittee is obligated to modify, if necessary, its pretreatment program plan, to be consistent with current Federal Pretreatment Regulations. The permittee is also required to implement its pretreatment program in accordance with the requirements at 40 C.F.R. Part 403 (General Pretreatment Regulations). These requirements are necessary to ensure continued compliance with the POTW's NPDES permit and its sludge use or disposal practices. Those activities that the permittee must perform include, but are not limited to, the following: (1) develop and enforce EPA approved specific effluent limits (technically-based local limits); (2) issue industrial user discharge permits, (3) conduct compliance monitoring activities (e.g., sampling and inspections at industrial users), and (4) initiate enforcement actions against non-complying industrial users.

Lastly, the permittee must submit an annual pretreatment report on **March 1**, which describes the permittee's pretreatment program activities for the twelve month period ending 60 days prior to the due date.

9. Operations and Maintenance

EPA regulations set forth a standard condition for "Proper Operation and Maintenance" that is included in all NPDES permits. *See* 40 CFR § 122.41(e). This condition is specified in Part II.B.1 (General Conditions) of the draft permit and it requires the proper operation and maintenance of all wastewater treatment systems and related facilities installed or used to achieve permit conditions.

EPA regulations also specify a standard condition to be included in all NPDES permits that specifically imposes on permittees a “duty to mitigate.” *See* 40 CFR § 122.41(d). This condition is specified in Part II.B.3 of the draft permit and it requires permittees to take all reasonable steps – which in some cases may include operations and maintenance work – to minimize or prevent any discharge in violation of the permit which has the reasonable likelihood of adversely affecting human health or the environment.

Proper operation of collection systems is critical to prevent blockages and equipment failures that would cause overflows of the collection system (sanitary sewer overflows, or SSOs), and to limit the amount of non-wastewater flow entering the collection system (inflow and infiltration or I/I). I/I in a collection system can pose a significant environmental problem because it may displace wastewater flow and thereby cause, or contribute to causing, SSOs. Moreover, I/I could reduce the capacity and efficiency of the treatment plant and cause bypasses of secondary treatment. Therefore, reducing I/I will help to minimize any SSOs and maximize the flow receiving proper treatment at the treatment plant. There is presently estimated to be approximately 75,000 gpd of I/I in the sewer system. In its September 6, 2001 Infiltration and Inflow Policy, MassDEP specified that certain conditions related to I/I control be established in NPDES municipal permits.

Therefore, specific permit conditions have been included in Part I.B., and I.C. of the draft permit. These requirements include mapping of the wastewater collection system, preparing and implementing a collection system operation and maintenance plan, reporting unauthorized discharges including SSOs, maintaining an adequate maintenance staff, performing preventative maintenance, controlling infiltration and inflow to the extent necessary to prevent SSOs and I/I related-effluent violations at the wastewater treatment plant, and maintaining alternate power where necessary. These requirements are intended to minimize the occurrence of permit violations that have a reasonable likelihood of adversely affecting human health or the environment.

10. Essential Fish Habitat

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA’s action or proposed actions that it funds, permits, or undertakes; may adversely impact any essential fish habitat as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 CFR § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species’ fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Essential fish habitat (EFH) is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999.

The Ware River is a tributary of the Chicopee River, which flows into the Connecticut River, which ultimately drains into the Long Island Sound. The Connecticut River system has been designated as EFH for Atlantic salmon. Although EFH has been designated for this general location, EPA has concluded that this activity is not likely to affect EFH or its associated species for the following reasons:

- The quantity of the discharge from the WWTP is 1.0 MGD, and the effluent receives advanced treatment;
- The facility withdraws no water from the Ware River; therefore no life stages of Atlantic salmon are vulnerable to impingement or entrainment from this facility;
- Limits specifically protective of aquatic organisms have been established for phosphorus, chlorine, aluminum, and copper, based on EPA water quality criteria;
- Acute and chronic toxicity testing on *Ceriodaphnia dubia* is required four (4) times per year.
- The permit prohibits any violation of state water quality standards.

EPA believes that the conditions and limitations contained within the draft permit adequately protect all aquatic life, including those species with EFH designation. Impacts associated with issuance of this permit to the EFH species, their habitat and forage, have been minimized to the extent that no significant adverse impacts are expected. Further mitigation is not warranted.

11. Endangered Species Act

Section 7(a) of the Endangered Species Act of 1973 (ESA), as amended, grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) administers Section 7 consultations for freshwater species. The National Marine Fisheries Service (NMFS) administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the federal endangered or threatened species of fish, wildlife, or plants to see if any such listed species might potentially be impacted by the re-issuance of this NPDES permit. No federally endangered species have been identified within 30 miles of the Town of Ware. Therefore, EPA concludes that the limits and conditions contained in this draft permit reissuance are not likely to adversely affect species of concern or their habitats. No consultation is necessary.

12. Monitoring

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308(a) of the CWA in accordance with 40 CFR §§122.41(j), 122.44(l), and 122.48.

The Draft Permit includes new provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The Draft Permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated CWA permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR § 122.41 and § 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr. Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for Massachusetts.

The Draft Permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR, no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

The Draft Permit also includes an "opt-out" request process. Permittees who believe they cannot use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt-outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt-outs expire at the end of this twelve (12) month period. Upon expiration, the permittee must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt-out request sixty (60) days prior to expiration of its opt-out, and such a request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the Draft Permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

13. State Certification Requirements

The NPDES Permit is issued jointly by the U. S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection under federal and state law, respectively. As such, all the terms and conditions of the permit are, therefore, incorporated into and constitute a discharge permit issued by the MassDEP Commissioner.

14. Comment Period, Hearing Requests, and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the U.S. EPA, Office of Ecosystem Protection, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. Public hearings may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates a significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period and after a public hearing, if such a hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

15. General Conditions

The general conditions of the permit are based on 40 CFR Parts 122, Subparts A and D and 40 CFR §124, Subparts A, D, E, and F and are consistent with management requirements common to other permits.

16. State Certification Requirements

The staff of the Massachusetts Department of Environmental Protection ("MassDEP") has reviewed the draft permit. EPA has requested permit certification by the State pursuant to 40 CFR § 124.53 and expects that the draft permit will be certified.

17. EPA & MassDEP Contacts

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays, from:

Robin L. Johnson
EPA New England – Region 1

5 Post Office Square, Suite 100
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Boston, MA 02109-3912
Telephone: 617-918-1045 FAX: 617-918-0045
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Claire Golden
Massachusetts Department of Environmental Protection
205B Lowell Street
Wilmington, Massachusetts 01887
Telephone: 978-694-3244 FAX: 978-694-3498
claire.golden@state.ma.us

February 21, 2013
Date

Ken Moraff, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

A-5

TOPOGRAPHIC MAP

WARE WASTEWATER TREATMENT PLANT

SECTION OF USGS MAP
SCALE 1 IN. = 3,400 FT. +/-

THERE ARE NO WELLS, SPRINGS, OR SURFACE WATER BODIES, OTHER THAN THE WARE RIVER, WITHIN ¼ MILE OF THE WARE WASTEWATER TREATMENT PLANT.

Figure 1 – Facility Location Map

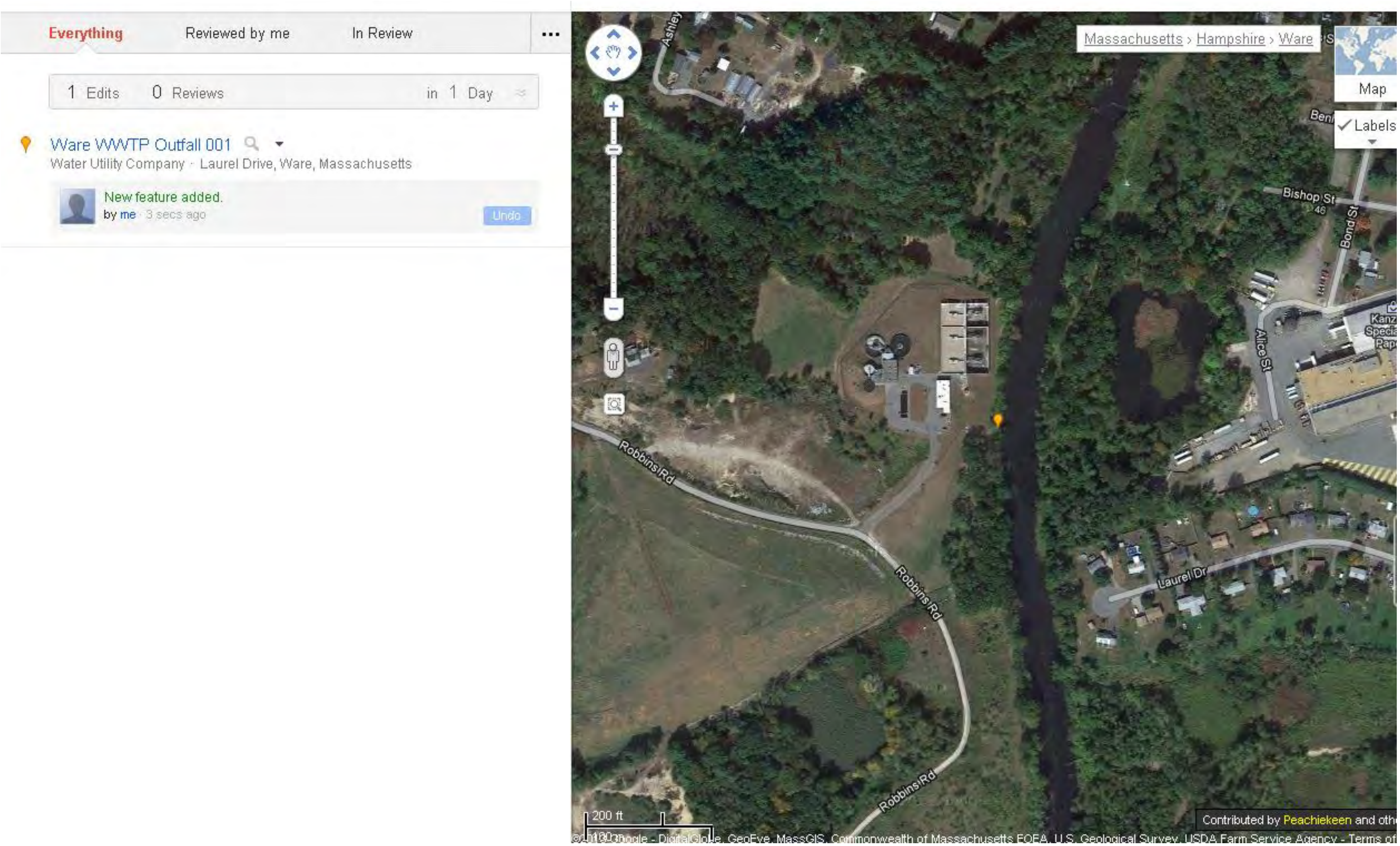


Figure 2 – Outfall Location Map

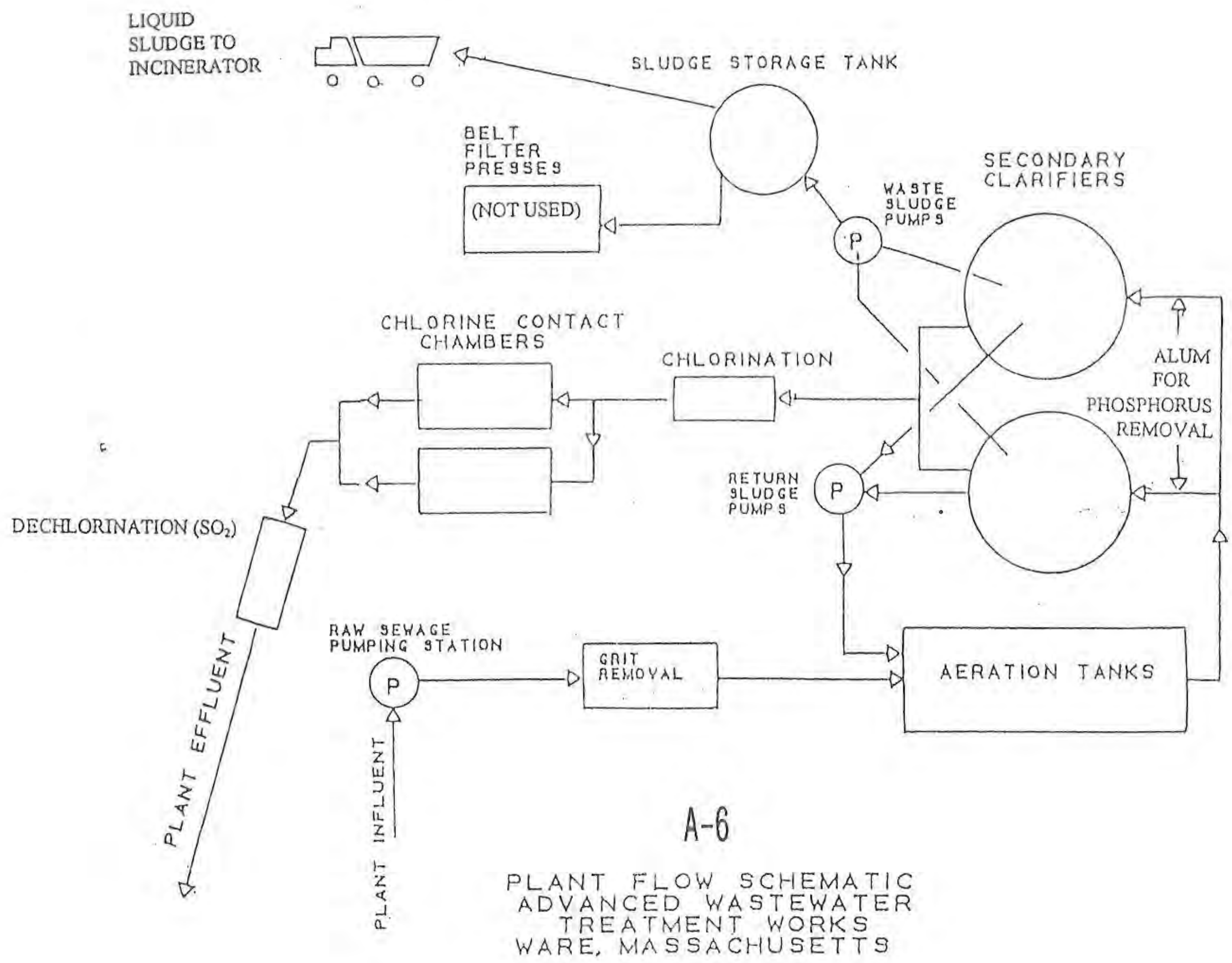


Figure 3 – Facility Schematic

001A

BOD, 5-day, 20 deg. C
Limit Start Date = 7/1/07
Season = 0

Pram	MP Dt	Rec Dt	Q1 208 lb/d MO AVG	Q2 208 lb/d WKLY AVG	C1 25 mg/L MO AVG	C2 25 mg/L WKLY AVG	C3 Req. Mon. mg/L DAILY MX
00310	07/31/2009	8/11/2009	32 lb/d	86 lb/d	6 mg/L	10 mg/L	10 mg/L
00310	08/31/2009	9/12/2009	39 lb/d	90 lb/d	7 mg/L	15 mg/L	15 mg/L
00310	09/30/2009	10/14/2009	18 lb/d	28 lb/d	4 mg/L	6 mg/L	6 mg/L
00310	10/31/2009	11/13/2009	28.7 lb/d	58.1 lb/d	6.6 mg/L	11 mg/L	11 mg/L
00310	11/30/2009	12/8/2009	14.1 lb/d	56.7 lb/d	3 mg/L	10.8 mg/L	18 mg/L
00310	12/31/2009	1/14/2010	34.2 lb/d	53.2 lb/d	6.3 mg/L	8.5 mg/L	11 mg/L
00310	01/31/2010	2/12/2010	30.1 lb/d	71 lb/d	6 mg/L	8.7 mg/L	18 mg/L
00310	02/28/2010	3/11/2010	27.7 lb/d	40.7 lb/d	5.3 mg/L	7.8 mg/L	7.8 mg/L
00310	03/31/2010	4/13/2010	72 lb/d	154 lb/d	10 mg/L	18 mg/L	18 mg/L
00310	04/30/2010	5/13/2010	23 lb/d	38 lb/d	3 mg/L	6 mg/L	6 mg/L
00310	05/31/2010	6/8/2010	14 lb/d	16 lb/d	3 mg/L	3 mg/L	3 mg/L
00310	06/30/2010	7/13/2010	13 lb/d	14 lb/d	3 mg/L	3 mg/L	3 mg/L
00310	07/31/2010	8/11/2010	39 lb/d	65 lb/d	10 mg/L	15 mg/L	15 mg/L
00310	08/31/2010	9/13/2010	23 lb/d	41 lb/d	6 mg/L	10 mg/L	10 mg/L
00310	09/30/2010	10/14/2010	34.4 lb/d	87.9 lb/d	4 mg/L	20 mg/L	20 mg/L
00310	10/31/2010	11/8/2010	210 lb/d	40 lb/d	5 mg/L	9 mg/L	9 mg/L
00310	11/30/2010	12/7/2010	25 lb/d	37 lb/d	6 mg/L	8 mg/L	8 mg/L
00310	12/31/2010	1/11/2011	16 lb/d	30 lb/d	4 mg/L	7 mg/L	7 mg/L
00310	01/31/2011	2/8/2011	28 lb/d	48 lb/d	7 mg/L	12 mg/L	12 mg/L
00310	02/28/2011	3/3/2011	35 lb/d	57 lb/d	8 mg/L	13 mg/L	13 mg/L
00310	03/31/2011	4/11/2011	23 lb/d	45 lb/d	2 mg/L	2 mg/L	2 mg/L
00310	04/30/2011	5/9/2011	39 lb/d	69 lb/d	5 mg/L	9 mg/L	9 mg/L
00310	05/31/2011	6/7/2011	13 lb/d	13 lb/d	2 mg/L	2 mg/L	2 mg/L
00310	06/30/2011	7/7/2011	18 lb/d	48 lb/d	3 mg/L	8 mg/L	8 mg/L
00310	07/31/2011	8/5/2011	19 lb/d	33 lb/d	4 mg/L	7 mg/L	7 mg/L
00310	08/31/2011	9/6/2011	16 lb/d	37 lb/d	3 mg/L	7 mg/L	7 mg/L
00310	09/30/2011	10/7/2011	24 lb/d	40 lb/d	3 mg/L	5 mg/L	5 mg/L
00310	10/31/2011	11/3/2011	13 lb/d	13 lb/d	2 mg/L	2 mg/L	2 mg/L
00310	11/30/2011	12/7/2011	23 lb/d	53 lb/d	3 mg/L	7 mg/L	7 mg/L
00310	12/31/2011	1/4/2012	16 lb/d	25 lb/d	2 mg/L	3 mg/L	3 mg/L
00310	01/31/2012	2/2/2012	23 lb/d	35 lb/d	4 mg/L	6 mg/L	6 mg/L
00310	02/29/2012	3/7/2012	35 lb/d	71 lb/d	7 mg/L	14 mg/L	14 mg/L
00310	03/31/2012	4/4/2012	26 lb/d	45 lb/d	4 mg/L	7 mg/L	7 mg/L
00310	04/30/2012	5/2/2012	13 lb/d	13 lb/d	3 mg/L	3 mg/L	3 mg/L
00310	05/31/2012	6/5/2012	19 lb/d	28 lb/d	4 mg/L	6 mg/L	6 mg/L
00310	06/30/2012	7/3/2012	19 lb/d	38 lb/d	4 mg/L	8 mg/L	2 mg/L

Chlorine, total residual
Limit Start Date = 7/1/07
Season = 0

Pram	MP Dt	Rec Dt	C1 160 ug/L MO AVG	C3 277 ug/L DAILY MX
50060	07/31/2009	8/11/2009	20 ug/L	60 ug/L
50060	08/31/2009	9/11/2009	60 ug/L	90 ug/L
50060	09/30/2009	10/14/2009	45 ug/L	70 ug/L
50060	10/31/2009	11/13/2009	26 ug/L	70 ug/L
50060	04/30/2010	5/13/2010	18 ug/L	90 ug/L
50060	05/31/2010	6/8/2010	36 ug/L	80 ug/L
50060	06/30/2010	7/13/2010	31 ug/L	70 ug/L
50060	07/31/2010	8/11/2010	29 ug/L	50 ug/L
50060	08/31/2010	9/13/2010	28 ug/L	50 ug/L
50060	09/30/2010	10/14/2010	25 ug/L	40 ug/L
50060	10/31/2010	11/8/2010	20 ug/L	30 ug/L
50060	04/30/2011	5/9/2011	24 ug/L	40 ug/L
50060	05/31/2011	6/7/2011	119 ug/L	260 ug/L
50060	06/30/2011	7/7/2011	81 ug/L	120 ug/L
50060	07/31/2011	8/5/2011	42 ug/L	240 ug/L
50060	08/31/2011	9/6/2011	69 ug/L	250 ug/L

50060	09/30/2011	10/7/2011	70 ug/L	220 ug/L
50060	10/31/2011	11/3/2011	65 ug/L	240 ug/L
50060	04/30/2012	5/2/2012	51 ug/L	170 ug/L
50060	05/31/2012	6/5/2012	56 ug/L	230 ug/L
50060	06/30/2012	7/3/2012	45 ug/L	280 ug/L

Coliform, fecal general
Limit Start Date = 7/1/07
Season = 0

			C1 200 CFU/100mL	C3 400 CFU/100mL
Pram	**MP Dt**	**Rec Dt**	**MO GEO**	**DAILY MX**
74055	07/31/2009	8/11/2009	41.4 CFU/100mL	1,500 CFU/100mL
74055	08/31/2009	9/11/2009	14.8 CFU/100mL	30 CFU/100mL
74055	09/30/2009	10/14/2009	13.6 CFU/100mL	70 CFU/100mL
74055	10/31/2009	11/13/2009	31.7 CFU/100mL	20 CFU/100mL
74055	04/30/2010	5/13/2010	30.5 CFU/100mL	80 CFU/100mL
74055	05/31/2010	6/8/2010	10 CFU/100mL	10 CFU/100mL
74055	06/30/2010	7/13/2010	9.4 CFU/100mL	10 CFU/100mL
74055	07/31/2010	8/11/2010	9 CFU/100mL	9 CFU/100mL
74055	08/31/2010	9/13/2010	9 CFU/100mL	10 CFU/100mL
74055	09/30/2010	10/14/2010	24.4 CFU/100mL	120 CFU/100mL
74055	10/31/2010	11/8/2010	9.5 CFU/100mL	10 CFU/100mL
74055	04/30/2011	5/9/2011	264 CFU/100mL	22,200 CFU/100mL
74055	05/31/2011	6/7/2011	9 CFU/100mL	9 CFU/100mL
74055	06/30/2011	7/7/2011	11 CFU/100mL	20 CFU/100mL
74055	07/31/2011	8/5/2011	24 CFU/100mL	450 CFU/100mL
74055	08/31/2011	9/6/2011	16 CFU/100mL	140 CFU/100mL
74055	09/30/2011	10/7/2011	17 CFU/100mL	50 CFU/100mL
74055	10/31/2011	11/3/2011	10 CFU/100mL	10 CFU/100mL
74055	04/30/2012	5/2/2012	10 CFU/100mL	10 CFU/100mL
74055	05/31/2012	6/5/2012	17 CFU/100mL	80 CFU/100mL
74055	06/30/2012	7/3/2012	10 CFU/100mL	10 CFU/100mL

E. coli, thermotol, MF, MTEC
Limit Start Date = 7/1/07
Season = 0

			C1 Req. Mon. CFU/100mL	C3 Req. Mon. CFU/100mL
Pram	**MP Dt**	**Rec Dt**	**MO AVG**	**DAILY MX**
31633	07/31/2009	8/11/2009	0 CFU/100mL	0 CFU/100mL
31633	08/31/2009	9/11/2009	0 CFU/100mL	0 CFU/100mL
31633	09/30/2009	10/14/2009	0 CFU/100mL	0 CFU/100mL
31633	10/31/2009	11/13/2009	0 CFU/100mL	0 CFU/100mL
31633	11/30/2009	12/8/2009	NODI Code = 9	NODI Code = 9
31633	12/31/2009	1/14/2010	NODI Code = 9	NODI Code = 9

Limit Start Date = 1/1/10
Season = 0

			C1 Req. Mon. CFU/100mL	C3 Req. Mon. CFU/100mL
Pram	**MP Dt**	**Rec Dt**	**MOAV GEO**	**DAILY MX**
31633	04/30/2010	5/13/2010	8 CFU/100mL	8 CFU/100mL
31633	05/31/2010	6/8/2010	8 CFU/100mL	8 CFU/100mL
31633	06/30/2010	7/13/2010	1 CFU/100mL	1 CFU/100mL
31633	07/31/2010	8/11/2010	0 CFU/100mL	0 CFU/100mL
31633	08/31/2010	9/13/2010	4 CFU/100mL	4 CFU/100mL
31633	09/30/2010	10/14/2010	0 CFU/100mL	0 CFU/100mL
31633	10/31/2010	11/8/2010	1 CFU/100mL	10 CFU/100mL
31633	04/30/2011	5/9/2011	4,300 CFU/100mL	4,300 CFU/100mL
31633	05/31/2011	6/7/2011	1 CFU/100mL	1 CFU/100mL
31633	06/30/2011	7/7/2011	1 CFU/100mL	1 CFU/100mL
31633	07/31/2011	8/5/2011	1 CFU/100mL	1 CFU/100mL
31633	08/31/2011	9/6/2011	1 CFU/100mL	1 CFU/100mL
31633	09/30/2011	10/7/2011	1 CFU/100mL	1 CFU/100mL
31633	10/31/2011	11/3/2011	1 CFU/100mL	1 CFU/100mL
31633	04/30/2012	5/2/2012	0 CFU/100mL	0 CFU/100mL
31633	05/31/2012	6/5/2012	2 CFU/100mL	2 CFU/100mL

31633	06/30/2012	7/3/2012	8 CFU/100mL	8 CFU/100mL

Flow, in conduit or thru treatment plant
Limit Start Date = 7/1/07
Season = 0

Pram	MP Dt	Rec Dt	Q1 Req. Mon. MGD MO AVG	Q2 Req. Mon. MGD DAILY MX
50050	07/31/2009	8/11/2009	0.63	1.11 MGD
50050	08/31/2009	9/11/2009	0.72	1.24 MGD
50050	09/30/2009	10/14/2009	0.55	0.69 MGD
50050	10/31/2009	11/13/2009	0.52	0.64 MGD
50050	11/30/2009	12/8/2009	0.56	0.63 MGD
50050	12/31/2009	1/14/2010	0.65	0.75 MGD
50050	01/31/2010	2/12/2010	0.6	0.98 MGD
50050	02/28/2010	3/11/2010	0.63	1 MGD
50050	03/31/2010	4/13/2010	0.86	1.7 MGD
50050	04/30/2010	5/13/2010	0.92	1.7 MGD
50050	05/31/2010	6/8/2010	0.56	0.62 MGD
50050	06/30/2010	7/13/2010	0.52	0.58 MGD
50050	07/31/2010	8/11/2010	0.47	0.54 MGD
50050	08/31/2010	9/13/2010	0.45	0.57 MGD
50050	09/30/2010	10/14/2010	0.46	0.53 MGD
50050	10/31/2010	11/8/2010	0.5	0.65 MGD
50050	11/30/2010	12/7/2010	0.51	0.62 MGD
50050	12/31/2010	1/11/2011	0.51	0.61 MGD
50050	01/31/2011	2/8/2011	0.48	0.54 MGD
50050	02/28/2011	3/3/2011	0.52	0.79 MGD
50050	03/31/2011	4/11/2011	1.35	2.7 MGD
50050	04/30/2011	5/9/2011	0.93	1.13 MGD
50050	05/31/2011	6/7/2011	0.8	0.96 MGD
50050	06/30/2011	7/7/2011	0.71	0.83 MGD
50050	07/31/2011	8/5/2011	0.57	0.69 MGD
50050	08/31/2011	9/6/2011	0.64	1.84 MGD
50050	09/30/2011	10/7/2011	0.95	2.03 MGD
50050	10/31/2011	11/3/2011	0.77	0.9 MGD
50050	11/30/2011	12/7/2011	0.91	1.03 MGD
50050	12/31/2011	1/4/2012	0.99	1.54 MGD
50050	01/31/2012	2/2/2012	0.7	0.79 MGD
50050	02/29/2012	3/7/2012	0.61	0.78 MGD
50050	03/31/2012	4/4/2012	0.6	0.68 MGD
50050	04/30/2012	5/2/2012	0.51	0.61 MGD
50050	05/31/2012	6/5/2012	0.56	0.68 MGD
50050	06/30/2012	7/3/2012	0.57	0.68 MGD
		AVG	0.660833333	
		MED	0.6	

Flow, total
Limit Start Date = 7/1/07
Season = 0

Pram	MP Dt	Rec Dt	Q1 1 MGD ROLL AVG
82220	07/31/2009	8/11/2009	0.72 MGD
82220	08/31/2009	9/11/2009	0.72 MGD
82220	09/30/2009	10/14/2009	0.69 MGD
82220	10/31/2009	11/13/2009	0.68 MGD
82220	11/30/2009	12/8/2009	0.68 MGD
82220	12/31/2009	1/14/2010	0.66 MGD
82220	01/31/2010	2/12/2010	0.64 MGD
82220	02/28/2010	3/11/2010	0.64 MGD
82220	03/31/2010	4/13/2010	0.65 MGD
82220	04/30/2010	5/13/2010	0.67 MGD
82220	05/31/2010	6/8/2010	0.65 MGD
82220	06/30/2010	7/13/2010	0.69 MGD
82220	07/31/2010	8/11/2010	0.63 MGD
82220	08/31/2010	9/13/2010	0.61 MGD
82220	09/30/2010	10/14/2010	0.6 MGD
82220	10/31/2010	11/8/2010	0.6 MGD
82220	11/30/2010	12/7/2010	0.59 MGD
82220	12/31/2010	1/11/2011	0.57 MGD
82220	01/31/2011	2/8/2011	0.57 MGD
82220	02/28/2011	3/3/2011	0.56 MGD
82220	03/31/2011	4/11/2011	0.61 MGD
82220	04/30/2011	5/9/2011	0.61 MGD
82220	05/31/2011	6/7/2011	0.63 MGD
82220	06/30/2011	7/7/2011	0.64 MGD
82220	07/31/2011	8/5/2011	0.65 MGD
82220	08/31/2011	9/6/2011	0.67 MGD
82220	09/30/2011	10/7/2011	0.71 MGD
82220	10/31/2011	11/3/2011	0.73 MGD
82220	11/30/2011	12/7/2011	0.76 MGD
82220	12/31/2011	1/4/2012	0.8 MGD
82220	01/31/2012	2/2/2012	0.82 MGD
82220	02/29/2012	3/7/2012	0.83 MGD
82220	03/31/2012	4/4/2012	0.77 MGD
82220	04/30/2012	5/2/2012	0.73 MGD
82220	05/31/2012	6/5/2012	0.71 MGD
82220	06/30/2012	7/3/2012	0.7 MGD

Nitrite plus nitrate total 1 det. (as N)
Limit Start Date = 7/1/07
Season = 0

Pram	MP Dt	Rec Dt	C1 Req. Mon. mg/L MO AV MN
00630	07/31/2009	8/11/2009	14
00630	08/31/2009	9/11/2009	9.3
00630	09/30/2009	10/14/2009	13
00630	10/31/2009	11/13/2009	16
00630	11/30/2009	12/8/2009	12
00630	12/31/2009	1/14/2010	15
00630	01/31/2010	2/12/2010	17
00630	02/28/2010	3/11/2010	5.8
00630	03/31/2010	4/13/2010	8.8
00630	04/30/2010	5/13/2010	3
00630	05/31/2010	6/8/2010	2.5
00630	06/30/2010	7/13/2010	15
00630	07/31/2010	8/11/2010	6.8
00630	08/31/2010	9/13/2010	13
00630	09/30/2010	10/14/2010	15
00630	10/31/2010	11/8/2010	18
00630	11/30/2010	12/7/2010	15
00630	12/31/2010	1/11/2011	19
00630	01/31/2011	2/8/2011	13

00630	02/28/2011	3/3/2011	17
00630	03/31/2011	4/11/2011	10
00630	04/30/2011	5/9/2011	12
00630	05/31/2011	6/7/2011	9.9
00630	06/30/2011	7/7/2011	6.8
00630	07/31/2011	8/5/2011	12
00630	08/31/2011	9/6/2011	8.7
00630	09/30/2011	10/7/2011	12
00630	10/31/2011	11/3/2011	10
00630	11/30/2011	12/7/2011	7
00630	12/31/2011	1/4/2012	9.9
00630	01/31/2012	2/2/2012	9.8
00630	02/29/2012	3/7/2012	10.9
00630	03/31/2012	4/4/2012	15
00630	04/30/2012	5/2/2012	16
00630	05/31/2012	6/5/2012	9.4
00630	06/30/2012	7/3/2012	7.4
		AVG	11.52777778
		MED	12

Nitrogen, ammonia total (as N)
Limit Start Date = 7/1/07
Season = 2

			C1 1 mg/L	C2 1 mg/L	C3 1.5 mg/L
Pram	MP Dt	Rec Dt	MO AVG	WKLY AVG	DAILY MX
00610	07/31/2009	8/11/2009	0.23 mg/L	0.6 mg/L	0.6 mg/L
00610	08/31/2009	9/12/2009	0.55 mg/L	0.98 mg/L	0.98 mg/L
00610	09/30/2009	10/14/2009	0.46 mg/L	0.56 mg/L	0.56 mg/L
00610	10/31/2009	11/13/2009	0.2 mg/L	0.32 mg/L	0.32 mg/L
00610	06/30/2010	7/13/2010	0.34 mg/L	0.74 mg/L	0.74 mg/L
00610	07/31/2010	8/11/2010	0.59 mg/L	0.85 mg/L	0.85 mg/L
00610	08/31/2010	9/13/2010	0.2 mg/L	0.25 mg/L	0.25 mg/L
00610	09/30/2010	10/14/2010	0.48 mg/L	0.89 mg/L	0.89 mg/L
00610	10/31/2010	11/8/2010	0.4 mg/L	0.96 mg/L	0.96 mg/L
00610	06/30/2011	7/7/2011	0.42 mg/L	0.72 mg/L	0.72 mg/L
00610	07/31/2011	8/5/2011	0.23 mg/L	0.34 mg/L	0.34 mg/L
00610	08/31/2011	9/6/2011	0.24 mg/L	0.49 mg/L	0.49 mg/L
00610	09/30/2011	10/7/2011	0.47 mg/L	1.2 mg/L	1.2 mg/L
00610	10/31/2011	11/3/2011	0.2 mg/L	0.32 mg/L	0.32 mg/L
00610	06/30/2012	7/3/2012	0.45 mg/L	0.62 mg/L	0.62 mg/L

Nitrogen, Kjeldahl, total (as N)
Limit Start Date = 7/1/07
Season = 0

			C1 Req. Mon. mg/L
Pram	MP Dt	Rec Dt	MO AV MN
00625	07/31/2009	8/11/2009	0.28
00625	08/31/2009	9/12/2009	1.1
00625	09/30/2009	10/14/2009	0.99
00625	10/31/2009	11/13/2009	1.3
00625	11/30/2009	12/8/2009	1.5
00625	12/31/2009	1/14/2010	1.5
00625	01/31/2010	2/12/2010	1.6
00625	02/28/2010	3/11/2010	4.9
00625	03/31/2010	4/13/2010	1.9
00625	04/30/2010	5/13/2010	4.2
00625	05/31/2010	6/8/2010	1.4
00625	06/30/2010	7/13/2010	1.6
00625	07/31/2010	8/11/2010	1.6
00625	08/31/2010	9/13/2010	1.7
00625	09/30/2010	10/14/2010	1.8
00625	10/31/2010	11/8/2010	1.4
00625	11/30/2010	12/7/2010	16
00625	12/31/2010	1/11/2011	2
00625	01/31/2011	2/8/2011	2
00625	02/28/2011	3/3/2011	2.7

00625	**03/31/2011**	**4/11/2011**	4.3
00625	**04/30/2011**	**5/9/2011**	2.3
00625	**05/31/2011**	**6/7/2011**	2.2
00625	**06/30/2011**	**7/7/2011**	1.1
00625	**07/31/2011**	**8/5/2011**	2.1
00625	**08/31/2011**	**9/6/2011**	1.7
00625	**09/30/2011**	**10/7/2011**	0.9
00625	**10/31/2011**	**11/3/2011**	1.2
00625	**11/30/2011**	**12/7/2011**	0.88
00625	**12/31/2011**	**1/4/2012**	0.95
00625	**01/31/2012**	**2/2/2012**	1.3
00625	**02/29/2012**	**3/7/2012**	1.6
00625	**03/31/2012**	**4/4/2012**	2.5
00625	**04/30/2012**	**5/2/2012**	1.4
00625	**05/31/2012**	**6/5/2012**	1.5
00625	**06/30/2012**	**7/3/2012**	1.5
		AVE	2.191666667
		MED	1.6

pH
Limit Start Date = 7/1/07
Season = 0

			C1 **6.5 SU**	**C3** **8.3 SU**
Pram	**MP Dt**	**Rec Dt**	**MINIMUM**	**MAXIMUM**
00400	**07/31/2009**	**8/11/2009**	6.5 SU	6.8 SU
00400	**08/31/2009**	**9/12/2009**	6.5 SU	6.7 SU
00400	**09/30/2009**	**10/14/2009**	6.5 SU	6.7 SU
00400	**10/31/2009**	**11/13/2009**	6.5 SU	6.9 SU
00400	**11/30/2009**	**12/8/2009**	6.5 SU	6.9 SU
00400	**12/31/2009**	**1/14/2010**	6.6 SU	6.8 SU
00400	**01/31/2010**	**2/12/2010**	6.5 SU	6.8 SU
00400	**02/28/2010**	**3/11/2010**	6.5 SU	7 SU
00400	**03/31/2010**	**4/13/2010**	6.5 SU	6.7 SU
00400	**04/30/2010**	**5/13/2010**	6.5 SU	6.8 SU
00400	**05/31/2010**	**6/8/2010**	6.5 SU	7.3 SU
00400	**06/30/2010**	**7/13/2010**	6.5 SU	7.4 SU
00400	**07/31/2010**	**8/11/2010**	6.5 SU	6.9 SU
00400	**08/31/2010**	**9/13/2010**	6.5 SU	6.8 SU
00400	**09/30/2010**	**10/14/2010**	6.5 SU	7 SU
00400	**10/31/2010**	**11/8/2010**	6.5 SU	6.8 SU
00400	**11/30/2010**	**12/7/2010**	6.5 SU	6.8 SU
00400	**12/31/2010**	**1/11/2011**	6.5 SU	7.2 SU
00400	**01/31/2011**	**2/8/2011**	6.7 SU	7 SU
00400	**02/28/2011**	**3/3/2011**	6.8 SU	6.9 SU
00400	**03/31/2011**	**4/11/2011**	6.6 SU	6.9 SU
00400	**04/30/2011**	**5/9/2011**	6.5 SU	7.1 SU
00400	**05/31/2011**	**6/7/2011**	6.9 SU	7.1 SU
00400	**06/30/2011**	**7/7/2011**	6.8 SU	7.4 SU
00400	**07/31/2011**	**8/5/2011**	6.9 SU	7.2 SU
00400	**08/31/2011**	**9/6/2011**	6.8 SU	7.1 SU
00400	**09/30/2011**	**10/7/2011**	6.8 SU	7.1 SU
00400	**10/31/2011**	**11/3/2011**	6.9 SU	7.2 SU
00400	**11/30/2011**	**12/7/2011**	6.9 SU	7.2 SU
00400	**12/31/2011**	**1/4/2012**	6.9 SU	7 SU
00400	**01/31/2012**	**2/2/2012**	6.8 SU	7 SU
00400	**02/29/2012**	**3/7/2012**	6.8 SU	7 SU
00400	**03/31/2012**	**4/4/2012**	6.8 SU	7 SU
00400	**04/30/2012**	**5/2/2012**	6.8 SU	7 SU
00400	**05/31/2012**	**6/5/2012**	6.9 SU	7.1 SU
00400	**06/30/2012**	**7/3/2012**	6.9 SU	7.2 SU

Phosphate, ortho, dissolved (as P)
Limit Start Date = 7/1/07
Season = 0

			Q1 **Req. Mon. lb/d**	**Q2** **Req. Mon. lb/d**	**C1** **Req. Mon. mg/L**	**C3** **Req. Mon. mg/L**
Pram	**MP Dt**	**Rec Dt**	**MO AVG**	**DAILY MX**	**MO AVG**	**DAILY MX**

00671	**11/30/2009**	**12/8/2009**	0.42 lb/d	0.66 lb/d	0.09 mg/L	0.14 mg/L
00671	**12/31/2009**	**1/14/2010**	0.49 lb/d	1.19 lb/d	0.09 mg/L	0.19 mg/L
00671	**01/31/2010**	**2/12/2010**	6.13 lb/d	30.99 lb/d	1.22 mg/L	3.8 mg/L
00671	**02/28/2010**	**3/11/2010**	3.3 lb/d	4.3 lb/d	0.63 mg/L	0.8 mg/L
00671	**03/31/2010**	**4/13/2010**	3 lb/d	3.6 lb/d	0.4 mg/L	0.47 mg/L
00671	**11/30/2010**	**12/7/2010**	3.3 lb/d	5.1 lb/d	0.79 mg/L	1.2 mg/L
00671	**12/31/2010**	**1/11/2011**	3.1 lb/d	3.7 lb/d	0.73 mg/L	0.86 mg/L
00671	**01/31/2011**	**2/8/2011**	3.9 lb/d	7.6 lb/d	0.99 mg/L	1.9 mg/L
00671	**02/28/2011**	**3/3/2011**	3.2 lb/d	3.7 lb/d	0.73 mg/L	0.86 mg/L
00671	**03/31/2011**	**4/11/2011**	4.6 lb/d	6.9 lb/d	0.41 mg/L	0.61 mg/L
00671	**11/30/2011**	**12/7/2011**	2.9 lb/d	4.4 lb/d	0.38 mg/L	0.58 mg/L
00671	**12/31/2011**	**1/4/2012**	3 lb/d	4 lb/d	0.37 mg/L	0.49 mg/L
00671	**01/31/2012**	**2/2/2012**	2 lb/d	4 lb/d	0.34 mg/L	0.68 mg/L
00671	**02/29/2012**	**3/7/2012**	1.6 lb/d	1.9 lb/d	0.31 mg/L	0.37 mg/L
00671	**03/31/2012**	**4/4/2012**	2 lb/d	2.7 lb/d	0.4 mg/L	0.53 mg/L

Phosphorus, total (as P)
Limit Start Date = 7/1/07
Season = 0

			C1	**C2**	**C3**
			1 mg/L	**1 mg/L**	**1.5 mg/L**
Pram	**MP Dt**	**Rec Dt**	**MO AVG**	**WKLY AVG**	**DAILY MX**
00665	**07/31/2009**	**8/11/2009**	0.32 mg/L	0.36 mg/L	0.36 mg/L
00665	**08/31/2009**	**9/11/2009**	0.36 mg/L	0.42 mg/L	0.42 mg/L
00665	**09/30/2009**	**10/14/2009**	0.31 mg/L	0.46 mg/L	0.46 mg/L
00665	**10/31/2009**	**11/13/2009**	0.21 mg/L	0.28 mg/L	0.28 mg/L
00665	**04/30/2010**	**5/13/2010**	0.23 mg/L	0.3 mg/L	0.3 mg/L
00665	**05/31/2010**	**6/8/2010**	0.24 mg/L	0.36 mg/L	0.36 mg/L
00665	**06/30/2010**	**7/13/2010**	0.29 mg/L	0.38 mg/L	0.38 mg/L
00665	**07/31/2010**	**8/11/2010**	0.48 mg/L	0.55 mg/L	0.55 mg/L
00665	**08/31/2010**	**9/13/2010**	0.63 mg/L	0.76 mg/L	0.76 mg/L
00665	**09/30/2010**	**10/14/2010**	0.66 mg/L	0.7 mg/L	0.7 mg/L
00665	**10/31/2010**	**11/8/2010**	0.64 mg/L	0.64 mg/L	0.64 mg/L
00665	**04/30/2011**	**5/9/2011**	0.45 mg/L	0.64 mg/L	0.64 mg/L
00665	**05/31/2011**	**6/7/2011**	0.4 mg/L	0.47 mg/L	0.47 mg/L
00665	**06/30/2011**	**7/7/2011**	0.37 mg/L	0.54 mg/L	0.54 mg/L
00665	**07/31/2011**	**8/5/2011**	0.45 mg/L	0.7 mg/L	0.7 mg/L
00665	**08/31/2011**	**9/6/2011**	0.46 mg/L	0.74 mg/L	0.74 mg/L
00665	**09/30/2011**	**10/7/2011**	0.6 mg/L	0.81 mg/L	0.81 mg/L
00665	**10/31/2011**	**11/3/2011**	0.53 mg/L	0.65 mg/L	0.65 mg/L
00665	**04/30/2012**	**5/2/2012**	0.43 mg/L	0.54 mg/L	0.54 mg/L
00665	**05/31/2012**	**6/5/2012**	0.6 mg/L	0.91 mg/L	0.91 mg/L
00665	**06/30/2012**	**7/3/2012**	0.98 mg/L	1.6 mg/L	1.6 mg/L

Season = 1

Pram	MP Dt	Rec Dt	C1 Req. Mon. mg/L MO AVG
00665	11/30/2009	12/8/2009	0.13 mg/L
00665	12/31/2009	1/14/2010	0.2 mg/L
00665	01/31/2010	2/12/2010	1.44 mg/L
00665	02/28/2010	3/11/2010	0.68 mg/L
00665	03/31/2010	4/13/2010	0.46 mg/L
00665	11/30/2010	12/7/2010	0.78 mg/L
00665	12/31/2010	1/11/2011	0.88 mg/L
00665	01/31/2011	2/8/2011	1.23 mg/L
00665	02/28/2011	3/3/2011	1 mg/L
00665	03/31/2011	4/11/2011	0.6 mg/L
00665	11/30/2011	12/7/2011	0.51 mg/L
00665	12/31/2011	1/4/2012	0.6 mg/L
00665	01/31/2012	2/2/2012	0.42 mg/L
00665	02/29/2012	3/7/2012	0.48 mg/L
00665	03/31/2012	4/4/2012	0.67 mg/L

Solids, total suspended
Limit Start Date = 7/1/07
Season = 0

Pram	MP Dt	Rec Dt	Q1 208 lb/d MO AVG	Q2 208 lb/d WKLY AVG	C1 25 mg/L MO AVG	C2 25 mg/L WKLY AVG	C3 Req. Mon. mg/L DAILY MX
00530	07/31/2009	8/11/2009	5 lb/d	11 lb/d	1 mg/L	2 mg/L	2 mg/L
00530	08/31/2009	9/12/2009	1 lb/d	6 lb/d	0 mg/L	1 mg/L	1 mg/L
00530	09/30/2009	10/14/2009	5 lb/d	19 lb/d	1 mg/L	4 mg/L	4 mg/L
00530	10/31/2009	11/13/2009	0 lb/d	0 lb/d	0 mg/L	0 mg/L	0 mg/L
00530	11/30/2009	12/8/2009	3.76 lb/d	NODI Code =	0.8 mg/L	3 mg/L	3 mg/L
00530	11/30/2009	1/13/2010	NODI Code =	14.1 lb/d	NODI Code =	NODI Code =	NODI Code =
00530	12/31/2009	1/14/2010	22.8 lb/d	32.6 lb/d	4.2 mg/L	6 mg/L	6 mg/L
00530	01/31/2010	2/12/2010	10.04 lb/d	47.31 lb/d	2 mg/L	5.8 mg/L	9 mg/L
00530	02/28/2010	3/11/2010	36.6 lb/d	52.3 lb/d	7 mg/L	10 mg/L	10 mg/L
00530	03/31/2010	4/13/2010	43 lb/d	69 lb/d	6 mg/L	8 mg/L	8 mg/L
00530	04/30/2010	5/13/2010	15 lb/d	21 lb/d	2 mg/L	4 mg/L	4 mg/L
00530	05/31/2010	6/8/2010	19 lb/d	31 lb/d	4 mg/L	6 mg/L	6 mg/L
00530	06/30/2010	7/13/2010	13 lb/d	14 lb/d	3 mg/L	3 mg/L	3 mg/L
00530	07/31/2010	8/11/2010	9 lb/d	13 lb/d	2 mg/L	3 mg/L	3 mg/L
00530	08/31/2010	9/13/2010	15 lb/d	24 lb/d	4 mg/L	6 mg/L	6 mg/L
00530	09/30/2010	10/14/2010	11.5 lb/d	17.6 lb/d	3 mg/L	4 mg/L	4 mg/L
00530	10/31/2010	11/8/2010	10 lb/d	13 lb/d	2 mg/L	3 mg/L	3 mg/L
00530	11/30/2010	12/7/2010	17 lb/d	29 lb/d	4 mg/L	6 mg/L	6 mg/L
00530	12/31/2010	1/11/2011	22 lb/d	26 lb/d	5 mg/L	6 mg/L	6 mg/L
00530	01/31/2011	2/8/2011	28 lb/d	64 lb/d	7 mg/L	16 mg/L	16 mg/L
00530	02/28/2011	3/3/2011	30 lb/d	44 lb/d	6 mg/L	10 mg/L	10 mg/L
00530	03/31/2011	4/11/2011	68 lb/d	90 lb/d	6 mg/L	8 mg/L	8 mg/L
00530	04/30/2011	5/9/2011	31 lb/d	62 lb/d	4 mg/L	8 mg/L	8 mg/L
00530	05/31/2011	6/7/2011	27 lb/d	33 lb/d	4 mg/L	5 mg/L	5 mg/L
00530	06/30/2011	7/7/2011	12 lb/d	12 lb/d	2 mg/L	2 mg/L	2 mg/L
00530	07/31/2011	8/5/2011	5 lb/d	10 lb/d	1 mg/L	2 mg/L	2 mg/L
00530	08/31/2011	9/6/2011	16 lb/d	21 lb/d	3 mg/L	4 mg/L	4 mg/L
00530	09/30/2011	10/7/2011	55 lb/d	95 lb/d	7 mg/L	12 mg/L	12 mg/L
00530	10/31/2011	11/3/2011	19 lb/d	32 lb/d	3 mg/L	5 mg/L	5 mg/L
00530	11/30/2011	12/7/2011	23 lb/d	45 lb/d	3 mg/L	6 mg/L	6 mg/L
00530	12/31/2011	1/4/2012	16 lb/d	25 lb/d	2 mg/L	3 mg/L	3 mg/L
00530	01/31/2012	2/2/2012	18 lb/d	23 lb/d	3 mg/L	4 mg/L	4 mg/L
00530	02/29/2012	3/7/2012	25 lb/d	50 lb/d	5 mg/L	10 mg/L	10 mg/L
00530	03/31/2012	4/4/2012	25 lb/d	35 lb/d	5 mg/L	7 mg/L	7 mg/L
00530	04/30/2012	5/2/2012	13 lb/d	17 lb/d	3 mg/L	4 mg/L	4 mg/L
00530	05/31/2012	6/5/2012	14 lb/d	19 lb/d	2 mg/L	4 mg/L	4 mg/L
00530	06/30/2012	7/3/2012	10 lb/d	14 lb/d	2 mg/L	3 mg/L	3 mg/L

Monitoring Location = K

BOD, 5-day, percent removal
Limit Start Date = 7/1/07
Season = 0

C1

			85 %
Pram	**MP Dt**	**Rec Dt**	**MO AV MN**
81010	07/31/2009	8/11/2009	96.5 %
81010	08/31/2009	9/11/2009	95.8 %
81010	09/30/2009	10/14/2009	98.5 %
81010	10/31/2009	11/13/2009	97 %
81010	11/30/2009	12/8/2009	96.5 %
81010	12/31/2009	1/14/2010	94.5 %
81010	01/31/2010	2/12/2010	96 %
81010	02/28/2010	3/11/2010	97 %
81010	03/31/2010	4/13/2010	93.6 %
81010	04/30/2010	5/13/2010	98 %
81010	05/31/2010	6/8/2010	98.9 %
81010	06/30/2010	7/13/2010	98.3 %
81010	07/31/2010	8/11/2010	97.3 %
81010	08/31/2010	9/13/2010	98.3 %
81010	09/30/2010	10/14/2010	96.8 %
81010	10/31/2010	11/8/2010	97.4 %
81010	11/30/2010	12/7/2010	97.7 %
81010	12/31/2010	1/11/2011	98.6 %
81010	01/31/2011	2/8/2011	96.8 %
81010	02/28/2011	3/3/2011	96.7 %
81010	03/31/2011	4/11/2011	97.8 %
81010	04/30/2011	5/9/2011	96 %
81010	05/31/2011	6/7/2011	99 %
81010	06/30/2011	7/7/2011	98 %
81010	07/31/2011	8/5/2011	98 %
81010	08/31/2011	9/6/2011	99 %
81010	09/30/2011	10/7/2011	98.4 %
81010	10/31/2011	11/3/2011	99 %
81010	11/30/2011	12/7/2011	98.7 %
81010	12/31/2011	1/4/2012	98.7 %
81010	01/31/2012	2/2/2012	97.4 %
81010	02/29/2012	3/7/2012	95.8 %
81010	03/31/2012	4/4/2012	97.8 %
81010	04/30/2012	5/2/2012	98.5 %
81010	05/31/2012	6/5/2012	98.4 %
81010	06/30/2012	7/3/2012	97.3 %

Solids, suspended percent removal
Limit Start Date = 7/1/07
Season = 0

			C1 85 %
Pram	**MP Dt**	**Rec Dt**	**MO AV MN**
81011	07/31/2009	8/11/2009	99.4 %
81011	08/31/2009	9/11/2009	99.9 %
81011	09/30/2009	10/14/2009	99.4 %
81011	10/31/2009	11/13/2009	100 %
81011	11/30/2009	12/8/2009	100 %
81011	12/31/2009	1/14/2010	98 %
81011	01/31/2010	2/12/2010	96 %
81011	02/28/2010	3/11/2010	96 %
81011	03/31/2010	4/13/2010	96 %
81011	04/30/2010	5/13/2010	98 %
81011	05/31/2010	6/8/2010	98 %
81011	06/30/2010	7/13/2010	99 %
81011	07/31/2010	8/11/2010	99 %
81011	08/31/2010	9/13/2010	99 %
81011	09/30/2010	10/14/2010	99 %
81011	10/31/2010	11/8/2010	99 %
81011	11/30/2010	12/7/2010	99 %
81011	12/31/2010	1/11/2011	98 %
81011	01/31/2011	2/8/2011	96.5 %
81011	02/28/2011	3/3/2011	97 %
81011	03/31/2011	4/11/2011	94 %
81011	04/30/2011	5/9/2011	98 %
81011	05/31/2011	6/7/2011	99 %

81011	**06/30/2011**	**7/7/2011**	99 %
81011	**07/31/2011**	**8/5/2011**	99.4 %
81011	**08/31/2011**	**9/6/2011**	98.6 %
81011	**09/30/2011**	**10/7/2011**	94.9 %
81011	**10/31/2011**	**11/3/2011**	98.6 %
81011	**11/30/2011**	**12/7/2011**	98.4 %
81011	**12/31/2011**	**1/4/2012**	98.2 %
81011	**01/31/2012**	**2/2/2012**	98.3 %
81011	**02/29/2012**	**3/7/2012**	97.6 %
81011	**03/31/2012**	**4/4/2012**	97.7 %
81011	**04/30/2012**	**5/2/2012**	99.1 %
81011	**05/31/2012**	**6/5/2012**	99.1 %
81011	**06/30/2012**	**7/3/2012**	98.8 %

001B
Monitoring Location = 1
LC50 Static 48Hr Acute Ceriodaphnia
Limit Start Date = 8/1/07
Season = 0

			C1
			100 %
Pram	**MP Dt**	**Rec Dt**	**DAILY MN**
TAA3B	**08/31/2009**	**9/21/2009**	100 %
TAA3B	**11/30/2009**	**1/13/2010**	100 %
TAA3B	**02/28/2010**	**3/11/2010**	100 %
TAA3B	**05/31/2010**	**6/16/2010**	100 %
TAA3B	**08/31/2010**	**8/31/2010**	100 %
TAA3B	**11/30/2010**	**12/9/2010**	100 %
TAA3B	**02/28/2011**	**3/29/2011**	100 %
TAA3B	**05/31/2011**	**6/7/2011**	100 %
TAA3B	**08/31/2011**	**9/6/2011**	100 %
TAA3B	**11/30/2011**	**12/12/2011**	100 %
TAA3B	**02/29/2012**	**3/9/2012**	100 %
TAA3B	**05/31/2012**	**6/12/2012**	100 %

Noel Statre 7Day Chronic Ceriodaphnia
Limit Start Date = 8/1/07
Season = 0

			C1
			7 %
Pram	**MP Dt**	**Rec Dt**	**DAILY MN**
TBP3B	**08/31/2009**	**9/21/2009**	100 %
TBP3B	**11/30/2009**	**1/13/2010**	100 %
TBP3B	**02/28/2010**	**3/11/2010**	7 %
TBP3B	**05/31/2010**	**6/16/2010**	6.25 %
TBP3B	**08/31/2010**	**8/31/2010**	25 %
TBP3B	**11/30/2010**	**12/9/2010**	25 %
TBP3B	**02/28/2011**	**3/29/2011**	6.25 %
TBP3B	**05/31/2011**	**6/7/2011**	25 %
TBP3B	**08/31/2011**	**9/6/2011**	100 %
TBP3B	**11/30/2011**	**12/12/2011**	50 %
TBP3B	**02/29/2012**	**3/9/2012**	50 %
TBP3B	**05/31/2012**	**6/12/2012**	100 %

Appendix B

Aluminum Data from Whole Effluent Toxicity Tests

Date	Effluent (µg/L)	River (µg/L)
11/9/2009	71	94
2/8/2010	243	82
5/10/2010	93	138
8/10/2010	100	90
11/18/2010	99	109
2/7/2011	108	74
5/9/2011	48	47
8/8/2011	77	38
11/14/2011	53	146
2/20/2012	140	70
median	96	86

Reasonable Potential Analysis
no ND, >10 data points, Lognormal distribution

Dilution Factor:	10

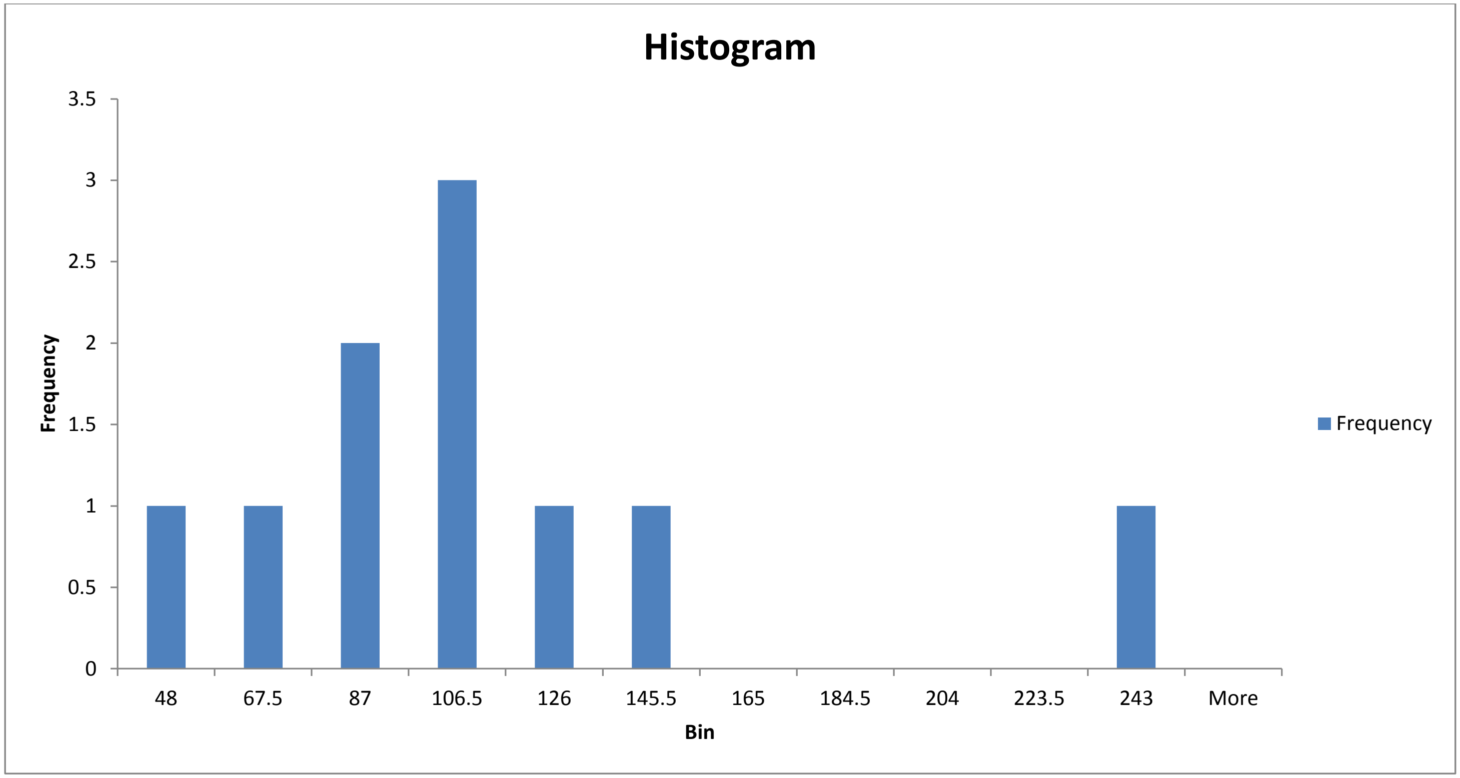
Date	Al (ug/L)	Yi lnAl (ug/L)
8/10/2009	71	4.2627
11/9/2009	243	5.4931
2/8/2010	93	4.5326
5/10/2010	100	4.6052
8/10/2010	99	4.5951
11/18/2010	108	4.6821
2/7/2011	48	3.8712
5/9/2011	77	4.3438
8/8/2011	53	3.9703
11/14/2011	140	4.9416

Al - (Lognormal distribution, no ND)

Estimated Daily Maximum Effluent Concentration

k = number of daily samples =	10	
u_y = Avg of Nat. Log of daily Discharge =	4.52977	
s_y = Std Dev. of Nat Log of daily discharge =	0.46944	
σ_y^2 = estimated variance = (SUM[$(y_i - u_y)^2$]) / (k-1) =	0.220377315	
cv(x)= Coefficient of Variation =	0.103635194	
99th Percentile Daily Max Estimate = exp (u_y + 2.326*s_y)		
Estimated Daily Max 99th percentile =	**276.3577**	**ug/L**
Estimated Daily Max including Dilution Factor =		**ug/L**
95th Percentile Daily Max Estimate = exp (u_y + 1.645*s_y)		
Estimated Daily Max =	**200.7389**	**ug/L**
Estimated Daily Max including Dilution Factor =		**ug/L**

Bin	*Frequency*
48	1
67.5	1
87	2
106.5	3
126	1
145.5	1
165	0
184.5	0
204	0
223.5	0
243	1
More	0



Aluminum Reasonable Potential Analysis

Acute					Water Quality Criterion
	Downstream conc = (QeCe + QsCs)/Qr			96.94432585	750.00
					There is NO reasonable potential
Qr =	16.25	cfs	7Q10 + design flow		
Qs =	14.7	cfs	7Q10		
Cs =	86	ug/l	Background conc		
Qe =	1.55	cfs	design flow		
Ce =	200.74	ug/l	maximum concentration		

Chronic					Water Quality Criterion
	Downstream conc = (QeCe + QsCs)/Qr			96.94443077	87.00
					There is reasonable potential
Qr =	16.25	cfs	7Q10 + design flow		
Qs =	14.7	cfs	7Q10		
Cs =	86	ug/l	Background conc		
Qe =	1.55	cfs	design flow		
Ce =	200.74	ug/l	95th percentile projection		

Permit Limit Calculation

$$Q_sC_s + Q_dC_d = Q_rC_r$$

Monthly Average
Permit Limit = $[C_r \times (Q_d + Q_s) - Q_sC_s]/Q_d=$ **96.48387 mg/L**

			Units
Where			
C_s=	background concentration	86.00	µg/L
Q_s=	critical streamflow	14.7	cfs
Qd=	critical effluent flow	1.55	cfs
Cr=	water quality criterion	87	µg/L

Appendix C

Copper Data from Whole Effluent Toxicity Tests

Date	Effluent (µg/L)	River (µg/L)
8/10/2009	12	4
11/9/2009	12	2
2/8/2010	20	<1
5/10/2010	9	2
8/10/2010	14	2
11/18/2010	12	3
2/7/2011	12	1
5/9/2011	10	10
8/8/2011	11	1
11/14/2011	7	<1
2/20/2012	6	1
median	12	2

Reasonable Potential Analysis
no ND, >10 data points, Lognormal distribution

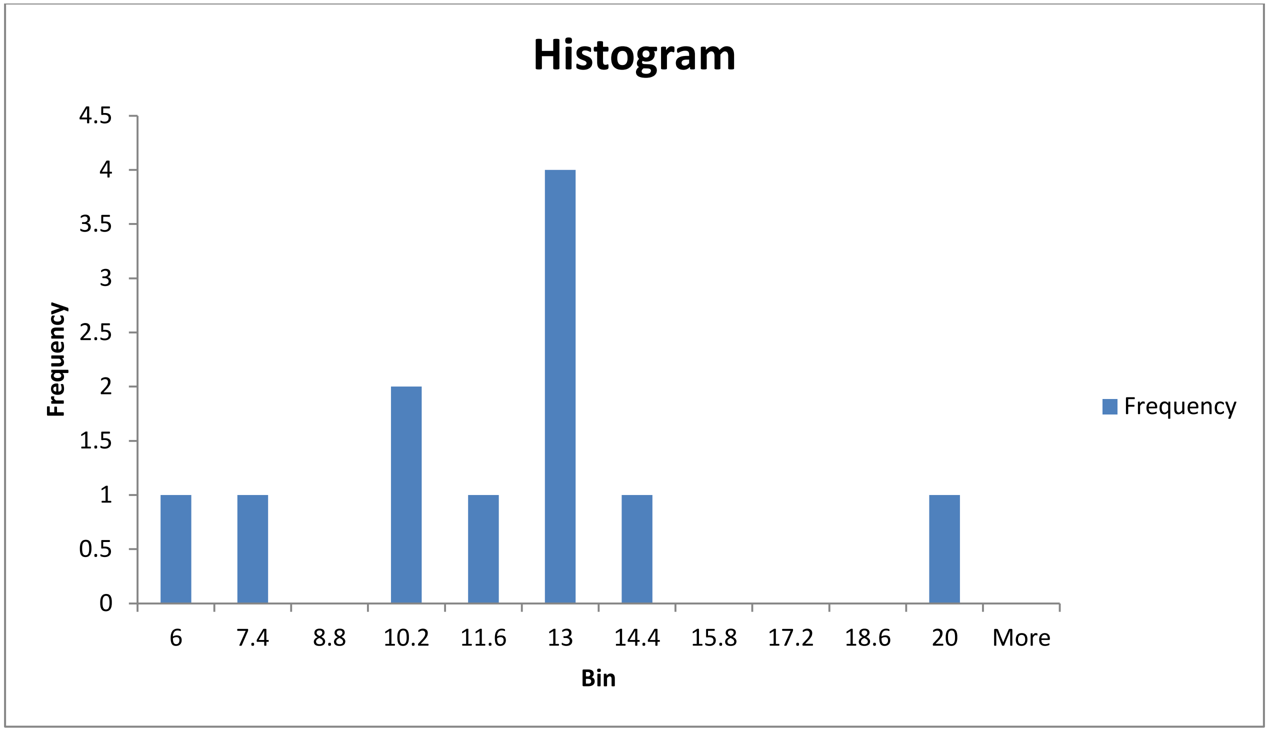
Dilution Factor:	10

Date	Cu (ug/L)	Y_i lnCu (ug/L)
8/10/2009	12	2.4849
11/9/2009	12	2.4849
2/8/2010	20	2.9957
5/10/2010	9	2.1972
8/10/2010	14	2.6391
11/18/2010	12	2.4849
2/7/2011	12	2.4849
5/9/2011	10	2.3026
8/8/2011	11	2.3979
11/14/2011	7	1.9459
2/20/2012	6	1.7918

Al - (Lognormal distribution, no ND)

Estimated Daily Maximum Effluent Concentration		
k = number of daily samples =	11	
u_y = Avg of Nat. Log of daily Discharge =	2.38271	
s_y = Std Dev. of Nat Log of daily discharge =	0.32625	
σ_y^2 = estimated variance = (SUM[(y_i - u_y)^2]) / (k-1) =	0.106435896	
cv(x)= Coefficient of Variation =	0.136921986	
99th Percentile Daily Max Estimate = exp (u_y + 2.326*s_y)		
Estimated Daily Max 99th percentile =	**23.1398**	**ug/L**
Estimated Daily Max including Dilution Factor =		**ug/L**
95th Percentile Daily Max Estimate = exp (u_y + 1.645*s_y)		
Estimated Daily Max =	**18.5298**	**ug/L**
Estimated Daily Max including Dilution Factor =		**ug/L**

Bin	*Frequency*
6	1
7.4	1
8.8	0
10.2	2
11.6	1
13	4
14.4	1
15.8	0
17.2	0
18.6	0
20	1
More	0



Acute					Water Quality Criterion
	Downstream conc = (QeCe + QsCs)/Qr			3.716923077	3.52
					There is reasonable potential
Qr =	16.25	cfs	7Q10 + design flow		
Qs =	14.7	cfs	7Q10		
Cs =	2	ug/l	Background conc		
Qe =	1.55	cfs	design flow		
Ce =	20.00	ug/l	maximum concentration		

Chronic					Water Quality Criterion
	Downstream conc = (QeCe + QsCs)/Qr			3.576690861	2.67
					There is reasonable potential
Qr =	16.25	cfs	7Q10 + design flow		
Qs =	14.7	cfs	7Q10		
Cs =	2	ug/l	Background conc		
Qe =	1.55	cfs	design flow		
Ce =	18.53	ug/l	95th percentile projection		

Permit Limit Calculation

$$Q_sC_s + Q_dC_d = Q_rC_r$$

Maximum Daily Permit Limit = $[C_r \times (Q_d + Q_s) - Q_sC_s]/Q_d =$ **17.93548 µg/L**

			Units
Where			
C_s=	background concentration	2.00	µg/L
Q_s=	critical streamflow	14.7	cfs
Qd=	critical effluent flow	1.55	cfs
Cr=	acute water quality criterion	3.52	µg/L

$$Q_sC_s + Q_dC_d = Q_rC_r$$

Monthly Average Permit Limit = $[C_r \times (Q_d + Q_s) - Q_sC_s]/Q_d =$ **9.024194 µg/L**

			Units
Where			
C_s=	background concentration	2.00	µg/L
Q_s=	critical streamflow	14.7	cfs
Qd=	critical effluent flow	1.55	cfs
Cr=	chronic water quality criterion	2.67	µg/L

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
COMMONWEALTH OF MASSACHUSETTS
1 WINTER STREET
BOSTON, MASSACHUSETTS 02108

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ECOSYSTEM PROTECTION
REGION I
BOSTON, MASSACHUSETTS 02109

JOINT PUBLIC NOTICE OF A DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE INTO THE WATERS OF THE UNITED STATES UNDER SECTIONS 301 AND 402 OF THE CLEAN WATER ACT, AS AMENDED, AND UNDER SECTIONS 27 AND 43 OF THE MASSACHUSETTS CLEAN WATERS ACT, AS AMENDED, AND REQUEST FOR STATE CERTIFICATION UNDER SECTION 401 OF THE CLEAN WATER ACT.

DATE OF NOTICE: March 8, 2013

NPDES PERMIT NUMBER: MA0100889

PUBLIC NOTICE NUMBER: MA-007-13

NAME AND MAILING ADDRESS OF APPLICANT:

Town of Ware
Department of Public Works
4 ½ Church Street
Ware, Massachusetts 01082

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Ware Wastewater Treatment Plant
30 Robbins Road
Ware, Massachusetts 01082

RECEIVING WATER(S):

Ware River (Segment MA 36-06)
Chicopee River Basin

RECEIVING WATER CLASSIFICATION(S): B - Warm Water Fishery, CSO*

* Although this segment is classified as a CSO (combined sewer overflow) in the 2006 standards, there are currently no CSOs in this segment. Future standards will reflect this fact.

PREPARATION OF THE DRAFT PERMIT:

The U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) have cooperated in the development of a permit for the above identified facility. The effluent limits and permit conditions imposed have been drafted to assure compliance with the Clean Water Act, 33 U.S.C. sections 1251 et seq., the Massachusetts

Clean Waters Act, G.L. c. 21, §§ 26-53, 314 CMR 3.00 and State Surface Water Quality Standards at 314 CMR 4.00. EPA has formally requested that the State certify this draft permit pursuant to Section 401 of the Clean Water Act and expects that the draft permit will be certified. However, sludge conditions in the draft permit are not subject to State certification requirements.

INFORMATION ABOUT THE DRAFT PERMIT:

A fact sheet (describing the type of facility; type and quantities of wastes; a brief summary of the basis for the draft permit conditions; and significant factual, legal and policy questions considered in preparing this draft permit) and the draft permit may be obtained at no cost at http://www.epa.gov/region1/npdes/draft_permits_listing_ma.html or by writing or calling EPA's contact person named below:

Robin L. Johnson
U.S. Environmental Protection Agency – Region 1
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912
Telephone: (617) 918-1045

The administrative record containing all documents relating to this draft permit is on file and may be inspected at the EPA Boston office mentioned above between 9:00 a.m. and 5:00 p.m., Monday through Friday, except holidays.

PUBLIC COMMENT AND REQUEST FOR PUBLIC HEARING:

All persons, including applicants, who believe any condition of this draft permit is inappropriate, must raise all issues and submit all available arguments and all supporting material for their arguments in full by **April 6, 2013**, to the U.S. EPA, 5 Post Office Square, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing to EPA and the State Agency for a public hearing to consider this draft permit. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on this draft permit, the Regional Administrator will respond to all significant comments and make the responses available to the public at EPA's Boston office.

FINAL PERMIT DECISION:

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

DAVID FERRIS, DIRECTOR
MASSACHUSETTS WASTEWATER MANAGEMENT PROGRAM
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

KEN MORAFF, ACTING DIRECTOR
OFFICE OF ECOSYSTEM PROTECTION
ENVIRONMENTAL PROTECTION AGENCY – REGION 1

APPENDIX C

Potential Future Sewer Expansion Project Flows

Ware, MA - Sewer Master Plan
Projected Future Flow Estimates by Project

(All flows are projected Average Daily Flows)

Master Calculation Inputs

People/Single Family Home	2.5
Residential (GPD/Capita)	70
Residential (GPD/Unit)	175
TR-16 I/I Allowance (GPD/In-Diam-Mile)	250

Project 1	Longview Street Sewer Extension						
	Residential	94	units times	175	gpd/unit =	16,450	
							*calculated lower,adjusted commercial properties that were below 175 to 175
	Commercial	8.726	acres	523		4,699	
	Infiltration	10.76	in-diam-mi times	250	gpd/in-diam-mi =	2,689	
Project 2	Meadow Heights Sewer Extension						
	Residential	49	units times	175	gpd/unit =	8,575	
	Infiltration	8.26	in-diam-mi times	250	gpd/in-diam-mi =	2,064	
Project 3	Malboeuf Road Sewer Extension						
	Residential	142	units times	175	gpd/unit =	24,850	
	Infiltration	15.30	in-diam-mi times	250	gpd/in-diam-mi =	3,826	
Project 4	Mountain View Drive Sewer Extension						
	Residential	50	units times	175	gpd/unit =	8,750	
	Infiltration	5.45	in-diam-mi times	250	gpd/in-diam-mi =	1,364	
Project 5	Palmer Road Sewer Extension						
	Residential	54	units times	175	gpd/unit =	9,450	
							*calculated 418, one 300, other 120, increased the 120 to 175
	Existing Commercial	0.8	acres	523		475	
	Developable Commercial	0.098	acres	523	gpd/acre =	175	*put as 175, originally 51.
	Infiltration	11.67	in-diam-mi times	250	gpd/in-diam-mi =	2,917	
Project 6	Old Belchertown Road Sewer Extension						
	Residential	84	units times	175	gpd/unit =	14,700	
							*calculated to 43, changed to 175
	Commercial	0.082	acre	523	gpd/acre	175	
	Infiltration	13.33	in-diam-mi times	250	gpd/in-diam-mi =	3,333	
Project 7	Beaver Lake Area Low-Pressure Sewer System						
	Residential	445	units times	175	gpd/unit =	77,875	
	Infiltration	0.00	in-diam-mi times	250	gpd/in-diam-mi =	0	

APPENDIX D

Rules and Regulations Governing the Town of Ware's Public Sewer System

RULES AND REGULATIONS GOVERNING THE TOWN OF WARE'S PUBLIC SEWER SYSTEM

Adopted July 21, 2015
Amended October 20, 2015

TABLE OF CONTENTS

TOWN OF WARE SEWER REGULATIONS

SECTION 1- GENERAL PROVISIONS

1.1 Purpose and Policy

These regulations set forth uniform requirements for Users of the Publicly Owned Treatment Works for the Town of Ware and enable the Town of Ware to comply with all applicable State and Federal laws, including the Clean Water Act (33 United States Code [U.S.C.] section 1251 et seq.) and the General Pretreatment Regulations (Title 40 of the *Code of Federal Regulations* [CFR] Part 403). The objectives of these regulations are:

A. To prevent the introduction of pollutants into the Publicly Owned Treatment Works that will interfere with its operation;

B. To prevent the introduction of pollutants into the Publicly Owned Treatment Works that will pass through the Publicly Owned Treatment Works, inadequately treated, into receiving waters, or otherwise be incompatible with the Publicly Owned Treatment Works;

C. To protect both Publicly Owned Treatment Works personnel who may be affected by wastewater and sludge in the course of their employment and the general public;

D. To promote reuse and recycling of industrial wastewater and sludge from the Publicly Owned Treatment Works;

E. To provide for fees for the equitable distribution of the cost of operation, maintenance, and improvement of the Publicly Owned Treatment Works; and

F. To enable the Town of Ware to comply with its National Pollutant Discharge Elimination System permit conditions, sludge use and disposal requirements, and any other Federal or State laws to which the Publicly Owned Treatment Works is subject.

G. To assure that connections into the public sewer shall be properly constructed, installed, and connected.

These regulations shall apply to all Users of the Publicly Owned Treatment Works. The regulations authorize the issuance of individual wastewater discharge permits; provide for monitoring, compliance, and enforcement activities; establish administrative review procedures; require User reporting; and provide for the setting of fees for the equitable distribution of costs resulting from the program established herein.

It shall be unlawful to introduce any substance into the Publicly Owned Treatment Works for the Town of Ware except as a User in compliance with these regulations.

1.2 Administration

Except as otherwise provided herein, the Director of Public Works shall administer, implement, and enforce the provisions of these regulations. Any powers granted to or duties imposed upon the Director of Public Works may be delegated by the Director of Public Works to a duly authorized Town of Ware employee.

1.3 Abbreviations

The following abbreviations, when used in these regulations, shall have the designated meanings:

BOD	Biochemical Oxygen Demand
BMP	Best Management Practice
BMR	Baseline Monitoring Report
CFR	Code of Federal Regulations
CIU	Categorical Industrial User
COD	Chemical Oxygen Demand
EPA	U.S. Environmental Protection Agency
gpd	gallons per day
IU	Industrial User
mg/l	milligrams per liter
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
SIU	Significant Industrial User
SNC	Significant Noncompliance
TSS	Total Suspended Solids
U.S.C.	United States Code

1.4 Definitions

Unless a provision explicitly states otherwise, the following terms and phrases, as used in these regulations, shall have the meanings hereinafter designated.

Act or "the Act." The Federal Water Pollution Control Act, also known as the Clean Water Act, as amended, 33 U.S.C. section 1251 et seq.

Approval Authority. The U.S. Environmental Protection Agency, Region 1.

Authorized or Duly Authorized Representative of the User.

(1) If the User is a corporation:

(a) The president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(b) The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the related facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; can ensure that the necessary systems are established or actions taken to gather complete and accurate information for individual wastewater discharge permit requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) If the User is a partnership or sole proprietorship: a general partner or proprietor, respectively.

(3) If the User is a Federal, State, or local governmental facility: a director or highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or their designee.

(4) The individuals described in paragraphs 1 through 3, above, may designate a Duly Authorized Representative if the authorization is in writing; the authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company, and the written authorization is submitted to the Town of Ware.

Biochemical Oxygen Demand or BOD. The quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures for five (5) days at 20 degrees centigrade, usually expressed as a concentration (e.g., mg/l).

Best Management Practices or BMPs: means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to implement the prohibitions listed in Section 2.6 A and B. BMPs include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw materials storage.

Board - The Board of Water and Sewer Commissioners of Ware, Massachusetts or its authorized agent or representative.

Board of Health shall mean the Board of Health of the Town of Ware.

Building drain: That part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, and other draining pipes inside the walls of the building and conveys it to the building sewer.

Building sewer: A sewer conveying wastewater from the premises of a User to the publicly owned treatment works.

Categorical Pretreatment Standard or Categorical Standard. Any regulation containing pollutant discharge limits promulgated by EPA in accordance with sections 307(b) and (c) of the Act (33 U.S.C. section 1317) that apply to a specific category of Users and that appear in 40 CFR Chapter 1, Subchapter N, Parts 405-471.

Categorical Industrial User. An Industrial User subject to a categorical Pretreatment Standard or categorical Standard.

Chemical Oxygen Demand or COD. A measure of the oxygen required to oxidize all compounds, both organic and inorganic, in water.

Control Authority (or Town). The Town of Ware.

Cooling water shall mean the water discharged from any use, such as air conditioning, cooling or refrigeration, to which the only pollutant added is heat.

Daily Maximum. The arithmetic average of all effluent samples for a pollutant collected during, a calendar day.

Daily Maximum Limit. The maximum allowable discharge limit of a pollutant during a calendar day. Where Daily Maximum Limits are expressed in units of mass, the daily discharge is the total mass discharged over the course of the day. Where Daily Maximum Limits are expressed in terms of a concentration, the daily discharge is the arithmetic average measurement of the pollutant concentration derived from all measurements taken that day.

Director or Director of Public Works. The person designated by the Town of Ware to supervise the operation of the POTW, and who is charged with certain duties and responsibilities by these regulations. This person acts as the Superintendent. The term also means a Duly Authorized Representative of the Director of Public Works.

Domestic wastes shall mean liquid wastes:

(1) From the noncommercial preparation, cooking and handling of food; or
(2) Containing human excrement and similar matter from the sanitary conveniences of dwellings, commercial buildings, industrial facilities and institutions.

Environmental Protection Agency or EPA. The U.S. Environmental Protection Agency or, where appropriate, the Regional Water Management Division Director, the Regional Administrator, or other duly authorized official of said agency.

Existing source. Any source of discharge that is not a "New Source."

Grab sample. A sample that is taken from a waste stream without regard to the flow in the waste stream and over a period of time not to exceed fifteen (15) minutes.

Indirect Discharge or Discharge. The introduction of pollutants into the POTW from any non-domestic source.

Industrial User: A source of Indirect Discharge to the POTW.

Infiltration shall mean the water entering a sanitary sewer, including sewer service connections, from the ground, through such means as, but not limited to, defective pipes, pipe joints, connections or manhole walls. Infiltration does not include, and is distinguished from, inflow.

Inflow shall mean the water discharged into a sanitary sewer including service connections from such sources as, but not limited to, roof leaders, cellar, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross-connections from the storm sewers and combined sewers, catch basins, storm waters, surface run-off, street wash waters, or drainage. Inflow does not include, and is distinguished from, infiltration.

Instantaneous Limit. The maximum, concentration of a pollutant allowed to be discharged at any time, determined from the analysis of any discrete or composite sample collected, independent of the industrial flow rate and the duration of the sampling event.

Interference. A discharge that, alone or in conjunction with a discharge or discharges from other sources, inhibits or disrupts the POTW, its treatment processes or operations or its sludge processes, use or disposal; and therefore, is a cause of a violation of the Town's NPDES permit or of the prevention of sewage sludge use or disposal in compliance with any of the following statutory/regulatory provisions or permits issued thereunder, or any more stringent State or local regulations: section 405 of the Act; the Solid Waste Disposal Act, including Title II commonly referred to as the Resource Conservation and Recovery Act (RCRA); any State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the Solid Waste Disposal Act; the Clean Air Act; the Toxic Substances Control Act; and the Marine Protection, Research, and Sanctuaries Act.

Local Limit. Specific discharge limits developed and enforced by the Town of Ware upon industrial or commercial facilities to implement the general and specific discharge prohibitions listed in 40 CFR 403.5(a)(l) and (b).

"May" is permissive.

Medical waste. Isolation wastes, infectious agents, human blood and blood products, pathological, wastes, sharps, body parts, contaminated bedding, surgical wastes, potentially contaminated laboratory wastes, and dialysis wastes.

Monthly Average. The sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

Monthly Average Limit. The highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

National Pollutant Discharge Elimination System (NPDES): the program for issuing, conditioning and denying permits for the discharge of pollutants from point sources into the navigable waters, the contiguous zone and the oceans pursuant to Section 402 of PL 92 500.

New Source.

(1) Any building, structure, facility, or installation from which there is (or may be) a discharge of pollutants, the construction of which commenced after the publication of proposed Pretreatment Standards under section 307(c) of the Act that will be applicable to such source if such Standards are thereafter promulgated in accordance with that section, provided that:

  (a) The building, structure, facility, or installation is constructed at a site at which no other source is located; or,

  (b) The building, structure, facility, or installation totally replaces the process or production equipment that causes the discharge of pollutants at an Existing Source; or

  (c) The production or wastewater generating processes of the building, structure, facility, or installation are substantially independent of an Existing Source at the same site. In determining whether these are substantially independent, factors such as the extent to which the new facility is integrated with the existing plant, and the extent to which the new facility is engaged in the same general type of activity as the Existing Source, should be considered.

(2) Construction on a site at which an Existing Source is located results in a modification rather than a New Source if the construction does not create a new building, structure, facility, or installation meeting the criteria of Section(l)(b) or (c) above but otherwise alters, replaces, Or adds to existing process or production equipment.

(3) Construction of a New Source as defined under this paragraph has commenced if the owner or operator has:

  (a) Begun, or caused to begin, as part of a continuous onsite construction program;

    i. any placement, assembly, or installation of facilities or equipment; or

    ii. significant site preparation work including clearing, excavation, or removal of existing buildings, structures, or facilities which is necessary for the placement assembly, or installation of new source facilities or equipment; or

(b) Entered into a binding contractual obligation for the purchase of facilities or equipment, which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation under this paragraph.

Non-contact cooling water. Water used for cooling that does not come into direct contact with any raw material, intermediate product, waste product, or finished product.

Pass Through. A discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the Town of Ware NPDES permit, including an increase in the magnitude or duration of a violation.

Person. Any individual, partnership, copartnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity, or any other legal entity; or their legal representatives, agents, or assigns. This definition includes all Federal, State, and local governmental entities.

pH. A measure of the acidity or alkalinity of a solution, expressed in standard units.

Pollutant. Dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, Medical Wastes, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, municipal, agricultural and industrial wastes, and certain characteristics of wastewater (e.g., pH, temperature, TSS, turbidity, color, BOD, COD, toxicity, or odor).

Pretreatment. The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, introducing such pollutants into the POTW. This reduction or alteration can be obtained by physical, chemical, or biological processes; by process changes; or by other means, except by diluting the concentration of the pollutants unless allowed by an applicable Pretreatment Standard.

Pretreatment requirements. Any substantive or procedural requirement related to pretreatment imposed on a User, other than a Pretreatment Standard.

Pretreatment standards or Standards. Pretreatment Standards shall mean prohibited discharge standards, categorical Pretreatment Standards, and Local Limits.

Prohibited Discharge Standards or Prohibited Discharges. Absolute prohibitions against the discharge of certain substances; these prohibitions appear in Section 2.6 of these regulations.

Properly shredded garbage shall mean the wastes from the preparation, cooking, and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than one-half (1/2) inch (1.27 centimeters) in any dimension.

Publicly Owned Treatment Works or POTW. A treatment works, as defined by section 212 of the Act (33 U.S.C. section 1292), which is owned by the Town of Ware. This definition includes any devices or systems used in the collection, storage, treatment, recycling, and reclamation of sewage or industrial wastes of a liquid nature and any conveyances, which convey wastewater to a treatment plant.

Receiving stream shall mean a body of water, stream or water course receiving the discharge of waters from the wastewater treatment plant

Septic tank waste. Any sewage from holding tanks such as vessels, chemical toilets, campers, trailers, and septic tanks.

Sewage. Human excrement and gray water (household showers, dishwashing operations, etc.).

Significant Industrial User (SIU).

A Significant Industrial User is:

(1) An Industrial User subject to categorical Pretreatment Standards; or

(2) An Industrial User that:

(a) Discharges an average of twenty-five thousand (25,000) gpd or more of process wastewater to the POTW (excluding sanitary, non-contact cooling and boiler blowdown wastewater);

(b) Contributes a process waste stream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or

(c) Is designated as such by Town of Ware on the basis that it has a reasonable potential for adversely affecting the POTW's operation or for violating any Pretreatment Standard or Requirement.

Significant Non-Compliance (SNC) shall mean any violation which meets one or more specific criteria set forth within 40 CFR 403.8 (f)(2)(vii).

"Shall" is mandatory.

Slug load or Slug discharge. Any discharge at a flow rate or concentration, which could cause a violation of the prohibited discharge standards in Section 2.6 of these regulations. A Slug Discharge is any Discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch Discharge, which has a reasonable potential to cause Interference or Pass Through, or in any other way violate the POTW's regulations, Local Limits or Permit conditions.

Standard Industrial classification (SIC) shall mean a classification pursuant to the Standard Industrial Classification Manual issued by the Executive Office of the President, Office of Management and Budget, 1972, as amended from time to time.

Storm Water. Any flow occurring during or following any form of natural precipitation, and resulting from such precipitation, including snowmelt.

Total Suspended Solids or Suspended Solids. The total suspended matter that floats on the surface of, or is suspended in, water, wastewater, or other liquid, and that is removable by laboratory filtering.

"Town" shall mean the Town of Ware, Massachusetts.

Toxic pollutant shall mean any pollutant or combination of pollutants listed as toxic in regulations promulgated by the administrator of the Environmental Protection Agency under Section 307(a) of the Act, or other Acts; or in regulations promulgated under M.G.L. C. 21, including, but not limited to, 314 CMR 3.00, 7.00 and 12.00.

User. Any person who contributes, causes or permits the contribution of wastewater into the Publicly Owned Treatment Works of the Town of Ware.

Wastewater. Liquid and water-carried industrial wastes and sewage from residential dwellings, commercial buildings, industrial, and manufacturing facilities, and institutions, whether treated or untreated, which are contributed to the POTW.

Wastewater Treatment Plant (WWTP), Water Pollution Control Plant (WPCP) or Treatment Plant. That portion of the POTW that is designed to provide treatment of municipal sewage and industrial waste.

Terms not otherwise defined herein shall be as adopted in the latest edition of Standard Methods for the Examination of Water and Wastewater published by the American Public Health Association, the American Water Works Association and the Water Pollution Control Federation, or as defined in the General Pretreatment Regulations 40 CFR Part 403.

SECTION 2- GENERAL SEWER USE REQUIREMENTS

2.1 Control of Inflow/Infiltration

All new systems of sewers and extensions of existing systems shall be so constructed as to prevent any and all inflow/infiltration considered excessive as defined by Federal Standards. All new sewer systems and extensions shall include a standard pressurization test for pressure sewers and an exfiltration test for gravity sewers and manholes, as required by the Director of Public Works or his/her designee. The Director of Public Works shall specify the nature of the required testing. These tests shall be witnessed and attested to by the authorized DPW representatives. If the Town Engineer cannot witness the tests, a registered professional engineer (in Massachusetts) shall certify and seal with authorized stamp, a letter which states the results of all testing on sewers and manholes. All existing sewerage systems shall be maintained to eliminate any and all inflow/infiltration considered excessive by DEP.

2.2 User compliance.

A. It shall be unlawful to discharge to any natural outlet within the Town, or in any area under the jurisdiction of said Town, any sewage or other polluted waters, except where suitable treatment has been provided in accordance with subsequent provisions of this bylaw and the requirements of the Commonwealth of Massachusetts.

B. Except as hereinafter provided, it shall be unlawful to construct or maintain in the Town any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of sewage except where no sewage facilities are available.

C. Users shall make wastewater acceptable in accordance with these regulations before discharging to the Town sewer and subsequently to the POTW. Any user to whom federal or state pretreatment standards are applicable shall be in compliance with such standards within the time required by the Director of Public Works or his/her designee. In addition, the Director may deny or condition new or increased contributions of pollutants to the Ware sewer system by industrial users.

2.3 Required building sewer connections.

All structures used for human occupancy and equipped with sanitary facilities which are located within one hundred fifty (150) feet of public sewer mains and to which the property abuts shall connect at the owner's expense to the public sewer system if the connection into the community system will flow into the main by gravity.

All new structures must be connected to the community sewerage system if the property abuts a public easement in which a sewer main exists and is available for connection.

Upon connection to the community sewerage system any septic tank must be disconnected from the structure and shall be pumped dry and the tank filled with clean gravel or sand. The contents of a septic tank which is being discontinued because the structure which it served is being connected to the community sewerage system must have the sludge pumped from the tank and disposed of in a proper fashion according the DEP regulations.

All structures within one hundred fifty (150) feet of a community sewer main, unless exempted by this regulation, shall connect to the community sewer system.

Any persons requesting exemption from connecting to the community sewer system shall be required to:

A. Have their premises inspected by the Director or other authorized representative.

B. Show just cause that the connection would result in an unreasonable disruption of existing facilities or create an extreme financial burden. To document and justify such a financial burden, financial statements and/ or other financial records must be submitted to the Director for review.

C. Provide information, such as certification by a registered engineer or sanitarian, that the septic system was properly installed and is operating satisfactorily and in compliance with current State and local regulations.

2.4. Building sewers and connections.

A. No unauthorized person shall uncover, make any connections with or opening into, use, alter, or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the Department of Public Works. Any person preparing a new discharge into the system or a substantial change in volume or character of pollutants that are being discharged into the system shall notify the Department of Pubic Works at least forty-five (45) days prior to the proposed change or connection.

B. There shall be two classes of sewer connection permits: for residential and commercial service, and for Industrial Users. In either case, the property owner or his or her agent shall make application on a special form furnished by the Director. The permit application shall be supplemented by any plans, specifications or other information considered pertinent by the Director. A permit and inspection fee as shown in the Appendix for a residential, commercial or industrial sewer connection permit shall be paid to the Town of Ware.

C. All costs and expense for the installation of the building sewer shall be borne by the applicant or property owner. The property owner shall select a private contractor to make the connection. Any work done in the public right-of-way and all connections shall be in accord with such rules, regulations, or directions of the Department of Public Works. The property owner shall indemnify the Town of Ware from any loss or damage that may directly or indirectly be caused by the installation of the building sewer.

D. A separate and independent building sewer shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway, the building sewer from the front building may be extended to the rear building and charged as separate connections.

E. Old building sewers may be used in connection with new buildings only when they are found, on examination by the DPW, to meet all requirements of these rules and regulations.

F. The connection of the building sewer into the POTW shall conform to the requirements of the building and plumbing code or other applicable regulations. The property owner shall construct the building sewer from the property line to the building drain. This construction shall be in accordance with the requirements of the Department of Public Works and as herein stated.

G. The size, slope, alignment, materials of construction of a building sewer, and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling the trench, shall all conform to the requirements of the State Plumbing Code, as applicable and the Department of Public Works Standards. The following are the basic requirements:

(1) Pipe shall be a minimum of four (4) inch diameter for a single family residential dwelling, and a minimum of six (6) inch diameter for a commercial building or multifamily dwelling, as determined by the Director of Public Works.

(2) Pipe material shall be ductile iron, polyvinyl chloride (PVC), or similar material and subject to the approval of the Director of Public Works; all materials to be of sufficient strength for the particular installation.

(3) Pipe joints shall be either factory-made compression-type joints or FERNCO type couplings or equal.

(4) All building sewers shall be laid straight to line and grade, with a minimum pitch of one-quarter (1/4) inch per foot.

(5) All building sewers shall carefully be bedded in pea stone, backfilled, have a minimum of six (6) inch cushion from rock or ledge or other utility, to prevent damage.

(6) All pipe, joints and connections shall be watertight and gastight.

(7) When a new building replaces an existing service at a property, the existing sewer service shall be replaced complete to the sewer main unless the existing connection is approved by the Director of Public Works.

H. Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain may be lifted by an approved means and discharged to the building sewer.

I. The applicant for the building sewer permit shall notify the Department of Public Works when the building sewer is ready for inspection. The inspection will be made by an authorized representative of the Department of Public Works and approval will be given if the installation is accepted. The building sewer shall not be covered or backfilled until this approval is given. All sewer installation work shall be limited to within the time period of 7:00 a.m. and 4:00 p.m., Monday through Friday, excluding holidays. Work shall not be permitted on Saturdays, Sundays or holidays, nor be performed outside of the allowable time period without written authorization from the Director. Should the sewer installation work be performed outside of the above time periods, the user, contractor and/or developer shall pay for the cost of inspection by the Department of Public Works or their designated representative at the rates described herein.

J. The building sewer from the main to the building (or all pipes beyond the tee or wye in the roadway) is the property of the property owner and all repairs to the same must be at his/her expense. If the Director makes an emergency repair to a building sewer, the reasonable costs of such repair may be charged to the property owner as a supplemental fee.

K. No person shall make or have connections of roof downspouts, foundation drains, areaway drains, or other sources of surface runoff groundwater to a building sewer or building drain which in turn is connected directly or indirectly to a public sanitary sewer. Sump or cellar pumps used for the control or relief of groundwater and/or drainage shall not be discharged to the building sewer, either directly or indirectly.

L. All excavations for building sewer installation shall be completed in compliance with all applicable State and Federal regulations and shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the Director of Public Works.

M. Any excavation in Town accepted streets shall be in strict compliance with Department of Public Works Standards.

N. Pumping stations shall not be allowed to be constructed to service proposed subdivisions unless sufficient documentation has been provided to the Department of Public Works that a gravity connection to the Town's sanitary sewer system does not exist nor is feasible to connect into using acceptable engineering practices. Should the Director of Public Works authorize the construction of a pumping station to service a subdivision, the pumping station shall be designed and constructed in accordance with specifications approved by the Director of Public Works.

O. No new services will be granted from November 1 to April 1 except in such cases as deemed emergencies, or otherwise deemed appropriate by the Director.

Applications must be received by October 15 to qualify for installation by November 1.

P. All fittings supplied as a courtesy by the Sewer Division to the consumer, shall be billed to the consumer.

Q. Maintenance and repair of building sewers shall be the responsibility of the property owner. If the Director makes an emergency repair to a building sewer, the reasonable costs of such repair may be charged to the property owner as a supplemental fee.

2.5 Fees

A. User charges

The Town of Ware shall annually establish equitable and just user charges for the use of the sewage facilities to be paid by every owner of an establishment whose building sewers connect directly or indirectly into public sewers. Such annual charges shall be in proportion to the quantity of water supplied to every such establishment, subject to just and equitable discounts and abatements in exceptional cases, or in the case of private water supply, a fair estimate shall be used. The town shall revise the charges for users or user classes to accomplish the following: maintain a proportionate distribution of operation and maintenance cost among users and user classes as required herein; generate sufficient revenue to pay the total operation and maintenance costs necessary to the proper operation and maintenance (including replacement) of the treatment works; and apply excess revenues collected from a class of users to the costs of operation and maintenance attributable to that class for the next year and adjust the rate accordingly. The user charges shall constitute a lien upon the real estate using such public sewers to be collected in the same manner as taxes upon real estate. Such lien shall be proper and superior to every other lien or claim except a lien of an existing tax, water charge or local assessment or in an action of contract in the name of the Town.

B. Charges for Service

The charge for residential or sewer service shall be based upon the quantity of water actually passing through the water meter, whether used or wasted. The rate shall be prevailing rate as established by the Board of Water and Sewer Commissioners per one hundred (100) cubic feet of water consumption as measured on the water meter. In addition to the charge for water consumption, a service charge per billing period shall be billed to all users as approved by the Board of Water and Sewer Commissioners. Service charges for sewer use are listed in Appendix A.

Septic tank sludge from septic tanks located within Ware and from outside Ware will be treated for a fee per gallons as established by the Board of Water and Sewer Commissioners and payable by the firm which delivers the sludge. The fee shall be as shown in Appendix A.

There shall be conducted a regular annual review of the sewer rates.

C. Sewer Abatement Request

1.) The applicant requesting sewer abatement must complete an Application for Sewer Abatement form approved by the Board and submit that form to the Board or designee, within thirty (30) days after the billing period. The applicant must provide a written description as to the reasons why he/she feels the abatement should be granted.

2.) A processing fee of $15.00 shall be charged for all sewer abatement applications submitted for consideration. The fee shall be attached to the application and shall not be refundable if the application is denied.

3.) The Board will determine whether or not to issue abatement. Abatements are issued in the form of a credit on the applicant's next bill.

D. Sewer Abatements Considered for Approval

1.) Agriculture or Horticulture Use
Water not discharged to the sewer system. Abatement requests are considered for dwellings that are designated as Agriculture or Horticulture facilities and are used for the purpose of raising animals or commercial crops when a common water meter is used for the purpose of the farmhouse and livestock watering. The sewer use fee will be based on an average home of similar size and usage.

2.) Filling Swimming Pools
Sewer abatements for the purpose of filling new swimming pools or replacement liners in old pools will be granted by the Board if the abatement value is greater than the cost associated for the Town to process the abatement. The DPW Division will charge a $35.00 service fee for meter readings and man-hours associated with the request for the sewer abatement.

3.) Excessive Usage from Broken Water Pipes
In the event a meter reading is excessive due to broken water pipes, the homeowner may request a sewer abatement if he/she can prove within a reasonable doubt that the excess water did not enter the sewer system.

4.) Inaccurate Readings
Sewer adjustments for inaccurate readings shall be subject to the Water Department confirming the error. The sewer fee charged will be proportional to the corrected water meter reading.

E. Sewer Abatement Not Allowed
Sewer Abatement will not be granted for the following use:

1.) Watering of gardens

2.) General wash-down of automobiles, buildings, driveways, etc.

3.) Watering of lawns

4.) No water meter reading or use (The minimum charge will apply unless the water meter has been removed.)

5.) Any other reason determined by the Board after review

2.6 Prohibited Discharges

A. General Prohibitions.

No User shall introduce or cause to be introduced into the POTW any pollutant or wastewater which causes Pass Through or Interference. These general prohibitions apply to all Users of the POTW whether or not they are subject to categorical Pretreatment Standards or any other National, State, or local Pretreatment Standards or Requirements.

B. Specific Prohibitions. No User shall introduce or cause to be introduced into the POTW the following pollutants, substances, or wastewater:

(1) Pollutants which create a fire or explosive hazard in the POTW, including, but not limited to, wastestreams with a closed-cup flashpoint of less than 140 degrees F (60 degrees C) using the test methods specified in 40 CFR 261.21;

(2) Wastewater having a pH less than 6.5 or more than 9.5, or otherwise causing corrosive structural damage to the POTW or equipment;

(3) Solid or viscous substances in amounts which will cause obstruction of the flow in the POTW resulting in Interference but in no case solids greater than 2 inch(es) in any dimension;

(4) Pollutants, including oxygen-demanding pollutants (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration which, either singly or by interaction with other pollutants, will cause Interference with the POTW;

(5) Wastewater having a temperature which will inhibit biological activity in the treatment plant resulting in Interference, but in no case wastewater which

causes the temperature at the introduction into the treatment plant to exceed 104 degrees F (40 degrees C);

(6) Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin, in amounts that will cause Interference or Pass Through;

(7) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems;

(8) Trucked or hauled pollutants, except at discharge points designated by the Director of Public Works in accordance with Section 3.4 of these regulations;

(9) Noxious or malodorous liquids, gases, solids, or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance or a hazard to life, or to prevent entry into the sewers for maintenance or repair;

(10) Wastewater which imparts color which cannot be removed by normal treatment process, such as, but not limited to, dye wastes and vegetable tanning solutions, which consequently imparts color to the treatment plant's effluent, thereby violating the Town of Ware NPDES permit;

(11) Wastewater containing any radioactive wastes or isotopes except in compliance with applicable State or Federal regulations;

(12) Storm Water, surface water, ground water, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, Non-contact Cooling Water, and unpolluted wastewater, unless specifically authorized by the Director of Public Works;

(13) Sludges, screenings, or other residues from the pretreatment of industrial wastes;

(14) Medical Wastes, except as specifically authorized by the Director of Public Works in an individual wastewater discharge permit;

(15) Wastewater causing, alone or in conjunction with other sources, the treatment plant's effluent to fail toxicity test;

(16) Detergents, surface-active agents, or other substances which that might cause excessive foaming in the POTW;

(17) Fats, oils, or greases of animal or vegetable origin in concentrations greater than that authorized by the Director of Public Works;

(18) Wastewater causing two readings on an explosion hazard meter at the point of discharge into the POTW, or at any point in the POTW, of more than five percent (5%), or any single reading over ten percent (10%), of the lower explosive limit (LEL) of the meter.

C. Pollutants, substances, or wastewater prohibited by this Section shall not be processed or stored in such a manner that they could be discharged to the POTW.

2.7 Polluted Discharge--Restricted

No Person shall discharge or cause to be discharged the following described substances, materials, waters, or Wastes if it appears likely in the opinion of the Director that such Wastes can harm either the Sewers, Wastewater treatment process, or equipment, have an adverse effect on the receiving stream, or can otherwise endanger life, limb, public property, or constitute a nuisance.

In forming an opinion as to the acceptability of these Wastes, the Director will give consideration to such factors as the quantities of subject Wastes in relation to flows and velocities in the Sewers, materials of construction of the Sewers, nature of the Wastewater treatment process, capacity of the Wastewater Treatment Works, degree of treatability of wastes in the Wastewater Treatment Works and other pertinent factors.

The substances restricted are:

1. No waters or wastes containing fats, wax, grease, or oils, whether emulsified or not, in excess of one hundred (100) mg/liter or containing substances which may solidify or become viscous at temperatures between thirty-two degrees (32^o) and one hundred fifty degrees (150^o) Fahrenheit, (zero (0o) and sixty-five degrees (65^o) Centigrade);

2. Any Garbage that has not been properly shredded. The installation and operation of any Garbage grinder equipment with a motor of three-fourths (¾) horsepower (0.76 hp metric) or greater may be subject to the review and approval of the Director;

3. Any waters or Wastes containing phenols or other taste or odor producing substances in such concentrations as to exceed the limits established by the Director and/or the requirements of the state, federal or other public agencies or jurisdictions for such discharge or the Receiving Waters;

4. Materials which exert or cause: Unusual concentrations of inert Suspended Solids (such as, but not limited to, Fuller's earth, lime slurries and lime residues) or of dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate),

   a. Color or Turbidity in such an amount that it will prevent the POTW from discharging a treated effluent in compliance with the water quality standards,

b. Unusual BOD, COD, or Chlorine Demand in such quantities as to constitute a significant load on the POTW,
c. Unusual volume of flow or concentration of waste constituting "slugs" as defined in this chapter;

5. Waters or Wastes containing substances which are not amenable to treatment or reduction by the Wastewater treatment processes employed, or are amenable to treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharges to the Receiving Waters;

6. Septic tank solids that are not diluted sufficiently to assure that all particles will be carried freely under all flow conditions in the Wastewater Treatment Works.

2.8 Polluted Discharges--Options of Director

If any waters or Wastes are discharged, or are proposed to be discharged to the Public Sewers, which water contain the substances in excess of the limits which may be established by the Director of Public Works or possess the characteristics which, in the judgment of the Director of Public Works, may have a deleterious effect upon the Wastewater Treatment Works, processes, equipment, or Receiving Waters, or which otherwise create a hazard to life or constitute a public nuisance, the Director may:

1. Reject the Wastes;

2. Require Pretreatment to an acceptable condition for discharge to the Public Sewers;

3. Require control over the quantities and rates of discharge; and/or

4. Require payment to cover the added cost of handling and treating Wastes not covered by existing taxes or Sewer charges under the provisions of this chapter. The amount to be assessed shall include not only the aforementioned cost but also costs of ascertaining responsibilities.

If the Director permits the Pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the Director, and subject to the requirements of all applicable codes, ordinances and laws.

As set forth in Paragraph 1 above, the Director may restrict any waters or Wastes containing any of the following organic chemicals that exceed the following concentrations:

2.9 National Categorical Pretreatment Standards

Users must comply with the categorical Pretreatment Standards found at 40 CFR Chapter I, Subchapter N, Parts 405—471.

A. Where a categorical Pretreatment Standard is expressed only in terms of either the mass or the concentration of a pollutant in wastewater, the Director of Public Works may impose equivalent concentration or mass limits in accordance with Section 2.9E and 2.9F.

B. When the limits in a categorical Pretreatment Standard are expressed only in terms of mass of pollutant per unit of production, the Director of Public Works may convert the limits to equivalent limitations expressed either as mass of pollutant discharged per day or effluent concentration for purposes of calculating effluent limitations applicable to individual Industrial Users.

C. When wastewater subject to a categorical Pretreatment Standard is mixed with wastewater not regulated by the same Standard, the Director of Public Works shall impose an alternate limit in accordance with 40 CFR 403.6(e).

D. A CIU may obtain a net/gross adjustment to a categorical Pretreatment Standard in accordance with the following paragraphs of this Section.

 (1) Categorical Pretreatment Standards may be adjusted to reflect the presence of pollutants in the Industrial User's intake water in accordance with this Section. Any Industrial User wishing to obtain credit for intake pollutants must make application to the Town of Ware. Upon request of the Industrial User, the applicable Standard will be calculated on a "net" basis (i.e., adjusted to reflect credit for pollutants in the intake water) if the requirements of paragraph (2) of this Section are met.

 (2) Criteria.

  (a) Either (i) The applicable Categorical Pretreatment Standards contained in 40 CFR subchapter N specifically provide that they shall be applied on a net basis; or (ii) The Industrial User demonstrates that the control system it proposes or uses to meet applicable categorical Pretreatment Standards would, if properly installed and operated, meet the Standards in the absence of pollutants in the intake waters.

  (b) Credit for generic pollutants such as biochemical oxygen demand (BOD), total suspended solids (TSS), and oil and grease should not be granted unless the Industrial User demonstrates that the constituents of the generic measure in the User's effluent are substantially similar to the constituents of the generic measure in the intake water or unless appropriate additional limits are placed on process water pollutants either at the outfall or elsewhere.

  (c) Credit shall be granted only to the extent necessary to meet the applicable categorical Pretreatment Standard(s), up to a maximum value equal to the influent value. Additional monitoring may be necessary to determine eligibility for credits and compliance with Standard(s) adjusted under this Section.

(d) Credit shall be granted only if the User demonstrates that the intake water is drawn from the same body of water as that into which the POTW discharges. The Town of Ware may waive this requirement if it finds that no environmental degradation will result.

E. When a categorical Pretreatment Standard is expressed only in terms of pollutant concentrations, an Industrial User may request that Town of Ware convert the limits to equivalent mass limits. The determination to convert concentration limits to mass limits is within the discretion of the Director of Public Works. The Town of Ware may establish equivalent mass limits only if the Industrial User meets all the conditions set forth in Sections 2.9E(l)(a through e) below.

(1) To be eligible for equivalent mass limits, the Industrial User must:

a. Employ, or demonstrate that it will employ, water conservation methods and technologies that substantially reduce water use during the term of its individual wastewater discharge permit;

b. Currently use control and treatment technologies adequate to achieve compliance with the applicable categorical Pretreatment Standard, and not have used dilution as a substitute for treatment;

c. Provide sufficient information to establish the facility's actual average daily flow rate for all waste streams, based on data from a continuous effluent flow monitoring device, as well as the facility's long-term average production rate. Both the actual average daily flow rate and the long-term average production rate must be representative of current operating conditions;

d. Not have daily flow rates, production levels, or pollutant levels that vary so significantly that equivalent mass limits are not appropriate to control 'the Discharge; and

e. Have consistently complied with all applicable categorical Pretreatment Standards during the period prior to the industrial User's request for equivalent mass limits;

(2) An Industrial User subject to equivalent mass limits must:

a. Maintain and effectively operate control and treatment technologies adequate to achieve compliance with the equivalent mass limits;

b. Continue to record the facility's flow rates through the use of a continuous effluent, flow monitoring device;

c. Continue to record the facility's production rates and notify the Director of Public Works whenever production rates are expected to vary by more than 20 percent from its baseline production rates determined, in paragraph 2.9F(1)(c) of this Section. Upon notification of a revised production rate, the Director of Public Works will reassess the equivalent mass limit and revise the limit as necessary to reflect changed conditions at the facility; and

d. Continue to employ the same or comparable water conservation methods and, technologies as those implemented pursuant to paragraphs 2.9 E(l)(a) of this Section so 'long as it discharges under an equivalent mass limit.

(3) When developing equivalent mass limits, the Director of Public Works:

a. Will calculate the equivalent mass limit by multiplying the actual average daily flow rate of the regulated process(es) of the Industrial User by the concentration-based Daily Maximum and Monthly Average Standard for the applicable categorical Pretreatment Standard and the appropriate unit conversion factor;

b. Upon notification of a revised production rate, will reassess the equivalent mass limit and recalculate the limit as necessary to reflect changed conditions at the facility; and

c. May retain the same equivalent mass limit in subsequent individual wastewater discharger permit terms if the Industrial User's actual average daily flow rate was reduced solely as a result of the implementation of water conservation methods and technologies, and the actual average daily flow rates used in the original calculation of the equivalent mass limit were not based on the use of dilution as a substitute for treatment pursuant to Section 2.14. The Industrial User must also be in compliance with Section 13.3 regarding the prohibition of bypass.

F. The Director of Public Works may convert the mass limits of the categorical Pretreatment Standards of 40 CFR Parts 414,419, and 455 to concentration limits for purposes of calculating limitations applicable to individual Industrial Users. The conversion is at the discretion of the Director of Public Works.

G. Once included in its permit, the Industrial User must comply with the equivalent limitations developed in this Section (2.9) in lieu of the promulgated categorical Standards from which the equivalent limitations were derived.

H. Many categorical Pretreatment Standards specify one limit for calculating maximum daily discharge limitations and a second limit for calculating maximum Monthly Average, or 4-day average, limitations. Where such Standards are being applied, the same production or flow figure shall be used in calculating both the average and the maximum equivalent limitation.

I. Any Industrial User operating under a permit incorporating equivalent mass or concentration limits calculated from a production-based Standard shall notify the Director of Public Works within two (2) business days after the User has a reasonable basis to know that the production level will significantly change within the next calendar month. Any User not notifying the Director of Public Works of such anticipated change will be required to meet the mass or concentration limits in its permit that were based on the original estimate of the long term average production rate.

2.10 State Pretreatment Standards

Users must comply with all Commonwealth of Massachusetts Pretreatment Standards. It is the responsibility of the industrial user to identify all applicable Commonwealth of Massachusetts Pretreatment Standards.

2.11 Local Limits

A. The Director of Public Works is authorized to establish Local Limits pursuant to 40 CFR 403.5(c).

B. The following pollutant limits are established to protect against Pass Through and Interference. No person shall discharge wastewater containing in excess of the following local limits. Any industrial user who discharges in excess of the TSS limit may be accessed a surcharge fee.

Maximum Allowable Industrial Headworks Loadings (MAIHL)

Pollutant	Concentration (mg/l)	Loading (lbs/d)
Zinc	8.53 mg/l	6.05 lbs/day
Total Suspended Solids	208.1 mg/l	147.5 lbs/day
Turbidity	49 NTUs	

The above limits apply at the point where the wastewater is discharged to the POTW. All concentrations for metallic substances are for total metal unless indicated otherwise. Director of Public Works may impose mass limitations in addition to the concentration-based limitations above.

C. The Director of Public Works may develop Best Management Practices (BMPs), by regulation or in individual wastewater discharge permits.

2.12 Wastewaters--Containing Fats, Oil, and Grease (FOG)

Grease, oil, and sand interceptors shall be required when, in the opinion of the Director, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand or other harmful ingredients; except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be maintained by the user at user's own expense in continuously efficient operation at all times.

2.13 Right of Revision

The Town of Ware reserves the right to establish, by regulation or in individual wastewater discharge permits, more stringent Standards or Requirements on discharges to the POTW consistent with the purpose of these regulations.

2.14 Dilution

No User shall ever increase the use of process water, or in any way attempt to dilute a discharge, as a partial or complete substitute for adequate treatment to achieve compliance with a discharge limitation unless expressly authorized by an applicable Pretreatment Standard or Requirement. The Director of Public Works may impose mass limitations on Users who are using dilution to meet applicable Pretreatment Standards or Requirements, or in other cases when the imposition of mass limitations is appropriate.

SECTION 3- PRETREATMENT OF WASTEWATER

3.1 Pretreatment Facilities

Users shall provide wastewater treatment as necessary to comply with these regulations and shall achieve compliance with all categorical Pretreatment Standards, Local Limits, discharge permits, and the prohibitions set out in Section 2.1 of these regulations within the time limitations specified by EPA, the Commonwealth of Massachusetts, or the Director of Public Works, whichever is most stringent. Any facilities necessary for compliance shall be provided, operated, and maintained at the User’s expense. Detailed plans describing such facilities and operating procedures shall be submitted to the Director of Public Works for review and approval, and shall be approved in writing by the Director of Public Works before such facilities are constructed. The review of such plans and operating procedures shall in no way relieve the User from the responsibility of modifying such facilities as necessary to produce a discharge acceptable to the Town of Ware under the provisions of these regulations.

3.2 Additional Pretreatment Measures

A. Whenever deemed necessary, the Director of Public Works may require Users to restrict their discharge during peak flow periods, designate that certain wastewater be discharged only into specific sewers, relocate and/or consolidate points of discharge, separate sewage wastestreams from industrial wastestreams, and such other conditions as may be necessary to protect the POTW and determine the User’s compliance with the requirements of these regulations.

B. The Director of Public Works may require any User to install and maintain, on their property and at their expense, a suitable storage and flow-control facility to ensure equalization of flow. An individual wastewater discharge permit may be issued solely for flow equalization.

C. Grease, oil, and sand interceptors shall be provided when, in the opinion of the Director of Public Works, they are necessary for the proper handling of wastewater containing excessive amounts of grease and oil, or sand; except that such interceptors shall not be required for residential users. All interception units shall be of a type and capacity approved by the Director of Public Works, complying with the Town of Ware's standards for grease, oil, and sand interceptors and shall be so located to be easily accessible for cleaning and inspection. Such interceptors shall be inspected, cleaned, and repaired in accordance with the Town of Ware's standards for grease, oil, and sand interceptors by the User at the expense of the User.

D. Users with the potential to discharge flammable substances shall be required to install and maintain an approved combustible gas detection meter.

3.3 Accidental Discharge/Slug Discharge Control Plans

The Director of Public Works shall evaluate whether each SIU needs an accidental discharge/slug discharge control plan or other action to control Slug Discharges. The Director of Public Works may require any User to develop, submit for approval, and implement such a plan or take such other action that may be necessary to control Slug Discharges. Alternatively, the Director of Public Works may develop such a plan for any User. An accidental discharge/slug discharge control plan shall address, at a minimum, the following;

A. Description of discharge practices, including non-routine batch discharges

B. Description of stored chemicals;

C. Procedures for immediately notifying the Director of Public Works of any accidental or Slug Discharge, as required by Section 6.6 of these regulations; and

D. Procedures to prevent adverse impact from any accidental or Slug Discharge. Such procedures include, but are not limited to, inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site runoff, worker training, building of containment structures or equipment measures for containing toxic organic pollutants, including solvents, and/or measures and equipment for emergency response.

3.4 Hauled Wastewater

A. Septic tank waste may be introduced into the POTW only at locations designated by the Director of Public Works, and at such times as are established by the Director of Public Works. Such waste shall not violate Section 2 of these regulations or any other requirements established by Town of Ware. The Director of Public Works may require septic tank waste haulers to obtain individual wastewater discharge permits.

B. The Director of Public Works may require haulers of industrial waste to obtain individual wastewater discharge permits. The Director of Public Works may require generators of hauled industrial waste to obtain individual wastewater discharge permits. The Director of Public Works also may prohibit the disposal of hauled industrial waste. The discharge of hauled industrial waste is subject to all other requirements of these regulations.

C. Industrial waste haulers may discharge loads only at locations designated by the Director of Public Works. No load may be discharged without prior consent of the Director of Public Works. The Director of Public Works may collect samples of each hauled load to ensure compliance with applicable Standards. The Director of Public Works may require the industrial waste hauler to provide a waste analysis of any load prior to discharge.

D. Industrial waste haulers must provide a waste-tracking form for every load. This form shall include, at a minimum, the name and address of the industrial waste hauler, permit number, truck identification, names and addresses of sources of waste, and volume and characteristics of waste. The form shall identify the type of industry known or suspected waste constituents, and whether any wastes are RCRA hazardous wastes.

E. All hauled waste checks shall be made out to the Town of Ware. The proceeds from the treatment of hauled wastewater shall be deposited into the Town of Ware Wastewater Enterprise Account. The money from this account shall only be used for maintenance of the POTW and collection system.

SECTION 4-INDIVIDUAL WASTEWATER DISCHARGE PERMITS

4.1 Wastewater Analysis

When requested by the Director of Public Works, a User must submit information on the nature and characteristics of its wastewater within twenty (20) days of the request. The Director of Public Works is authorized to prepare a form for this purpose and may periodically require Users to update this information.

4.2 Individual Wastewater Discharge Permit Requirement

A. No Significant Industrial User shall discharge wastewater into the POTW without first obtaining an individual wastewater discharge permit from the Director of Public Works, except that a Significant Industrial User that has filed a timely application pursuant to Section 4.3 of these regulations may continue to discharge for the time period specified therein.

B. The Director of Public Works may require other Users to obtain individual wastewater discharge permits as necessary to carry out the purposes of these regulations.

C. Any violation of the terms and conditions of an individual wastewater discharge permit shall be deemed a violation of these regulations and subjects the wastewater discharge permittee to the sanctions set out in Sections 10 through 12 of these regulations. Obtaining an individual wastewater discharge permit does not relieve a permittee of its obligation to comply with all Federal and State Pretreatment Standards or Requirements or with any other requirements of Federal, State, and local law.

4.3 Individual Wastewater Discharge Permitting: Existing Connections

Any Industrial User in possession of a valid individual wastewater discharge permit at the time of promulgation of these regulations may continue discharging under the terms of that permit until the expiration date of the permit.

4.4 Individual Wastewater Discharge Permitting: New Connections

Any User required to obtain an individual wastewater discharge permit who proposes to begin or recommence discharging into the POTW must obtain such permit prior to the beginning or recommencing of such discharge. An application for this individual wastewater discharge permit, in accordance with Section 4.5 of these regulations, must be flied at least thirty (30) days prior to the date upon which any discharge will begin or recommence. Each application for new connection shall be accompanied by the appropriate fee made out to the Town of Ware. A one-time connection fees shall be identified in the individual wastewater discharge permit. Neither of these fees is refundable. A table of the fees is included in the Appendix.

4.5 Individual Wastewater Discharge Permit Application Contents

All Users required to obtain an individual wastewater discharge permit must submit a permit application. The Director of Public Works may require Users to submit all or some of the following information as part of a permit application. Incomplete or inaccurate applications will not be processed and will be returned to the User for revision.

(1) Identifying Information,

a. The name and address of the facility, including the name of the operator and owner.

b. Contact information, description of activities, facilities, and plant production processes on the premises;

(2) Environmental Permits. A list of any environmental control permits held by or for the facility.

(3) Description of Operations.

a. A brief description of the nature, average rate of production (including each product produced by type, amount, processes, and rate of production), and standard industrial classifications of the operation(s) carried out by such User. This description should include a schematic process diagram, which indicates points of discharge to the POTW from the regulated processes.

b. Types of wastes generated, and a list of all raw materials and chemicals used or stored at the facility which are, or could accidentally or intentionally be, discharged to the POTW;

c. Number and type of employees, hours of operation, and proposed or actual hours of operation;

d. Type and amount of raw materials processed (average and maximum per day);

e. Site plans, floor plans, mechanical and plumbing plans, and details to show all sewers, floor drains, and appurtenances by size, location, and elevation, and all points of discharge;

(4) Time and duration of discharges;

(5) The location for monitoring all wastes covered by the permit;

(6) Flow Measurement. Information showing the measured average daily and maximum daily flow, in gallons per day, to the POTW from regulated process streams and other streams, as necessary.

(7) Measurement of Pollutants.

a. The categorical Pretreatment Standards applicable to each regulated process and any new categorically regulated processes for Existing Sources.

b. The results of sampling and analysis identifying the nature and concentration, and/or mass, where required by the Standard or by the Director of Public Works, of regulated pollutants in the discharge from each regulated process.

c. Instantaneous, Daily Maximum, and long-term average concentrations, or mass, where required, shall be reported.

d. The sample shall be representative of daily operations and shall be analyzed in accordance with procedures set out in Section 6.10 of these regulations. Where the Standard requires compliance with a BMP or pollution prevention alternative, the User shall submit documentation as required by the Director of Public Works or the applicable Standards to determine compliance with the Standard.

e. Sampling must be performed in accordance with procedures set out in Section 6.11 of these regulations.

(8) Any requests for a monitoring waiver (or a renewal of an approved monitoring waiver) for a pollutant neither present nor expected to be present in the discharge based on Section 6.4 B.

(9) Any other information as may be deemed necessary by The Director of Public Works to evaluate the permit application.

(10) Each application for a new or the renewal of an individual permit shall be accompanied by a the appropriate fee made out to the Town of Ware. This fee is not refundable.

4.6 Application Signatories and Certifications

A. All wastewater discharge permit applications, User reports and certification statements must be signed by an Authorized Representative of the User and contain the certification statement in Section 6.14 A.

B. If the designation of an Authorized Representative is no longer accurate because a different individual or position has responsibility for the overall operation of the facility or overall responsibility for environmental matters for the company, a new written authorization satisfying the requirements of this Section must be submitted to the Director of Public Works prior to or together with any reports to be signed by an Authorized Representative.

4.7 Individual Wastewater Discharge Permit Decisions

The Director of Public Works will evaluate the data furnished by the User and may require additional information. Within ninety (90) days of receipt of a complete permit application, the Director of Public Works will determine whether to issue an individual wastewater discharge permit. The Director of Public Works may deny any application for an individual wastewater discharge permit at his or her discretion.

SECTION 5- INDIVIDUAL WASTEWATER DISCHARGE PERMIT ISSUANCE

5.1 Individual Wastewater Discharge Permit Duration

An individual wastewater discharge permit shall be issued for a specified time period, not to exceed five (5) years from the effective date of the permit. An individual wastewater discharge permit may be issued for a period less than five (5) years, at the discretion of the Director of Public Works. Each individual wastewater discharge permit will indicate a specific date upon which it will expire.

Individual wastewater permits are non-transferable.

5.2 Individual Wastewater Discharge Permit Contents

An individual wastewater discharge permit shall include such conditions as are deemed reasonably necessary by the Director of Public Works to prevent Pass Through or Interference, protect the quality of the water body receiving the treatment plant's effluent, protect worker health and safety, facilitate sludge management and disposal, and protect against damage to the POTW.

A. Individual wastewater discharge permits shall contain:

(1) A statement that indicates the wastewater discharge permit issuance date, expiration date and effective date;

(2) A statement that the wastewater discharge permit is nontransferable without prior notification to the Town of Ware in accordance with Section 5.5 of these regulations, and provisions for furnishing the new owner or operator with a copy of the existing wastewater discharge permit;

(3) Effluent limits, including Best Management Practices, based on applicable Pretreatment Standards;

(4) Self-monitoring, sampling, reporting, notification, and record-keeping requirements. These requirements shall include an identification of pollutants (or best management practices) to be monitored, sampling location, sampling frequency, and sample type based on Federal, State, and local law.

(5) The process for seeking a waiver from monitoring for a pollutant neither present nor expected to be present in the Discharge in accordance with Section 6.4 B.

(6) A statement of applicable penalties for violation of Pretreatment Standards and Requirements, and any applicable compliance schedule. Such schedule may not extend the time for compliance beyond that required by applicable Federal, State, or local law.

(7) Requirements to control Slug Discharge, if determined by the Director of Public Works to be necessary.

(8) Any grant of a monitoring waiver by the Director of Public Works (Section 6.4 B) must be included as a condition in the User's permit or other control mechanism.

B. Individual wastewater discharge permits may contain, but need not be limited to, the following conditions:

(1) Limits on the average and/or maximum rate of discharge, time of discharge, and/or requirements for flow regulation and equalization;

(2) Requirements for the installation of pretreatment technology, pollution control, or construction of appropriate containment devices, designed to reduce, eliminate, or prevent the introduction of pollutants into the treatment works;

(3) Requirements for the development and implementation of spill control plans or other special conditions including management practices, necessary to adequately prevent accidental, unanticipated, or nonroutine' discharges;

(4) Development and implementation of waste minimization plans to reduce the amount of pollutants discharged to the POTW;

(5) The unit charge or schedule of User charges and fees for the management of the wastewater discharged to the POTW;

(6) Requirements for installation and maintenance of inspection and sampling facilities and equipment, including flow measurement devices;

(7) A statement that compliance with the individual wastewater discharge permit does not relieve the permittee of responsibility for compliance with all applicable Federal and State Pretreatment Standards, including those which become effective during the term of the individual wastewater discharge permit; and

(8) Other conditions as deemed appropriate by the Director of Public Works to ensure compliance with these regulations, and State and Federal laws, rules, and regulations.

5.3 Permit Issuance Process

A. Public Notification. The Director of Public Works will publish a notice of the anticipated issuance of a pretreatment permit at least thirty (30) days prior to issuance. The notice will indicate a location where the draft permit may be reviewed and an address where written comments may be submitted.

B. Permit Appeals. The Director of Public Works shall provide public notice of the issuance of an individual wastewater discharge permit. Any person, including the User, may petition the Director of Public Works to reconsider the terms of an individual wastewater discharge permit within thirty (30) days of notice of its issuance.

(1) Failure to submit a timely petition for review shall be deemed to be a waiver of the administrative appeal.

(2) In its petition, the appealing party must indicate the, individual wastewater discharge permit provisions objected to, the reasons for this objection, and the alternative condition, if any, it seeks to place in the individual wastewater discharge permit.

(3) The effectiveness of the individual wastewater discharge permit shall not be stayed pending the appeal.

(4) If the Director of Public Works fails to act within thirty (30) days, a request for reconsideration shall be deemed to be denied. Decisions not to reconsider an individual wastewater discharge permit, not to issue an individual wastewater discharge permit, or not to modify an individual wastewater discharge permit shall be considered final administrative actions for purposes of judicial review.

(5) Aggrieved parties seeking judicial review of the final administrative individual wastewater discharge permit decision must do so by filing a complaint with the appropriate Court for proper jurisdiction within the Commonwealth of Massachusetts.

5.4 Permit Modification

A. The Director of Public Works may modify an individual wastewater discharge permit for good cause, including, but not limited to the following reasons:

(1) To incorporate any new or revised Federal, State, or local Pretreatment Standards or Requirements;

(2) To address significant alterations or additions to the User's operation, processes, or wastewater volume or character since the time of the individual wastewater discharge permit issuance;

(3) A change in the POTW that requires either a temporary or permanent reduction or elimination of the authorized discharge;

(4) Information indicating that the permitted discharge poses a threat to the Town of Ware POTW, a Town of Ware POTW process, Town of Ware personnel, or the receiving waters;

(5) Violation of any terms or conditions of the individual wastewater discharge permit;

(6) Misrepresentations or failure to fully disclose all relevant facts in the wastewater discharge permit application or in any required reporting;

(7) Revision of or a grant of variance from categorical Pretreatment Standards pursuant to 40 CFR 403.13;

(8) To correct typographical or other errors in the individual wastewater discharge permit; or

(9) To reflect a transfer of the facility ownership or operation to a new owner or operator where requested in accordance with Section 5.5.

B. The Director of Public Works may modify a general permit for good cause, including, but not limited to, the following reasons:

(1) To incorporate any new or revised Federal, State, or local Pretreatment Standards or Requirements;

(2) A change in the POTW that requires either a temporary or permanent reductions or elimination of the authorized discharge;

(3) To correct typographical or other errors in the individual wastewater discharge permit; or

(4) To reflect a transfer of the facility ownership or operation to a new owner or operator where requested in accordance with Section 5.5.

5.5 Individual Wastewater Discharge Permit Transfer

Individual wastewater discharge permits may be transferred to a new owner or operator only if the permittee gives at least thirty (30) days advance notice to the Director of Public Works and the Director of Public Works approves the individual wastewater discharge permit transfer. Permits shall only be transferable if the waste characteristics from the old facility are to remain identical to that of the new one. The notice to the Director of Public Works shall include a written certification by the new owner or operator which:

A. States that the new owner and/or operator has no immediate intent to change the facility's operations and processes;

B. Identifies the specific date on which the transfer is to occur; and

C. Acknowledges full responsibility for complying with the existing individual wastewater discharge permit.

Failure to provide advance notice of a transfer renders the individual wastewater discharge permit void as of the date of facility transfer.

5.6 Individual Wastewater Discharge Permit Revocation

The Director of Public Works may revoke an individual wastewater discharge permit for good cause, including, but not limited to, the following reasons:

A. Failure to notify the Director of Public Works of significant changes to the wastewater prior to the changed discharge;

B. Failure to provide prior notification to the Director of Public Works of changed conditions pursuant to Section 6.5 of these regulations;

C. Misrepresentation or failure to fully disclose all relevant facts in the wastewater discharge permit application;

D. Falsifying self-monitoring reports and certification statements;

E. Tampering with monitoring equipment;

F. Refusing to allow the Director of Public Works timely access to the facility premises and records;

G. Failure to meet effluent limitations;

H. Failure to pay fines;

I. Failure to pay sewer charges;

J. Failure to meet compliance schedules;

K. Failure to complete a wastewater survey or the wastewater discharge permit application;

L. Failure to provide advance notice of the transfer of business ownership of a permitted facility; or

M. Violation of any Pretreatment Standard or Requirement, or any terms of the wastewater discharge permit or these regulations.

Individual wastewater discharge permits shall be voidable upon cessation of operations or transfer of business ownership. All individual wastewater discharge permits issued to a User are void upon the issuance of a new individual wastewater discharge permit to that User.

5.7 Individual Wastewater Discharge Permit Renewal

A User with an expiring individual wastewater discharge permit shall apply for individual wastewater discharge permit renewal by submitting a complete permit application, in accordance with Section 4.5 of these regulations, a minimum of thirty (30) days prior to the expiration of the User's existing individual wastewater discharge permit.

5.8 Regulation of Waste Received from Other Jurisdictions

A. If another municipality, or User located within another municipality, contributes wastewater to the POTW, the Director of Public Works shall enter into an intermunicipal agreement with the contributing municipality.

B. Prior to entering into an agreement required by paragraph A, above, the Director of Public Works shall request the following information from the contributing municipality:

(1) A description of the quality and volume of wastewater discharged to the POTW by the contributing municipality;

(2) An inventory of all Users located within the contributing municipality that are discharging to the POTW; and

(3) Such other information as The Director of Public Works may deem necessary.

C. An intermunicipal agreement, as required by paragraph A, above, shall contain the following conditions:

(1) A requirement for the contributing municipality to adopt a sewer use ordinance or regulations at least as stringent as these regulations. The requirement shall specify that such ordinance and limits must be revised as necessary to reflect changes made to the Town of Ware regulations or Local Limits;

(2) A requirement for the contributing municipality to submit a revised User inventory on at least an annual basis;

(3) A provision specifying which pretreatment implementation activities, including individual wastewater discharge permit issuance, inspection and sampling, and enforcement, will be conducted by the contributing municipality; which of these activities will be conducted by the Director of Public Works; and which of these activities will be conducted jointly by the contributing municipality and the Director of Public Works;

(4) A requirement for the contributing municipality to provide the Director of Public Works with access to all information that the contributing municipality obtains as part of its pretreatment activities;

(5) Limits on the nature, quality, and volume of the contributing municipality's wastewater at the point where it discharges to the POTW;

(6) Requirements for monitoring the contributing municipality's discharge;

(7) A provision ensuring the Director of Public Works access to the facilities of Users located within the contributing municipality's jurisdictional boundaries for the purpose of inspection, sampling, and any other duties deemed necessary by the Director of Public Works; and

(8) A provision specifying remedies available for breach of the terms of the intermunicipal agreement.

SECTION 6- REPORTING REQUIREMENTS

6.1 Baseline Monitoring Reports

A. Within either one hundred eighty (180) days after the effective date of a categorical Pretreatment Standard, or the final administrative decision on a category determination under 40 CFR 403.6(a)(4), whichever is later, existing Categorical Industrial Users currently discharging to or scheduled to discharge to the POTW shall submit to the Director of Public Works a report which contains the information listed in paragraph B, below. At least ninety (90) days prior to commencement of their discharge, New Sources, and sources that become Categorical Industrial Users subsequent to the promulgation of an applicable categorical Standard, shall submit to the Director of Public Works a report which contains the information listed in paragraph B, below. A New Source shall report the method of pretreatment it intends to use to meet applicable categorical Standards. A New Source also shall give estimates of its anticipated flow and quantity of pollutants to be discharged.

B. Users described above shall submit the information set forth below.

(1) All information required in Section 4.5A (1) (a), Section 4.5A (2), Section 4.5A (3) (a), and Section 4.5A (6).

(2) Measurement of pollutants.

a. The User shall provide the information required in Section 4.5 A (7) (a) through (d).

b. The User shall take a minimum of one representative sample to compile that data necessary to comply with the requirements of this paragraph.

c. Samples should be taken immediately downstream from pretreatment facilities if such exist or immediately downstream from the regulated process if no pretreatment exists. If other wastewaters are mixed with the regulated wastewater prior to pretreatment the User should measure the flows and concentrations necessary to allow use of the combined waste stream formula in 40 CFR 403.6(e) to evaluate compliance with the Pretreatment Standards. Where an alternate concentration or mass limit has been calculated in accordance with 40 CFR 403.6(e) this adjusted limit along with supporting data shall be submitted to the Control Authority;

d. Sampling and analysis shall be performed in accordance with Section 6.10;

e. The Director of Public Works may allow the submission of a baseline report which utilizes only historical data so long as the data provides information sufficient to determine the need for industrial pretreatment measures;

f. The baseline report shall indicate the time, date and place of sampling and methods of analysis, and shall certify that such sampling and analysis is representative of normal work cycles and expected pollutant Discharges to the POTW.

(3) Compliance Certification. A statement, reviewed by the User's Authorized Representative as defined in Section 1.4 C and certified by a qualified professional, indicating whether Pretreatment Standards are being met on a consistent basis, and, if not, whether additional operation and maintenance (O&M) and/or additional pretreatment is required to meet the Pretreatment Standards and Requirements.

(4) Compliance Schedule. If additional pretreatment and/or O&M will be required to meet the Pretreatment Standards, the shortest schedule by which the User will provide such additional pretreatment and/or O&M must be provided. The completion date in this schedule shall not be later than the compliance date established for the applicable Pretreatment Standard. A compliance schedule pursuant to this Section must meet the requirements set out in Section 6.2 of these regulations.

(5) Signature and Report Certification. All baseline monitoring reports must be certified in accordance with Section 6.14 A of these regulations and signed by an Authorized Representative as defined in Section 1.4C.

6.2 Compliance Schedule Progress Reports

The following conditions shall apply to the compliance schedule required by Section 6.1(B)(4) of these regulations:

A. The schedule shall contain progress increments in the form of dates for the commencement and completion of major events leading to the construction and operation of additional pretreatment required. for the User to meet the applicable Pretreatment Standards (such events include, but are not limited to, hiring an engineer, completing preliminary and final plans, executing contracts for major components, commencing and completing construction, and beginning and conducting routine operation);

B. No increment referred to above shall exceed nine (9) months;

C. The User shall submit a progress report to The Director of Public Works no later than fourteen (14) days following each date in the schedule and the final date of compliance including, as a minimum, whether or not it complied with the increment of progress, the reason for any delay, and, if appropriate, the steps being taken by the User to return to the established schedule; and

D. In no event shall more than nine (9) months elapse between such progress reports to The Director of Public Works.

6.3 Reports on Compliance with Categorical Pretreatment Standard Deadline

Within ninety (90) days following the date for final compliance with applicable categorical Pretreatment Standards, or in the case of a New Source following commencement of the introduction of wastewater into the POTW, any User subject to such Pretreatment Standards and Requirements shall submit to The Director of Public Works a report containing the information described in Section 4.5A(6) and (7) and 6. 1(B)(2) of these regulations. For Users subject to equivalent mass or concentration limits established in accordance with the procedures in Section 2.9, this report shall contain a reasonable measure of the User's long-term production rate. For all other Users subject to categorical Pretreatment Standards expressed in terms of allowable pollutant discharge per unit of production (or other measure of operation), this report shall include the User's actual production during the appropriate sampling period. All compliance reports must be signed and certified in accordance with Section 6.14 A of these regulations. All sampling will be done in conformance with Section 6.11.

6.4 Periodic Compliance Reports

A. Except as specified in Section 6.4.C, all Significant Industrial Users must, at a frequency determined by The Director of Public Works submit reports indicating the nature, concentration of pollutants in the discharge which are limited by Pretreatment Standards and the measured or estimated average and maximum daily flows for the reporting period. In cases where the Pretreatment Standard requires compliance with a Best Management Practice (BMP) or pollution prevention alternative, the User must submit documentation required by The Director of Public Works or the Pretreatment Standard necessary to determine the compliance status of the User.

B. The Town of Ware may authorize an Industrial User subject to a categorical Pretreatment Standard to forego sampling of a pollutant regulated by a categorical Pretreatment Standard if the Industrial User has demonstrated through sampling and other technical factors that the pollutant is neither present nor expected to be present in the Discharge, or is present only at background levels from intake Water and without any increase in the pollutant due to activities of the Industrial User. This authorization is subject to the following conditions:

(1) The waiver may be authorized where a pollutant is determined to be present solely due to sanitary wastewater discharged from the facility provided that the sanitary wastewater is not regulated by an applicable categorical Standard and otherwise includes no process wastewater.

(2) The monitoring waiver is valid only for the duration of the effective period of the individual wastewater discharge permit, but in no case longer than 5 years. The User must submit a new request for the waiver before the waiver can be granted for each subsequent individual wastewater discharge permit. See Section 4.5A(8).

(3) In making a demonstration that a pollutant is not present, the Industrial User must provide data from at least one sampling of the facility's process wastewater prior to any treatment .present at the facility that is representative of all wastewater from all processes.

(4) The request for a monitoring waiver must be signed in accordance with Section 1 .4C, and include the certification statement in 6.14.A (40 CFR 403 .6(a)(2)(ii)).

(5) Non-detectable sample results may be used only as a demonstration that a pollutant is not present if the EPA approved method from 40 CFR Part 136 with the lowest minimum detection level for that pollutant was used in the analysis.

(6) Any grant of the monitoring waiver by the Director of Public Works must be included as a Condition in the User's permit. The reasons supporting the waiver and any information submitted by the User in its request for the waiver must be maintained by the Director of Public Works for 3 years after expiration of the waiver.

(7) Upon approval of the monitoring waiver and revision of the User's permit by the Director of Public Works, the Industrial User must certify on each report with the statement in Section 6.14 C below, that there has been no

increase in the pollutant in its wastestream due to activities of the Industrial User.

(8) In the event that a waived pollutant is found to be present or is expected to be present because of changes that occur in the User's operations, the User must immediately: Comply with the monitoring requirements of Section 6.4 A, or other more frequent monitoring requirements imposed by the Director of Public Works, and notify the Director of Public Works.

(9) This provision does not supersede certification processes and requirements established in categorical Pretreatment Standards, except as otherwise specified in the categorical Pretreatment Standard.

C. All periodic compliance reports must be signed and certified in accordance with Section 6.14 A of these regulations.

D. All wastewater samples must be representative of the User's discharge. Wastewater monitoring and flow measurement facilities shall be properly operated, kept clean, and maintained in good working order at all times. The failure of a User to keep its monitoring facility in good working order shall not be grounds for the User to claim that sample results are unrepresentative of its discharge.

E. If a User subject to the reporting requirement in this section monitors any regulated pollutant at the appropriate sampling location more frequently than required by the Director of Public Works, using the procedures prescribed in Section 6.11 of these regulations, the results of this monitoring shall be included in the report.

F. Users that send electronic (digital) documents to the Town of Ware to satisfy the requirements of this Section shall also include one hard copy of the report as well;

6.5 Reports of Changed Conditions

Each User must notify the Director of Public Works of any significant changes to the User's operations or system, which might alter the nature, quality, or volume of its wastewater at least ninety (90) days before the change.

A. The Director of Public Works may require the User to submit such information as may be deemed necessary to evaluate the changed condition, including the submission of a wastewater discharge permit application under Section 4.5 of these regulations.

B. The Director of Public Works may issue an individual wastewater discharge permit under Section 5.7 of these regulations or modify an existing wastewater discharge permit under Section 5.4 of these regulations in response to changed conditions or anticipated changed conditions.

6.6 Reports of Potential Problems

A. In the case of any discharge, including, but not limited to, accidental discharges, discharges of a non-routine, episodic nature, a non-customary batch discharge, a Slug Discharge or Slug Load, that might cause potential problems for the POTW, the User shall immediately telephone and notify the Director of Public Works of the incident. This notification shall include the location of the discharge, type of waste, concentration and volume, if known, and corrective actions taken by the User.

B. Within five (5) days following such discharge, the User shall, unless waived by the Director of Public Works, submit a detailed written report describing the cause(s) of the discharge and the measures to be taken by the User to prevent similar future occurrences. Such notification shall not relieve the User of any expense, loss, damage, or other liability, which shall be incurred as a result of damage to the POTW, natural resources, or any other damage to person or property; nor shall such notification relieve the User of any fines, penalties, or other liability which may be imposed pursuant to these regulations.

C. A notice shall be permanently posted on the User's bulletin board or other prominent place advising employees who to call in the event of a discharge described in paragraph A, above. Employers shall ensure that all employees, who could cause such a discharge to occur, are advised of the emergency notification procedure.

D. Significant Industrial Users are required to notify the Director of Public Works immediately of any changes at its facility affecting the potential for a Slug Discharge.

6.7 Reports from Unpermitted Users

All Users not required to obtain an individual wastewater discharge permit shall provide appropriate reports to the Director of Public Works as the Director of Public Works may require.

6.8 Notice of Violation/Repeat Sampling and Reporting

If sampling performed by a User indicates a violation, the User must notify the Director of Public Works within twenty-four (24) hours of becoming aware of the violation. The User shall also repeat the sampling and analysis and submit the results of the repeat analysis to the Director of Public Works within thirty (30) days after becoming aware, of the violation. Re-sampling by the Industrial User is not required if the Town of Ware performs sampling at the User's facility at least once a month, or if the Town of Ware performs sampling at the User between the time when the initial sampling was conducted and the time when the User or Town of Ware receives the results of this sampling, or if the Town of Ware has performed the sampling and analysis in lieu of the Industrial User.

6.9. Notification of the Discharge of Hazardous Waste

A. Any User who commences the discharge of hazardous waste shall notify the POTW, the EPA Regional Waste Management Division Director, and State hazardous waste authorities, in writing, of any discharge into the POTW of a substance which, if otherwise disposed of, would be a hazardous waste under 40 CFR Part 261. Such notification must include the name of the hazardous waste as set forth in 40 CFR Part 261, the EPA hazardous waste number, and the type of discharge (continuous, batch, or other). The notification requirement in this Section does not apply to pollutants already reported by Users subject to categorical Pretreatment Standards under the self-monitoring requirements of Sections 6.1, 6.3, and 6.4 of these regulations.

B. In the case of any new regulations under section 3001 of RCRA identifying additional characteristics of hazardous waste or listing any additional substance as a hazardous waste, the User must notify the Director of Public Works, the EPA Regional Waste Management Waste Division Director, and State hazardous waste authorities of the discharge of such substance within ninety (90) days of the effective date of such regulations.

C. This provision does not create a right to discharge any substance not otherwise permitted to be discharged by these regulations, a permit issued thereunder, or any applicable Federal or State law.

6.10 Analytical Requirements

All pollutant analyses, including sampling techniques, to be submitted as part of a wastewater discharge permit application or report shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto, unless otherwise specified in an applicable categorical Pretreatment Standard. If 40 CFR Part 136 does not contain sampling or analytical techniques for the pollutant in question, or where the EPA determines that the Part 136 sampling and analytical techniques are inappropriate for the pollutant in question, sampling and analyses shall be performed by using validated analytical methods or any other applicable sampling and analytical procedures, including procedures suggested by the Director of Public Works or other parties approved by EPA.

6.11 Sample Collection

Samples collected to satisfy reporting requirements shall be based on data obtained through appropriate sampling and analysis performed during the period covered by the report, based on data that is representative of conditions occurring during the reporting period. All samples shall be included with chain of custody reports.

A. Except as indicated in Section B and C below, the User must collect wastewater samples using 24-hour flow-proportional composite sampling techniques. Using protocols (including appropriate preservation) specified in 40 CFR Part 136 and appropriate EPA guidance, multiple grab samples collected during a 24-hour period may be composited prior to the analysis as follows: for cyanide, total phenols, and sulfides the samples maybe composited in the laboratory or in the field; for volatile organics and oil and grease, the samples may be composited in the laboratory. Grab samples' may be required to show compliance with Instantaneous Limits.

B. Samples for oil and grease, temperature, pH, cyanide, total phenols, sulfides, and volatile organic compounds must be obtained using grab collection techniques.

C. For sampling required in support of baseline monitoring and 90-day compliance reports required in Sections 6.1 and 6.3, a minimum of four (4) grab samples must be used for pH, cyanide, total phenols, oil and grease, sulfide and volatile organic compounds for facilities for which historical sampling data do not exist; for facilities for which historical, sampling data are available, the Director of Public Works may authorize a lower minimum. For the reports required by Section 6.4, the Industrial User is required to collect the number of grab samples necessary to assess and assure compliance with applicable Pretreatment Standards and Requirements.

6.12 Date of Receipt of Reports

Written reports will be deemed to have been submitted on the date postmarked. For reports that are not mailed, postage prepaid, into a mail facility serviced by the United States Postal Service, the date of receipt of the report shall govern.

6.13 Recordkeeping

Users subject to the reporting requirements of these regulations shall retain, and make available for inspection and copying, all records of information obtained pursuant to any monitoring activities required by these regulations, any additional records of information obtained pursuant to monitoring activities undertaken by the User independent of such requirements, and documentation associated with Best Management Practices established under Section 2.4 C. Records shall include the date, exact place, method, and time of sampling, and the name of the person(s) taking the samples; the date analyses were performed; who performed the analyses; the analytical techniques or methods used; and the results of such analyses. These records shall remain available for a period of at least three (3) years. This period shall be automatically extended for the duration of any litigation concerning the User or the Town of Ware to which the documents may be relevant, or where the User has been specifically notified of a longer retention period by the Director of Public Works.

6.14 Certification Statements

A. Certification of Permit Applications, User Reports and Initial Monitoring Waiver: The following certification statement is required to be signed and submitted by Users submitting permit applications in accordance with Section 4.7; Users submitting baseline monitoring, reports under Section 6.1 B (5); Users submitting reports on compliance with the categorical Pretreatment Standard deadlines under

Section 6.3; Users submitting periodic compliance reports required by Section 6.4 A-D, and Users submitting an initial request to forego sampling of a pollutant on the basis of Section 6.4B(4). The following certification statement must be signed by an Authorized Representative as defined in Section 1.4 C:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.
>
> Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

B. Certification of Pollutants Not Present

Users that have an approved monitoring waiver based on Section 6.4 B must certify on each report with the following statement that there has been no increase in the pollutant in its wastestream due to activities of the User.

> Based on my inquiry of the person or persons directly responsible for managing compliance with the Pretreatment Standard for 40 CFR_______ [specify applicable National Pretreatment Standard part(s)], I certify that, to the best of my knowledge and belief, there has been no increase in the level of______ [list pollutant(s)] in the wastewaters due to the activities at the facility since filing of the last periodic report under Section 6.4.A.

SECTION 7— COMPLIANCE MONITORING

7.1 Right of Entry: Inspection and Sampling

The Director of Public Works shall have the right to enter the premises of any User to determine whether the User is complying with all requirements of these regulations and any individual wastewater discharge permit or order issued hereunder. Users shall allow the Director of Public Works ready access to all parts of the premises for the purposes of inspection, sampling, records examination and copying, and the performance of any additional duties.

A. Where a User has security measures in force, which require proper identification and clearance before entry into its premises, the User shall make necessary arrangements with its security guards so that, upon presentation of suitable identification, the Director of Public Works shall be permitted to enter without delay for the purposes of performing specific responsibilities.

B. The Director of Public Works shall have the right to set up on the User's property, or require installation of, such devices as are necessary to conduct sampling and/or metering of the User's operations.

C. The Director of Public Works may require the User to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the User at its own expense. All devices used to measure wastewater flow and quality shall be calibrated quarterly to ensure their accuracy.

D. Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the User at the written or verbal request of the Director of Public Works and shall not be replaced. The costs of clearing such access shall be born by the User.

E. Unreasonable delays in allowing the Director of Public Works access to the User's premises shall be a violation of these regulations. The Director of Public Works at his or her discretion may deem the User's discharge permit null and void.

F. The Director of Public Works shall have the right to bring any state, federal, or local official on a site inspection. The Director of Public Works shall have the right to allow his or her consultant on a site inspection as well.

7.2 Search Warrants

If the Director of Public Works has been refused access to a building, structure, or property, or any part thereof, and is able to demonstrate probable cause to believe that there may be a violation of these regulations, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program of Town of Ware designed to verify compliance with these regulations or any permit or order issued hereunder, or to protect the overall public health, safety and welfare of the community, the Director of Public Works may seek issuance of a search warrant from the appropriate Court having jurisdiction in the Commonwealth of Massachusetts.

SECTION 8- CONFIDENTIAL INFORMATION

Information and data on a User obtained from reports, surveys, wastewater discharge permit applications, individual wastewater discharge permits, and monitoring programs, and from the inspection and sampling activities of the Director of Public Works, shall be available to the public without restriction, unless the User specifically requests, and is able to demonstrate to the satisfaction of the Director of Public Works, that the release of such information would divulge information, processes, or methods of production entitled to protection as trade secrets under applicable State law. Any such request must be asserted at the time of submission of the information or data. When requested and demonstrated by the User furnishing a report that such information should be held confidential, the portions of a report which might disclose trade secrets or secret processes shall not be made available for inspection by the public, but shall be made available immediately upon request to governmental agencies for uses related to the NPDES program or pretreatment program, and in enforcement proceedings involving the person furnishing the report. Wastewater constituents and characteristics and other effluent data, as defined at 40 CFR 2.302, shall not be recognized as confidential information and shall be available to the public without restriction.

SECTION 9- PUBLICATION OF USERS IN SIGNIFICANT NONCOMPLIANCE

The Director of Public Works shall publish annually, in a newspaper of general circulation that provides meaningful public notice within the jurisdictions served by the Town of Ware POTW a list of the Users that, at any time during the previous twelve (12) months, were in Significant Noncompliance with applicable Pretreatment Standards and Requirements. The term Significant Noncompliance shall be applicable to all Significant Industrial Users (or any other Industrial User that violates paragraphs (C), (I) or (H) of this Section) and shall mean:

A. Chronic violations of wastewater discharge limits, defined here as those in which sixty-six percent (66%) or more of all the measurements taken for the same pollutant parameter taken during a six- (6-) month period exceed.(by any magnitude) a numeric Pretreatment Standard or Requirement, including Instantaneous Limits as defined in Section 2;

B. Technical Review Criteria (TRC) violations, defined here as those in which thirty-three percent (33%) or more of wastewater measurements taken for each pollutant parameter during a six- (6-) month period equals or exceeds the product of the numeric Pretreatment Standard or Requirement including Instantaneous Limits, as defined by Section 2 multiplied by the applicable criteria (1.4 for BOD, TSS, fats, oils and grease, and 1.2 for all other pollutants except pH);

C. Any other violation of a Pretreatment Standard or Requirement as defined by Section 2 (Daily Maximum, long-term average, Instantaneous Limit, or narrative standard) that the Director of Public Works determines has caused, alone or in combination with other discharges, Interference or Pass Through, including endangering the health of POTW personnel or the general public;

D. Any discharge of a pollutant that has caused imminent endangerment to the public or to the environment, or has resulted in [the Director's] exercise of its emergency authority to halt or prevent such a discharge;

E. Failure to meet, within ninety (90) days of the scheduled date, a compliance schedule milestone contained in an individual wastewater discharge permit or enforcement order for starting construction, completing construction, or attaining final compliance;

F. Failure to provide, within forty-five (45) days after the due date, any required reports, including (but not limited to) baseline monitoring reports, reports on compliance with categorical Pretreatment Standard deadlines, periodic self-monitoring reports, and reports on compliance with compliance schedules;

G. Failure to accurately report noncompliance; or

H. Any other violation(s), which may include a violation of Best Management Practices, which the Director of Public Works determines will adversely affect the operation or implementation of the local pretreatment program.

SECTION 10—ADMINISTRATIVE ENFORCEMENT REMEDIES

10.1 Notification of Violation

When the Director of Public Works finds that a User has violated, or continues to violate, any provision of these regulations, an individual wastewater discharge permit or order issued hereunder, or any other Pretreatment Standard or Requirement, the Director of Public Works may serve upon that User a written Notice of Violation. Within thirty (30) days of the receipt of such notice, an explanation of the violation and a plan for the satisfactory correction and prevention thereof, to include specific required actions, shall be submitted by the User to the Director of Public Works. Submission of such a plan in no way relieves the User of liability for any violations occurring before or after receipt of the Notice of Violation. Nothing in this Section shall limit the authority of the Director of Public Works to take any action, including emergency actions or any other enforcement action, without first issuing a Notice of Violation.

10.2 Consent Orders

The Director of Public Works may enter into Consent Orders, assurances of compliance, or other similar documents establishing an agreement with any User responsible for noncompliance. Such documents shall include specific action to be taken by the User to correct the noncompliance within a time period specified by the document. Such documents shall have the same force and effect as the administrative orders issued pursuant to Sections 10.4 and 10.5 of these regulations.

10.3 Show Cause Hearing

The Director of Public Works may order a User which has violated, or continues to violate, any provision of these regulations, an individual wastewater discharge permit or order issued hereunder, or any other Pretreatment Standard or Requirement, to appear before the Director of Public Works and show cause why the proposed enforcement action should not be taken. Notice shall be served on the User specifying the time and place for the meeting, the proposed enforcement action, the reasons for such action, and a request that the User show cause why the proposed enforcement action should not be taken. The notice of the meeting shall be served personally or by registered or certified mail (return receipt requested) at least ten (10) days prior to the hearing. Such notice may be served on any Authorized Representative of the User as defined in Section 1.4 C and required by Section 4.7 A. A show cause hearing shall not be a bar against, or prerequisite for, taking any other action against the User.

10.4 Compliance Orders

When the Director of Public Works finds that a User has violated, or continues to violate, any provision of these regulations, an individual wastewater discharge permit, or order issued hereunder, or any other Pretreatment Standard or Requirement, the Director of Public Works may issue an order to the User responsible for the discharge directing that the User come into compliance within a specified time. If the User does not come into compliance within the time provided, sewer service may be discontinued unless adequate treatment facilities, devices, or other related appurtenances are installed and properly operated. Compliance orders also may contain other requirements to address the noncompliance, including additional self-monitoring and management practices designed to minimize the amount of pollutants discharged to the sewer, A compliance order may not extend the deadline for compliance established for a Pretreatment Standard or Requirement, nor does a compliance order relieve the User of liability for any violation, including any continuing violation. Issuance of a compliance order shall not be a bar against, or a prerequisite for, taking any other action against the User.

10.5 Cease and Desist Orders

When the Director of Public Works finds that a User has violated, or continues to violate, any provision of these regulations, an individual wastewater discharge permit or order issued hereunder, or any other Pretreatment Standard or Requirement, or that the User's past violations are likely to recur, the Director of Public Works may issue an order to the User directing it to cease and desist all such violations and directing the User to:

A. Immediately comply with all requirements; and

B. Take such appropriate remedial or preventive action as may be needed to properly address a continuing or threatened violation, including halting operations and/or terminating the discharge.

Issuance of a cease and desist order shall not be a bar against, or a prerequisite for, taking any other action against the User.

10.6 Emergency Suspensions

The Director of Public Works may immediately suspend a User's discharge, after informal notice to the User, whenever such suspension is necessary to stop an actual or threatened discharge which reasonably appears to present or cause an imminent or substantial endangerment to the health or welfare of persons. The Director of Public Works may also immediately suspend a User's discharge, after notice and opportunity to respond, that threatens to interfere with the operation of the POTW, or which presents, or may present, an endangerment to the environment.

A. Any User notified of a suspension of its discharge shall immediately stop or eliminate its contribution. In the event of a User's failure to immediately comply voluntarily with the suspension order, the Director of Public Works may take such steps as deemed necessary, including immediate severance of the sewer connection, to prevent or minimize damage to the POTW, its receiving stream, or endangerment to any individuals. The Director of Public Works may allow the User to recommence its discharge when the User has demonstrated to the satisfaction of the Director of Public Works that the period of endangerment has passed, unless the termination proceedings in Section 10.8 of these regulations are initiated against the User.

B. A User that is responsible, in whole or in part, for any discharge presenting imminent endangerment shall submit a detailed written statement, describing the causes of the harmful contribution and the measures taken to prevent any future occurrence, to the Director of Public Works prior to the date of any show cause or termination hearing under Sections 10.3 or 10.8 of these regulations.

Nothing in this Section shall be interpreted as requiring a hearing prior to any Emergency Suspension under this Section.

10.7 Termination of Discharge

In addition to the provisions in Section 5.6 of these regulations, any User who violates the following conditions is subject to discharge termination:

A. Violation of individual wastewater discharge permit conditions;

B. Failure to accurately report the wastewater constituents and characteristics of its discharge;

C. Failure to report significant changes in operations or wastewater volume, constituents, and characteristics prior to discharge;

D. Refusal of reasonable access to the User's premises for the purpose of inspection, monitoring, or sampling; or

E. Violation of the Pretreatment Standards in Section 2 of these regulations.

Such User will be notified of the proposed termination of its discharge and be offered an opportunity to show cause under Section 10.3 of these regulations why the proposed action should not be taken. Exercise of this option by the Director of Public Works shall not be a bar to, or a prerequisite for, taking any other action against the User.

SECTION .11 - JUDICIAL ENFORCEMENT REMEDIES

11.1 Injunctive Relief

When the Director of Public Works finds that a User has violated, or continues to violate, any provision of these regulations, an individual wastewater discharge permit or order issued hereunder, or any other Pretreatment Standard or Requirement, the Director of Public Works may petition the appropriate Court in the Commonwealth of Massachusetts through the Town of Ware's Attorney for the issuance of a temporary or permanent injunction, as appropriate, which restrains or compels the specific performance of the individual wastewater discharge permit, order, or other requirement imposed by these regulations on activities of the User. The Director of Public Works may also seek such other action as is appropriate for legal and/or equitable relief, including a requirement for the User to conduct environmental remediation. A petition for injunctive relief shall not be a bar against, or a prerequisite for, taking any other action against a User.

11.2 Civil Penalties

A. A User who has violated, or continues to violate, any provision of these regulations, an individual wastewater discharge permit, or order issued hereunder, or any other Pretreatment Standard or Requirement shall be liable to Town of Ware for a maximum civil penalty of $5,000 per violation, per day. In the case of a monthly or other long-term average discharge limit, penalties shall accrue for each day during the period of the violation.

B. To the fullest extent permitted by law, the Director of Public Works may recover reasonable attorneys' fees, court costs, and other expenses associated with enforcement activities, including sampling and monitoring expenses, and the cost of any actual damages incurred by the Town of Ware.

C. Filing a suit for civil penalties shall not be a bar against, or a prerequisite for, taking any other action against a User.

11.3 Remedies Nonexclusive

The remedies provided for in these regulations are not exclusive. The Director of Public Works may take any, all, or any combination of these actions against a noncompliant User. Enforcement of pretreatment violations will generally be in accordance with the Town of Ware enforcement response plan. However, the Director of Public Works may take other action against any User when the circumstances warrant.

SECTION 12- SUPPLEMENTAL ENFORCEMENT ACTION

12.1 Performance Bonds

The Director of Public Works may decline to issue or reissue an individual wastewater discharge permit to any User who has failed to comply with any provision of these regulations, a previous individual wastewater discharge permit, or order issued hereunder, or any other Pretreatment Standard or Requirement, unless such User first files a satisfactory bond, payable to Town of Ware, in a sum not to exceed a value determined by the Director to be necessary to achieve consistent compliance. This bond shall be made payable to the Town of Ware Industrial Wastewater Enterprise Account.

12.2 Liability Insurance

The Director of Public Works may decline to issue or reissue an individual wastewater discharge to any User who has failed to comply with any provision of these regulations, a previous individual wastewater discharge permit, or order issued hereunder, or any other Pretreatment Standard or Requirement, unless the User first submits proof that it has obtained financial assurances sufficient to restore or repair damage to the POTW caused by its discharge.

12.3 Payment of Outstanding Fees and Penalties

The Director of Public Works may decline to issue or reissue an individual wastewater discharge permit to any User who has failed to pay any outstanding fees or penalties incurred as a result of any provision of these regulations, a previous individual wastewater discharge permit, or an order issued hereunder.

12.4 Water and Sewer Supply Severance

Whenever a User has violated or continues to violate any provision of these regulations, an individual wastewater discharge permit, or order issued hereunder, or any other Pretreatment Standard or Requirement, water and sewer service to the User may be severed. Service will recommence, at the User's expense, only after the User has satisfactorily demonstrated its ability to comply.

12.5 Public Nuisances

A violation of any provision of these regulations, an individual wastewater discharge permit, or order issued hereunder, or any other Pretreatment Standard or Requirement is hereby declared a public nuisance and shall be corrected or abated as directed by the Director of Public Works. Any person(s) creating a public nuisance shall be subject to the provisions of Town of Ware bylaws, ordinances, codes and regulations governing such nuisances, including reimbursing the Town of Ware for any costs incurred in removing, abating, or remedying said nuisance.

12.6 Informant Rewards

The Director of Public Works may pay up to one thousand dollars ($1,000) for information leading to the discovery of noncompliance by a User. In the event that the information provided results in a civil penalty or an administrative fine levied against the User, The Director of Public Works may disperse up to ten percent (10%) of the collected fine or penalty to the informant. However, a single reward payment may not exceed ten thousand dollars ($10,000).

12.7 Contractor Listing

Users which have not achieved compliance with applicable Pretreatment Standards and Requirements are not eligible to receive a contractual award for the sale of goods or services to Town of Ware. Existing contracts for the sale of goods or services to the Town of Ware held by a User found to be in Significant Noncompliance with Pretreatment Standards or Requirements may be terminated at the discretion of the Director of Public Works.

SECTION 13 - AFFIRMATIVE DEFENSES TO DISCHARGE VIOLATIONS

13.1 Upset

A. For the purposes of this Section, upset means an exceptional incident in which there is unintentional and temporary noncompliance with categorical Pretreatment Standards because of factors beyond the reasonable control of the User. An upset does not, include noncompliance to the extent caused by operational or equipment error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

B. An upset shall constitute an affirmative defense to an action brought for noncompliance with categorical Pretreatment Standards if the requirements of paragraph (C), below, are met.

C. A User who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and the User can identify the cause(s) of the upset;

(2) The facility was at the time being operated in a prudent and workman-like manner and in compliance with applicable operation and maintenance procedures; and

(3) The User has submitted the following information to the Director of Public Works within twenty-four (24) hours of becoming aware of the upset if this information is provided orally, a written submission must be provided within five (5) days:

(a) A description of the indirect discharge and cause of noncompliance;

(b) The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

(c) Steps being taken and/or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

D. In any enforcement proceeding, the User seeking to establish the occurrence of an upset shall have the burden of proof.

E. Users shall have the opportunity for judicial determination on any claim of upset only in an enforcement action brought for noncompliance with categorical Pretreatment Standards.

F. Users shall control production of all discharges to the extent necessary to maintain compliance with categorical Pretreatment Standards upon reduction, loss, or failure of its treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

13.2 Prohibited Discharge Standards

A User shall have an affirmative defense to an enforcement action brought against it for noncompliance with the general prohibitions in Section 2.1(A) of these regulations or the specific prohibitions in Sections 2.1 (B)(3) through (16) of these regulations if it can prove that it did not know, or have reason to know, that its discharge, alone or in conjunction with discharges from other sources, would cause Pass Through or Interference and that either:

A. A Local Limit exists for each pollutant discharged and the User was in compliance with each limit directly prior to, and during, the Pass Through or Interference; or

B. No Local Limit exists, but the discharge did not change substantially in nature or constituents from the User's prior discharge when the Town of Ware was regularly in compliance with its NPDES permit, and in the case of Interference, was in compliance with applicable sludge use or disposal requirements.

13.3 Bypass

A. For the purposes of this Section,

(1) Bypass means the intentional diversion of wastestreams from any portion of a User's treatment facility.

(2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

B. A User may allow any bypass to occur which does not cause Pretreatment Standards or Requirements to be violated, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of paragraphs (C) and (D) of this Section.

C. Bypass Notifications

(1) If a User knows in advance of the need for a bypass, it shall submit prior notice to the Director of Public Works, at least ten (10) days before the date of the bypass, if possible.

(2) A User shall submit oral notice to the Director of Public Works of an unanticipated bypass that exceeds applicable Pretreatment Standards within twenty-four (24) hours from the time it becomes aware of the bypass. A written submission shall also be provided within five (5) days of the time the User becomes aware of the bypass. The written submission shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times, and, if the bypass has not .been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass. The Director of Public Works may waive the written report on a case-by-case basis if the oral report has been received within twenty-four (24) hours.

D. Bypass

(1) Bypass is prohibited, and the Director of Public Works may take an enforcement action against a User for a bypass, unless

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(c) The User submitted notices as required under paragraph (C) of this section.

(2) The Director of Public Works may approve an anticipated bypass, after considering its adverse effects, if the Director of Public Works determines that it will meet the three conditions listed in paragraph (D)(l) of this Section.

SECTION 14- WASTEWATER TREATMENT RATES - [RESERVED] - See Appendix

SECTION 15- MISCELLANEOUS PROVISIONS

15.1 Pretreatment Charges and Fees

The Board of Selectmen may adopt reasonable fees for reimbursement of costs of setting up and operating the Town of Ware Pretreatment Program, which may include:

A. Fees for wastewater discharge permit applications including the cost of processing such applications;

B. Fees for monitoring, inspection, and surveillance procedures including the cost of collection and analyzing a User's discharge, and reviewing monitoring reports and certification statements submitted by Users;

C. Fees for reviewing and responding to accidental discharge procedures and construction;

D. Fees for filing appeals;

E. Fees to recover administrative and legal costs (not included in Section 15.1 B) associated with the enforcement activity taken by the Director of Public Works to address IU noncompliance; and

F. Fees for the review of proposed Pretreatment system and modifications to Pretreatment systems.

G. Fees for analytical requirements at the POTW, which would regularly not be included in the POTW NPDES permit testing protocol.

H. Fees associated with any NPDES Permit required reports (e.g. plant rating studies), pretreatment system evaluation and design, and the design and construction of upgrades required at the POTW which are due solely or in part to the User's discharge. These fees may be assessed as a lump sum connection fee. The Control Authority will provide backup for such fees;

I. Fees to recover any NPDES permit violations which can be attributed to a User's individual wastewater discharge permit violation; and

J. Other fees as the Town of Ware may deem necessary to carry out the requirements contained herein. These fees relate solely to the matters covered by these regulations and are separate from all other fees, fines, and penalties chargeable by the Town of Ware.

15.2 Severability

If any provision of these regulations is invalidated by any court of competent jurisdiction, the remaining provisions shall not be affected and shall continue in full force and effect.

SECTION 16 – BETTERMENT ASSESSMENTS

16.1 Authority

The Town of Ware, acting through its Board of Selectmen serving as Water and Sewer Commissioners, shall assess the owners of land abutting a public sewer line installed by the Town by a rate based upon the uniform unit method. Sewer Assessments shall be determined utilizing the total number of existing residential sewer units to be served, or the residential equivalent of commercial, industrial or semi-public uses and shall be levied as betterment assessments or alternatively sewer privilege fees as described herein.

The authority to assess betterments, as well as the permitted methodologies for doing so, are described in MGL Ch. 80, §§ 14 through 24.

If any provision of these regulations or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of these regulations which can be given effect without such invalid provisions or applications.

16.2 Method of Assessing Betterments and Sewer Privilege Fees

A. General

The Town of Ware shall assess sewer betterments based upon the uniform unit method. Properties abutting a sewered street shall be assessed by a rate proportional to the total number of existing sewer units to be served at the time of the assessment. Said rate shall be determined by user class and shall apply to all lands developed or undeveloped abutting a sewered street. The total assessments shall not exceed the local share of the total sewer project cost which shall include total costs of engineering, survey, design, construction, land acquisition, construction engineering services, legal services and all related contingencies, less all state and federal aid received and other contributions to the project cost from other sources.

The Board shall levy, by preparing an Order of Assessment, assessments against all properties abutting a sewered street within six months after completion of the pertinent construction and of the subject portion of the sewer system (approved by the Board of Selectmen) for its intended use. In the Order of Assessment, the Board shall designate the owner of each parcel as of the preceding January first, as liable to assessment as stated under the provisions of the Massachusetts General Laws.

B. Time of Assessment

(1) Betterments – The number of existing sewer units shall be determined by the Board of Selectmen for each sewer construction project approved by the Town Meeting. The time of assessment for lands abutting the sewered

street shall be that date upon which the sewer system with appurtenances is "approved for use". In the case where the construction of that portion of the sewer system (lateral sewers) funded by betterments is completed prior to the date upon which the sewer system is "approved for use" it shall be within the discretion of the Board of Selectmen to establish an earlier date of assessment.

(2) Sewer Privilege Fees – For those properties not abutting the sewer line at the time of construction, but tying into the system at a future date, the time of assessment shall be the date upon which that property connects into the sewer system.

(3) For those properties serviced by the sewer system but subdivided at a future date, the time of assessment for the unsewered subdivision shall be the date upon which those subdivisions connect to the sewer system.

16.3 Sewer Unit Designation

A. General

Sewer units shall be determined based upon the user class of those properties to be assessed a betterment. Said classes shall include residential and non-residential. The non-residential class shall include commercial, industrial, municipal and any or all other non-residential properties and sewer units shall be determined based upon the residential equivalent of such commercial, industrial, municipal or other non-residential class, as provided herein.

B. Sewer Unit Determinations

Properties receiving direct benefit from the public sewer system, whether developed or undeveloped, shall be designated a number of sewer units in accordance with the following:

(1) Residential Developed:

(a) Single family dwellings shall comprise one sewer unit.

(b) Multiple family dwellings (more than one dwelling unit) shall comprise a number of sewer units based upon the following methodology:

i. Rental properties (apartments) shall be assessed one sewer unit for each apartment with more than one bedroom. Rental properties shall be assessed one-half of one sewer unit for each one bedroom or studio apartment.

ii. Condominium complexes shall be assessed one sewer unit for each dwelling unit.

(2) Non-Residential – Developed with Town water:

(a) Non-residential property shall include all industrial, commercial and municipal properties.

(b) Non-residential buildings which are metered for water use shall comprise a number of sewer units based upon the average water consumption for the 12 months preceding the appropriation of the funds for construction using the following formula:

$$\frac{\text{Water Usage (gpd)}}{\text{200 gpd}} = \text{Equivalent number of sewer units}$$

(All decimals shall be rounded up to the next whole highest number)

(3) Non-Residential – Developed without Town water:

(a) Non-residential buildings not metered for water use shall be assigned a water consumption volume by the Ware Board of Health based on Title 5 of the State Environmental Code for the Commonwealth of Massachusetts, Minimum Requirements for the Subsurface Disposal of Sanitary Sewage. An equivalent number of sewer units shall then be determined by using the following formula:

$$\frac{\text{Non-Residential Sewage Per Day (gpd)}}{\text{200 gpd}} = \text{Equivalent number of sewer units}$$

(All decimals shall be rounded up to the next whole highest number)

(4) Residential – Undeveloped:

(a) Undeveloped lots shall be assigned one sewer unit and be assessed accordingly. Future subdivisions of the assessed lot shall be subject to the assessment of sewer privilege fees.

(5) Non-Residential – Undeveloped:

(a) Undeveloped lots shall be assigned one sewer unit and be assessed accordingly. The lot shall be subject to the assessment of sewer privilege fees. Future use of the land shall govern the assessment of sewer privilege fees.

16.4 Betterment Payment

A. General

Except as herein provided, the provisions of Massachusetts General Laws relative to the assessment, apportionment, division, reassessment, abatement and collection of sewer assessments, liens therefor, and interest thereon shall apply to assessments made under this bylaw, and the Board of Assessors and Treasurer/Collector of the Town shall have all of the powers conveyed by Massachusetts General Laws relative to such assessments.

B. Lump Sum Betterments

The lump sum betterment payment for an assessed property shall be based upon the total number of sewer units designated for said property at the time of assessment. Said number of sewer units shall be determined as described herein.

C. Apportionment of Betterment Payment

Property owners shall have the option to apportion betterment payments in accordance with MGL Ch. 80, § 13. The interest rate charged by the Town shall be the rate being charged to the Town for the sewer construction project bond, plus any interest required by Massachusetts General Laws.

16.5 Sewer Privilege Fee

A. Private Sewer Extension

If a developer or a person other than the Town of Ware, or duly authorized representative of the Town, constructs a sewer extension to the public sewer system, the Town shall assess a sewer privilege fee in lieu of betterment assessment with respect to each sewer unit to be served by said sewer extension. The sewer privilege fee shall be equivalent to $7,500 per residential unit; non-residential units shall be $7,500 multiplied by the sewer unit calculation described in Section 16.3(B)(2) of this bylaw. Sewer privilege fees shall be levied at the time of connection to the public sewer system. Sewer Privilege Fees shall be paid in a lump sum at the time of connection.

In addition, the developer and/or property owners connecting to a private sewer extension shall bear the burden of all costs, including costs of legal services, related to the following:

(1) Review of design plans and specifications for the private sewer

extensions to be accepted as part of the public sewer system conducted by a Registered Professional Engineer as authorized by the Board of Selectmen.

(2) Inspection fees of the Board related to the installation of the private sewer extension tying into the public sewer system.

(3) Application fees for a building Sewer Connection Permit, which shall include all reasonable costs related to installation inspection performed by an inspector for the Town of Ware.

Private costs associated with the design and construction of a private sewer extension shall not be considered with respect to the sewer privilege fee. Payments or method of payment related to these costs shall not be reflected within the sewer privilege fee.

16.6 Public Sewers in Unaccepted Ways

If a property abuts a private or unaccepted way within which a public sewer has been installed, or if a property lies within one hundred (100) feet of a public sewer within a private or unaccepted way, the Town shall assess a sewer privilege fee in lieu of betterment assessment against said property. The sewer privilege fee shall be equivalent to the betterment assessment for said property as determined by the procedures outlined in Section 16.3 of these regulations and shall be levied at the time of connection to the public sewer. All provisions governing the payment and method of payment related to betterment assessments as described in Section 16.4 of these regulations shall apply.

SECTION 17 - EFFECTIVE DATE

These regulations shall be in full force and effect immediately following their passage, approval, and publication, as provided by law.

Adopted by the Board of Selectmen, July 21, 2015.

APPENDIX A

FEES

A-1 New Services

A. Application and Inspection Fee
The "**Application and Inspection Fee**" for a building sewer connection to the public sewer shall be $200.

B. Connection Fees
The "**Connection Fee**" for a building sewer connection to the public sewer shall be as follows:

1. Residential - A Sewer Connection ("Entrance") fee for individual residential sewer connections shall be two thousand two hundred and fifty dollars ($2,250.00).

2. Commercial - A Sewer Connection ("Entrance") fee for individual commercial sewer connections shall be five thousand dollars ($5,000.00).

3. Industrial - A Sewer Connection ("Entrance") fee for individual industrial sewer connections shall be ten thousand dollars ($10,000.00).

4. Subdivision - A Sewer Connection ("Entrance") fee for subdivisions of land shall be two thousand five hundred dollars ($5,000.00). This fee shall cover connections to the existing main sewer line by a new main sewer line in the proposed street. Entrance fees for individual lots will also apply to each lot within the subdivision.

5. In addition to the Sewer Connection ("Entrance") fee for subdivisions, an added cost per building lot proposed in a subdivision may be assessed for purposes of compensating the Town for administrative and construction inspection costs incurred. This cost per lot will be as established by the Board of Water and Sewer Commissioners.

Prior to issuance of a building permit for a building to be connected to the municipal sewer, the entire “Entrance Fee,” must be paid in full. The “Entrance Fee” for a subdivision connection must be paid in full prior to work being started on said connection by either Department of Public Works forces or by a private contractor.

A-2 Charges for sewer service.

A. User Fees (all users)

1. Base Charge – A base charge of $37.50 per quarter shall be charged for all active accounts. This base charge will cover the first 500 cubic feet of sewerage as measured by the water meter for the structure

2. User Fee – Sewer fees for all use above the minimum as defined in section 1 above shall be $3.93 per hundred cubic feet as measured by the water meter for the structure.

A.3 Charges of hauled waste

Septic tank sludge from septic tanks located within Ware will be treated for a fee per gallons of $0.05. The fee for waste from outside of town shall be $0.10 per gallon

A.4 Interest

The Sewer Division may charge interest on overdue bills for sewer charges, charges, fees or costs at the rate of 14% per annum.

Betterment Assessments shall bear an interest rate of two (2%) percent per annum above the rate of interest rate chargeable to the Town of Ware as provided in MGL Ch. 80, §13.

<u>APPENDIX E</u>

Open Space and Recreation Plan

Open Space & Recreation Plan

Town of Ware Massachusetts

March 3, 2016

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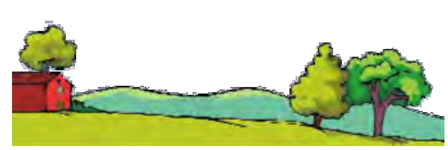

Plan Summary

During the development of the 2013 update to the Town of Ware's 2007 Open Space and Recreation Plan (OSRP), there was much discussion about the definition of 'open space'. For the purposes of this plan, open space is defined broadly and can include conservation land, active recreation lands such as ball fields and playgrounds, passive recreation lands including trails or places for nature observation, agricultural land, greenways and parks, forest land, open fields, and waterways and wetlands. Generally, open space refers to an undeveloped area used for conservation or recreation purposes. Working woodlands managed for timber harvest, as well as land with active agricultural operations, are also considered open space.

Included within the 2013 OSRP is a detailed environmental inventory and assessment as well as a discussion about community demographics and growth and development patterns. Together, this information is used to understand the needs of the community relative to open space and recreation. Community input has also been sought to inform a more complete picture of what gives Ware its sense of place and makes it a community in which people choose to live today and in the years to come.

Through the analysis of data and public input process, four goals for open space and recreation in the Town of Ware were identified:

Goal #1: Provide a broad range of high quality recreational programs.

Goal #2: Manage open space and recreation cohesively and effectively.

Goal #3: Preserve town's rural characteristics.

Goal #4: Increase public awareness of open space and recreation resources.

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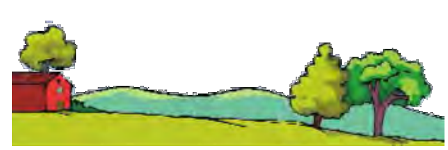

Introduction — Section 2

Statement of Purpose

The 2013 Open Space and Recreation Plan (OSRP) was developed to update the 2007 OSRP that was due to expire in 2014. The current OSRP offers many benefits to the Town of Ware, most notably the ability to recognize community characteristics that contribute to Ware's sense of place, and thus plan for their preservation. Likewise, when followed, this Plan can be an effective mechanism for achieving the community goals for open space and recreation identified in this plan.

Since the 2007 OSRP was completed, the community has been very active at improving and expanding recreational opportunities through the Parks and Recreation Commission and the Open Space Committee. Some of these projects include:

- Open Space Preservation – participation in the purchase by the East Quabbin Land Trust of the Hyde Woodland Preserve, a 100 acre woodland in the Dougal Range.
- Open Space and Agricultural Preservation – participation in the purchase by the East Quabbin Land Trust of the Frohloff Farm, an 88 acre property along the Ware River and at the southern end of the Dougal Range.
- Open Space Preservation - participation in a Conservation Restriction for a private property owner of 51 acres in the Dougal Range.
- Recreation – Upgrades to the facilities at Memorial Field, included new lighting system for baseball and soccer/football fields, reseeded the fields, and new walking path around the perimeter of the park.
- Recreation - Created a new ball field with fence at Grenville Park, used for tee ball.
- Recreation - Improvements to ball field at Grenville Park: raised and leveled to correct drainage issues in both infield and outfield, reseeded field and recreated infield.
- Recreation - Installed bocce court and horse shoe pits at Grenville Park.
- Recreation - Replaced all roofs on dugouts at Memorial Field, Kubinski Field, and the first and second baseball diamonds at Grenville Park, replaced asphalt roofs with metal and replaced rotten boards.
- Recreation - Installed underground electric service to band shell, park restrooms, and main baseball field at Grenville Park. Updated service in all locations.
- Recreation - Refurbished the band shell at Grenville Park and installed a new ADA compliant ramp.
- Recreation - Created two wheel chair accessible fishing piers with parking at Grenville Park.

Table 2-1: Open Space & Recreation Plan Committee

Herb Foley	Open Space Committee
Bill Imbier	Parks Commission
Brian Klassanos	Land owner
Danielle Souza	Recreation leagues
David Kopacz	Conservation Commission
Joe Knight	Planning Board
Denis Ouimette	Finance Committee
Kathy Cronin	Open Space Committee
Kevin McClure	Scouts
Diana Petersen	Resident, Business person
Nancy Talbot	Board of Selectmen

- Recreation - Installed a new boat ramp for trailered boat access at Grenville Park, along with a new dock to fish from and use in launching.
- Recreation - Roadway and parking lot improvements at Grenville Park, including paving the entrance and exit roads of the park, enlarging the main parking lot, installing drainage to handle high ground water around parts of parking lot, and paving to restrooms to better accommodate ADA needs.
- Recreation - Installed new roofs on all buildings at Reed Pool, including the bath house, filter house, and concession stand.
- Recreation - Upgrades at Reed Pool including installation of a new sand filter and chemical control system as well as safety devices, and upgrades to the electrical services in the filter house.
- Recreation - Introduced wheel chair accessible picnic tables into the park systems.
- Recreation - Added on to our hiking trails in Grenville park. Cutting of trees and wood chipped paths.
- Recreation - Installed two bridges on, and opened, southern section of Ware River Greenway rail trail.
- Refurbished and reinstalled the historic fountain in Nenameseck Square, including installation of a new upgraded pump system.

Planning Process and Public Participation

The Ware Board of Selectmen appointed an 11 member Open Space and Recreation Committee to work with the Pioneer Valley Planning Commission (PVPC) to develop an update to the 2007 OSRP. Table 2-1 lists the members to the Committee and their affiliation. Additionally, the Town Manager Stuart Beckley and the Town Planner Karen Cullen assisted the Committee. Funding for the PVPC's assistance was provided by a District Local Technical Assistance Grant to the Town of Ware. The OSRP update was developed to meet the requirements of the Executive Office of Energy and Environmental Affairs, Department of Conservation Services 2008 guidelines.

The Open Space and Recreation Plan Committee met six times on the following dates:

- Thursday, May 2, 2013
- Thursday, June 6, 2013
- Thursday, June 27, 2013
- Tuesday, July 30, 2013
- Tuesday, October 1, 2013
- Wednesday, March 2, 2016

Public input for the plan was conducted in several ways. A community survey was issued from June 7 through September 10, 2013. The survey was available electronically on Survey Monkey and in paper format at the Town Clerk's Office, the Young Men's Library Association, Reed Municipal Pool, and the Ware Senior Center. Press releases about the availability of the survey were issued in July, August and September, and an article ran in the Ware River News each month. A link to the survey was posted on the Town website. The Town received 103 survey responses, or approximately 2.5% of households.

In addition, a public visioning session was held on Monday, September 9, 2013 from 7-9 pm at the Ware Junior/Senior High School. The visioning session offered a public forum for discussing goals and strategies for addressing the future of open space and recreation in Ware. Despite broad outreach about the visioning session conducted in tandem with all notifications about the community survey, and the visioning session included as a "Save the date" on the survey itself, only 15 people attended the visioning session. Despite limited public participation in the survey and visioning session, the Committee utilized the information received from those engaged citizens.

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Community Setting — Section 3

A. Regional Context

Ware is located in the Connecticut River watershed in the southeast corner of Hampshire County along the southeastern shore of the Quabbin Reservoir. The town is characterized by an abundance of surface waters that generally flow along a series of north and south running valleys carved by glaciers. The Ware River valley extends along the town's eastern border; the Muddy Brook and Flat Brook valleys are located near the town's geographical center; the Swift River valley extends from the Quabbin Reservoir along the western town boundary. See Maps 1 and 2 for the regional context.

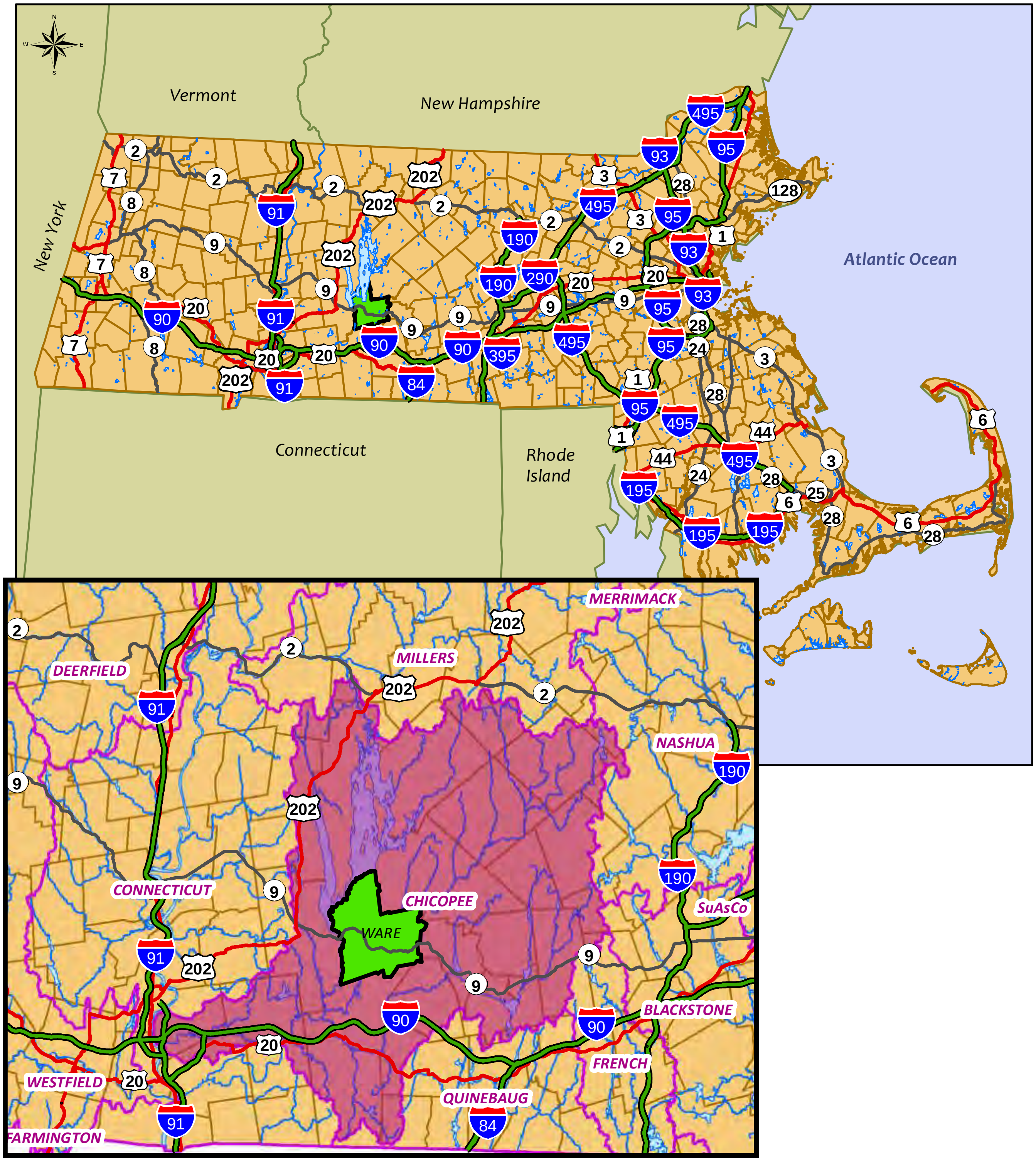
Ware has an area of 25,570 acres or approximately 40 square miles. It is bordered by: Belchertown to the west; New Salem, Petersham, and Hardwick to the north; New Braintree and West Brookfield to the east; and Warren and Palmer to the South. The Town is located approximately 27 miles from the City of Springfield to the southwest and 27 miles from the City of Worcester to the east.

Although major transportation corridors (Routes 9 and 32) in Ware have seen much development in recent times, the town has retained a rural character and historic appearance. Contributing to Ware's rural character is the Quabbin Reservoir, a part of which is in the town's northwestern corner. Built between 1928 and 1939 to provide water to the residents of Boston, the reservoir has 38.6 square miles of water surface, 118 miles of shoreline, 120 square miles of associated protected open space, and at capacity contains 412 billion gallons of water (see Table 3-1). Approximately 8,047 acres of protected land within the Quabbin Reservoir watershed is located in the Town of Ware.

Table 3-1: Protected Lands Associated with the Quabbin Reservoir

Landowner	Acres	Notes
Department of Conservation and Recreation (DCR) - Division of Water Supply Protection	53,987	
DCR – Division of State Parks and Recreation and Bureau of Forestry	2,381	Includes: Federated Women's Club State Forest, Shutesbury State Forest, Wendell State Forest, New Salem State Forest, Petersham State Forest
Department of Fish and Game - Division of Fisheries and Wildlife	3,015	Philipston Wildlife Management Area (WMA), Popple Camp WMA (Petersham), Racoon Hill WMA (Barre), other Barre WMAs, Wendell WMA, Petersham WMA
Private lands	17,200	Harvard University, Massachusetts Audubon Society, and the Trustees of Reservations
Total	76,583	120 square miles

Source: Quabbin Reservoir Watershed System, Land Management Plan 2007-2017



Legend

- Chicopee Basin
- Major Basins
- Rivers and Streams
- Lakes and Ponds

Open Space & Recreation Plan

Map 1: Vicinity and Major Watersheds

May 24, 2013

Sources:
MassGIS: Major Watershed Basins, Waterbodies, Rivers, Roads, Towns

Town of Ware
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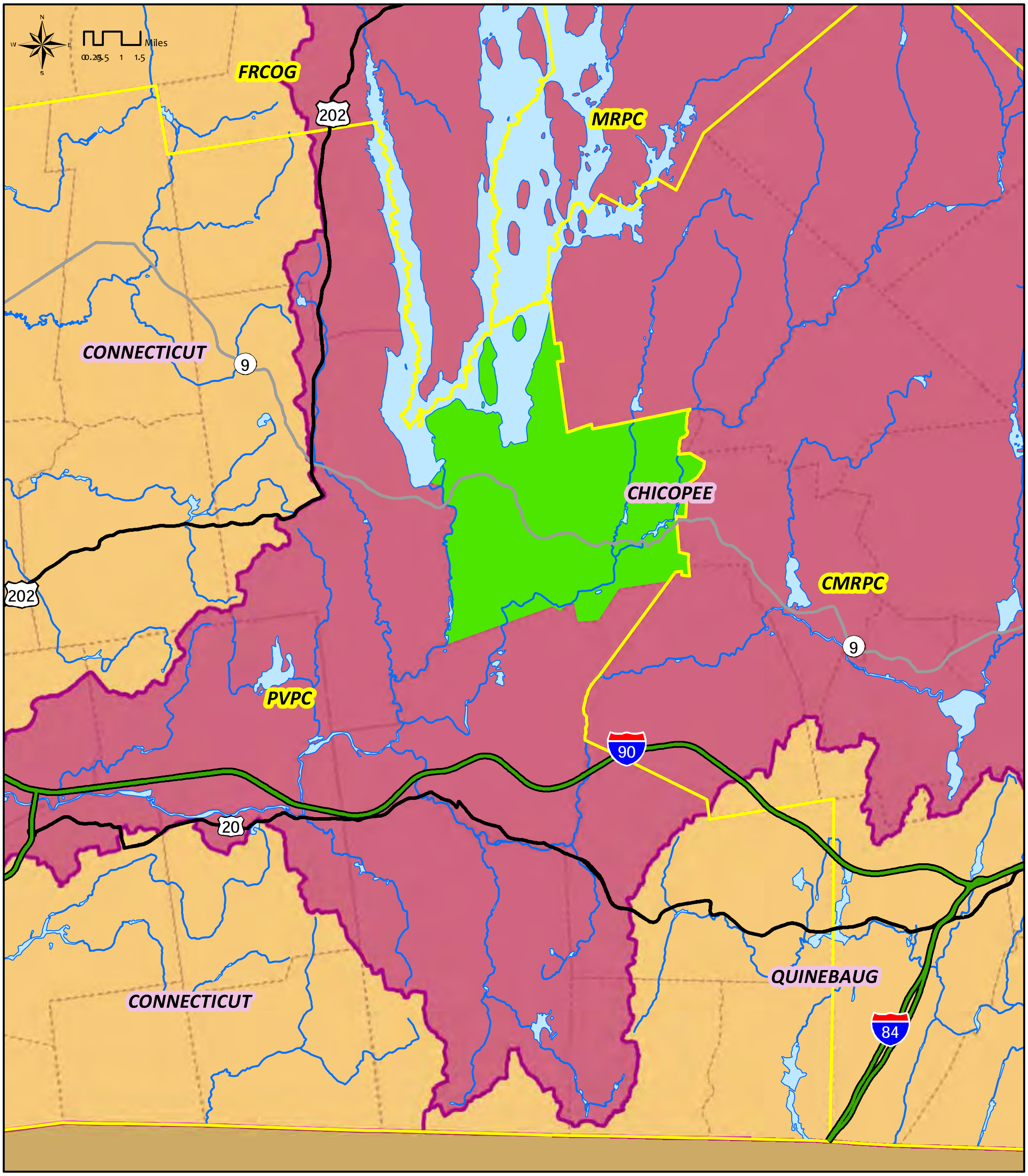
Ware, MA 01082

www.townofware.com



Legend

- Ware
- Major Basins
- Chicopee Basin
- Regional Planning Agencies

Open Space & Recreation Plan

Map 2: Regional Context

May 24, 2013

Sources:
MassGIS: Watershed Basins, Regional Planning Agencies, Waterbodies, Rivers, Roads, Towns

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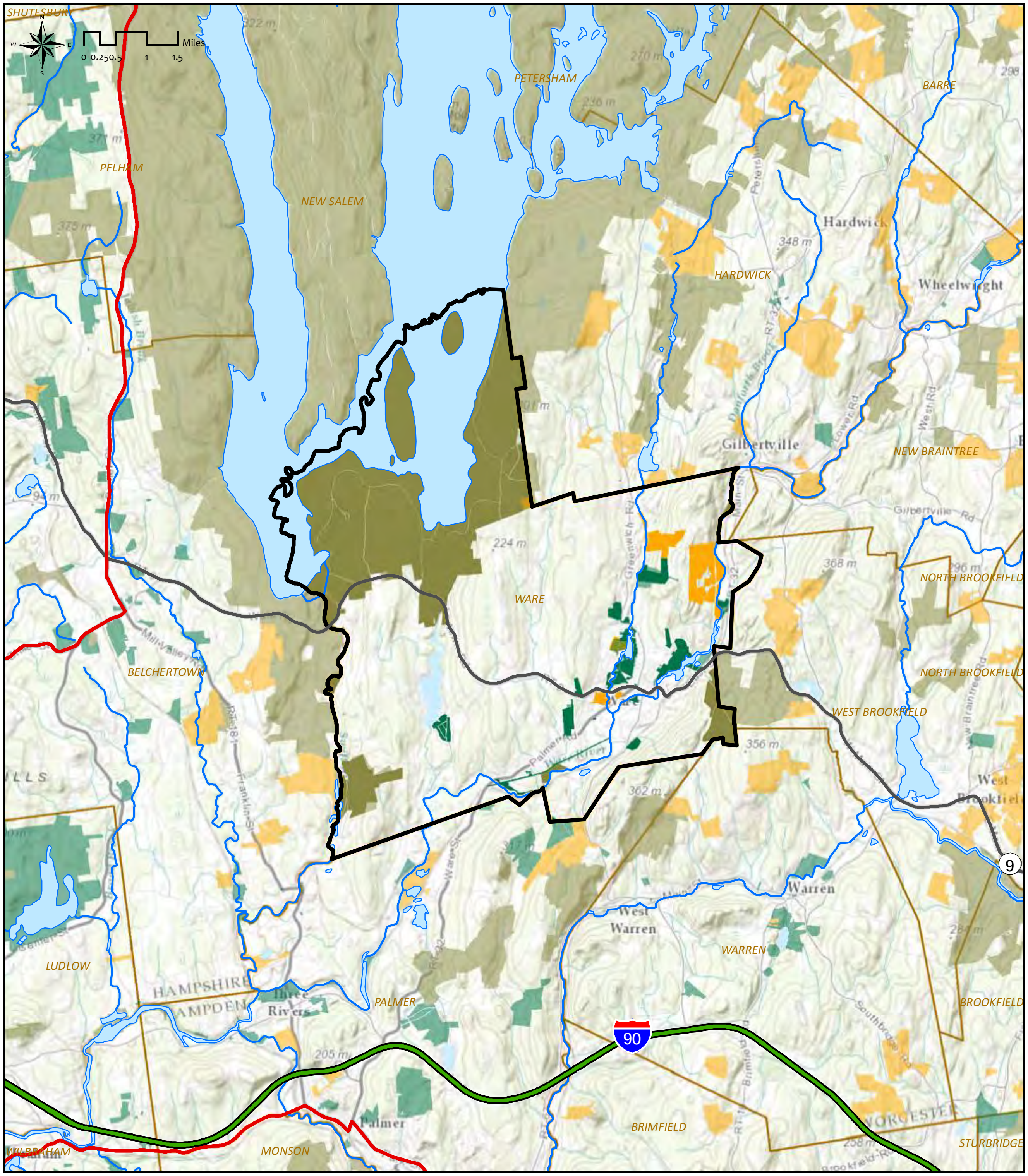

Legend

Open Space: Ware

- State
- Municipal
- Other

OpenSpace: Regional

- State
- Municipal
- Other

Open Space & Recreation Plan

Map 3: Regional Open Space

May 24, 2013

Sources:
MassGIS: Towns, Roads, Rivers, Lakes, Open Space
Ware: Open Space
ESRI: Base Map

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While public access to these lands is regulated by the Massachusetts Department of Conservation and Recreation (DCR) Division of Water Supply Protection to help protect drinking water supplies, there are opportunities for boat fishing and shore fishing access, hiking, sightseeing, bicycling on designated roads, picnicking, bird watching, and snowshoeing. An observatory tower is located on Quabbin Hill in Ware, and the park headquarters across the dam in Belchertown houses an interpretive center. There are six official access gates – numbers 50 through 55—into the Quabbin reservation located within Ware.

DCR actively protects and manages its lands at the Quabbin for forestry, wildlife, biological diversity and cultural resources. The program is detailed within the pages of a 10-year plan entitled 2007-2017 Quabbin Land Management Plan.

Map 3 shows the protected open space areas within the region. An examination of this map shows the potential for significant interconnected protected open space areas throughout the region, in addition to the extensive lands of the Quabbin reservation.

B. History of the Community

Ware's name is derived from the Nenameseck Indians' technique of building fishing weirs in the rivers. The weirs were rough walls of stone that formed a substructure for stakes and brush, allowing fish to be more easily caught. Locations within Ware provided favorite fishing spots for Native Americans who frequented the area before colonial times. The falls in particular, now the site of a dam located on the Ware River near the center of town, was a prime place to catch salmon, and many Native American relics have been found in this immediate area.

Abundant rivers and streams in the area also drew colonists who harnessed water power for small scale milling. The first mills were built around 1729, and Snow's Pond was one of the first manmade ponds in Ware. In 1742, the Ware River Precinct was established, which formed the basis for the establishment of the Town of Ware. The steady increase in the number of sawmills and grist mills drew people from surrounding towns. The first major manufacturing company in Ware began in 1813, supplying a local demand for textiles. In 1829 the Hampshire Manufacturing Company, followed by Otis Company, built large manufacturing mills in town. The Otis Company's mill is unique in that it was built from stone quarried from a nearby town, and is still standing today.

Prosperous mill manufacturing required railroads, which brought more goods and people to Ware. The early nineteenth century saw an influx of immigrants to the prospering and expanding factories. Here in town, residents lived, worked, went to school and church, found opportunities for recreation, and spent their wages in the downtown shops. During the 1800s, Ware was the most prosperous village in Hampshire County. Ware's boom was noticed as early as 1823 by reporter Jeremiah Spofford of the Gazetteer of Massachusetts, who wrote: "An immense change has been made in the town of Ware within a short period, By which a desolate wilderness has been changed into a prosperous village."

The town lost prosperity in the early twentieth century due to the regional decline of the milling economy. The Otis Manufacturing Company, which had been the largest single employer in the town for over one hundred years, also failed to gain profit. In October 1937, the Otis Manufacturing Company announced its liquidation and sale. Realizing the future impact of the announcement, within a few days, the Ware Citizens Committee voted to raise money to buy the mill. The purchase was the first employee buy-out of a major manufacturer in America. They renamed the now publicly-owned factory Ware Industries. It was during this period that Police Chief Bartholomew W. Buckley is credited with famously dubbing Ware as "The Town That Can't Be Licked."

Relative prosperity during the 1950s gave way to the pressures of inflation and recession prevalent throughout the 1970s, and Ware Industries declared bankruptcy in 1978. To recover the losses, the land and mill complex was divided into seventeen parcels and sold off to individual owners. Today, businesses, outlet shops, specialty stores, offices, and light industry are housed in the mill complex. Much of the building space throughout the millyard is either vacant or underutilized, providing an opportunity for redevelopment into a more vibrant economic center in the town.

C. Population Characteristics

Population Growth Indicators and Households

Ware's population grew steadily from 1930 to 1990, but has remained stable over the past 20 years. There has been only a one percent increase in population from 9,808 in 1990 to 9,872, in 2010, with a slight dip to 9,708 in 2000 (see Figure 3-1.) Neighboring communities generally have experienced greater population growth during this same period with the largest increase occurring in Belchertown at 38% (see Table 3-2 and Figure 3-2).

Figure 3-1: Ware Population Trends: 1930 to 2010

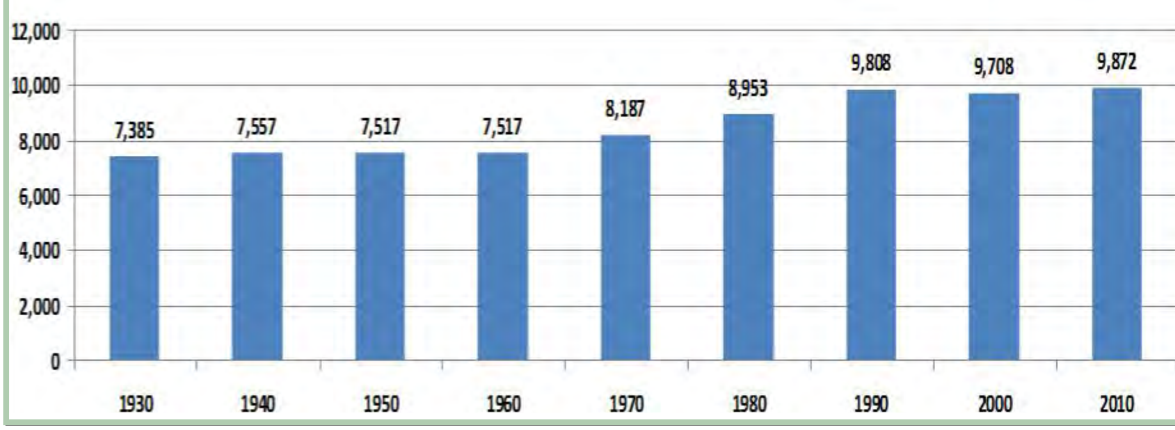
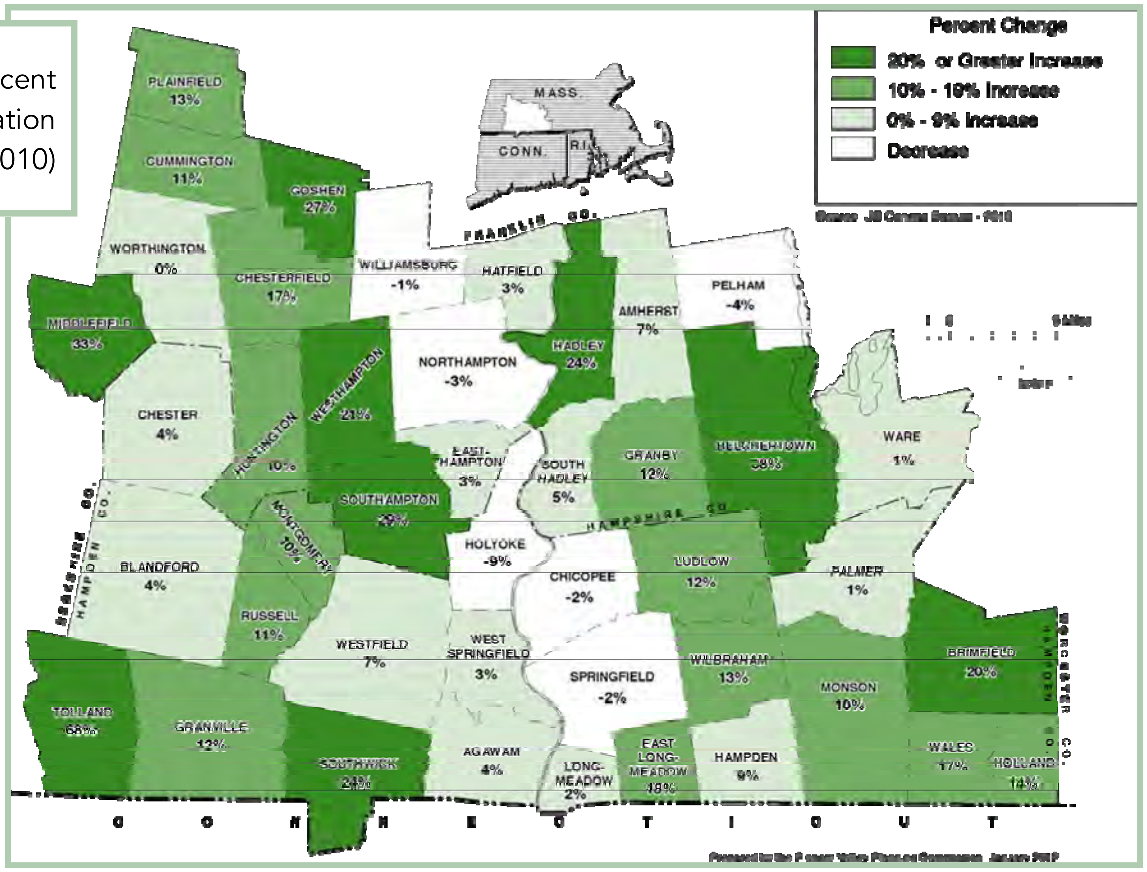


Table 3-2: Comparative Regional Population Trends			
Geography	1990	2010	Change 1990 to 2010
Ware	9,808	9,872	1%
Belchertown	10,579	14,649	38%
Palmer	12,054	12,140	1%
Pelham	1,373	1,321	-4%
Ludlow	18,820	21,103	12%
Hardwick	2,385	2,990	14%
Warren	4,437	5,135	16%
Hampshire County	146,568	158,080	8%
Hampden County	456,310	463,490	2%
Pioneer Valley Region	602,878	621,570	3%
Massachusetts	6,016,425	6,547,629	8%
Source: U.S. Census Bureau 1990-2010			

Figure 3-2: Percent Change In Population (1990 to 2010)



In Ware, the number of households increased by 8.6 percent, indicating a decline in the average household size during this same period, 1990 to 2010 (see Table 3-2).

The U.S. Census Bureau has not updated its estimates on the number of Ware residents with a disability since the 2000 Decennial Census, but the U.S. Census Bureau's latest regional estimates for 2008-2010 show that 11 percent of the region's total population of residents aged 18 to 64 and almost 40 percent of elderly residents reported having one or more disabilities (2008-2010 ACS).

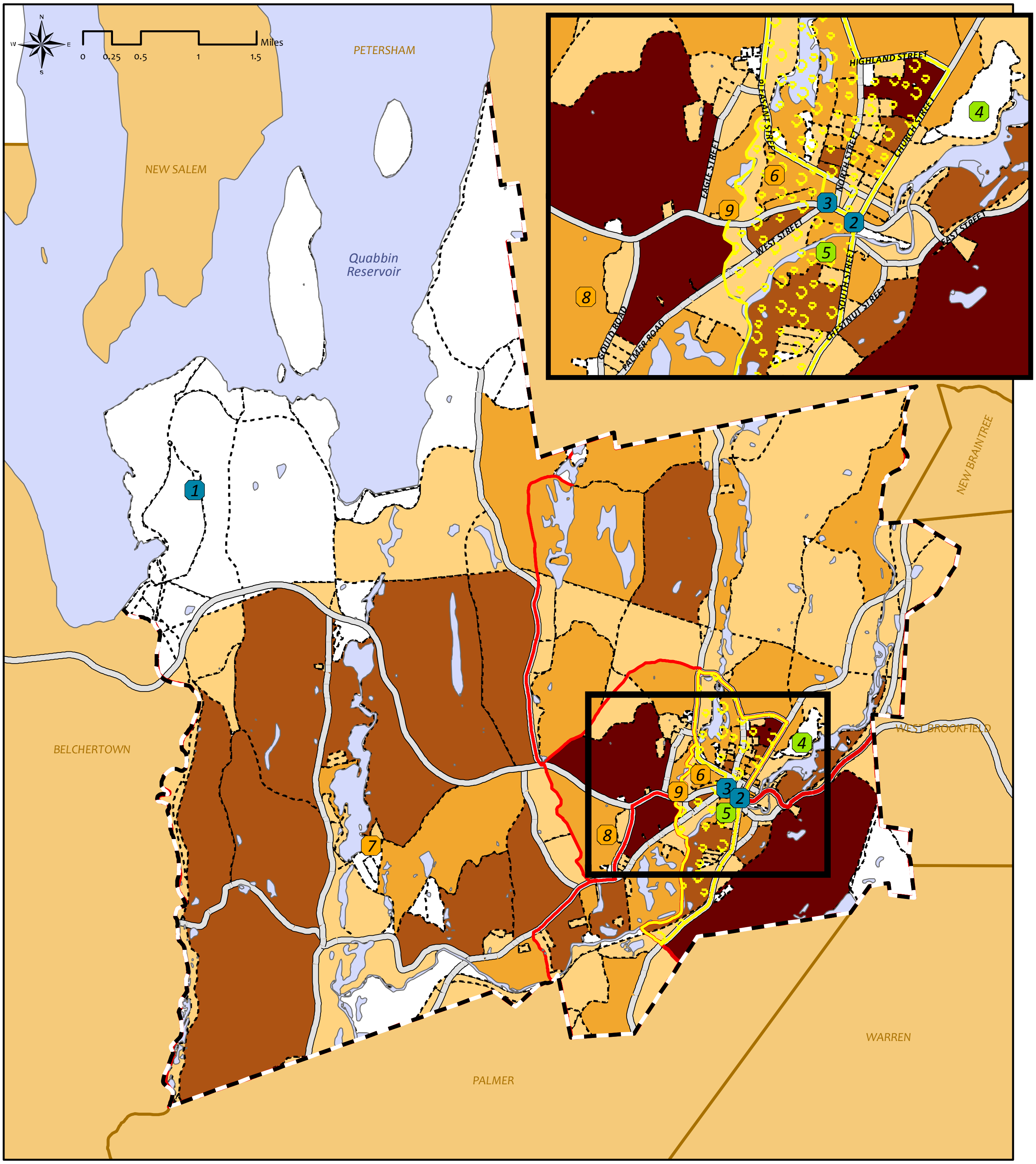
Table 3-3: Ware Demographic Trends Summary				
	1990	2000	2010	Change 1990 to 2010
Number of residents	9,808	9,707	9,872	0.7%
Number of households	3,836	4,027	4,120	7.4%
Households with children	1,228	1,200	1,084	-11.7%
Average household size	2.56	2.41	2.39	-6.6%
Single person households	1,149	1,172	1,198	4.3%
Source: United States Census Bureau, Decennial Census 1990, 2000, 2010				

Map 4 shows Ware's population by US Census Block, along with the location of the nine key recreation facilities in the town and of the environmental justice populations. The greater downtown area is home to the highest density of people, the environmental justice population, and 7 of the 9 recreational facilities. Map 5 shows similar data but at the Block Group level.

Population by Age

Despite the stable numbers in the overall population of Ware, there was tremendous growth in the 45 to 64-year-old age group. This population exploded from 1990 to 2010, increasing by 68%. In all other age groups, the population declined. This includes pre-school-age children (-18%), elementary (-18%), middle (-3%), and high school (-6%) age students as well (see Table 3-4).

Table 3-4: Ware Population By Age: 1990 to 2010 Comparison					
	POPULATION 1990	% OF TOTAL 1990 POPULATION	POPULATION 2010	% OF TOTAL 2010 POPULATION	% CHANGE
UNDER 5 YEARS	744	7.5%	611	6.2%	-18%
5-9 YEARS	737	7.5%	607	6.1%	
10-14 YEARS	591	6.0%	574	5.8%	-10%
15-19 YEARS	639	6.5%	598	6.1%	
20-24 YEARS	664	6.7%	548	5.6%	
25-34 YEARS	1,722	17.4%	1,201	12.2%	-18%
35-44 YEARS	1,366	13.8%	1,320	13.4%	
45-54 YEARS	948	9.6%	1,634	16.6%	
55-59 YEARS	389	3.9%	713	7.2%	68%
60-64 YEARS	427	4.3%	608	6.2%	
65-74 YEARS	945	9.6%	767	7.8%	
75-84 YEARS	517	5.2%	452	4.6%	-12%
85+ YEARS	199	2.0%	239	2.4%	
TOTAL POP.	9,808	100.0%	9,872	100.0%	
MEDIAN AGE	33.8	N/A	41.2	N/A	
Source: U.S. Census Bureau, 1990, 2000, & 2010 Decennial Census					



Legend

Census Tracts

Census Block Groups

Environmental Justice Area

Census Blocks; Population

0

1 - 50

51 - 100

101 - 200

201 - 473

Type of Recreation

Active

Active/Passive

Passive

1 - Quabbin Park
2 - Nemanesek Park
3 - Veteran's Park
4 - Grenville Park
5 - Memorial Field
6 - Kubinski Field
7 - Pennybrook Field
8 - School Campus Fields
9 - Reed Pool

Open Space & Recreation Plan

Map 4: Population, 2010

May 23, 2013

Sources:
MassGIS: US Census data, Environmental Justice Area
Ware: Recreation Areas

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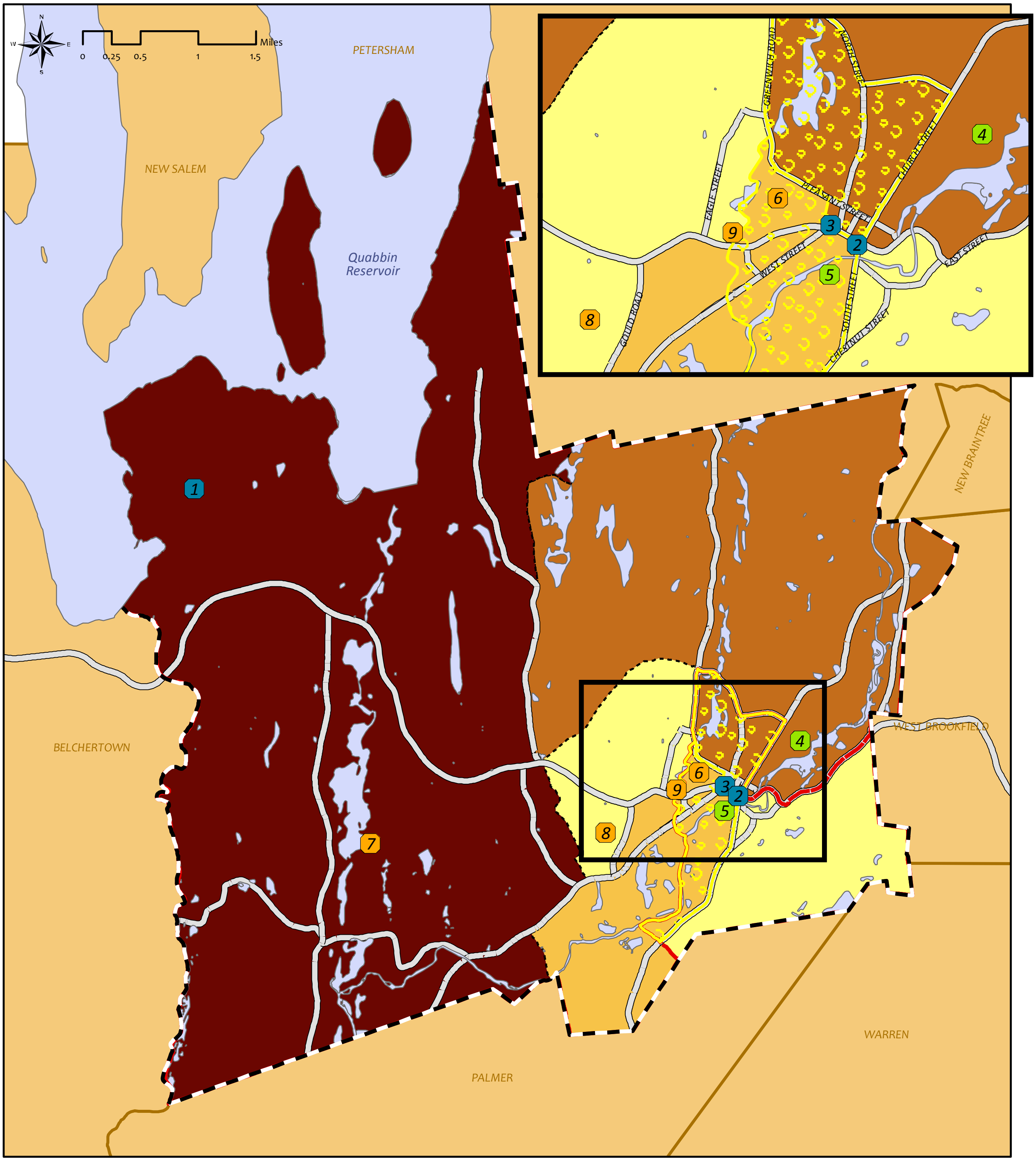
www.townofware.com



Legend

Census Tracts

Environmental Justice Area

Census Block Groups; Population

- 654 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 3335

Type of Recreation

- Active
- Active/Passive
- Passive

1 - Quabbin Park
2 - Nemanesek Park
3 - Veteran's Park
4 - Grenville Park
5 - Memorial Field
6 - Kubinski Field
7 - Pennybrook Field
8 - School Campus Fields
9 - Reed Pool

Open Space & Recreation Plan

Map 5: Population, 2010

May 23, 2013

Sources:
MassGIS: US Census data, Environmental Justice Area
Ware: Recreational Areas

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Ware, MA 01082

www.townofware.com

Looking at population figures in a shorter time frame of 10 years, from 2000 to 2010, the 45 to 64-year-old age group still shows significant growth of 33%. Aside from the school age populations, declines in the other populations are moderated by this shorter time frame. The population of pre-school-age children grew by 3.5%, while all other school age populations declined: elementary at -5%; middle school at -20%, and high school at -13% (see Table 3-5). This more careful examination of the population can provide some important insights in providing direction for open space and recreation planning.

Table 3-5: Ware Population By Age: 2000 to 2010 Comparison

	POPULATION 2000	% OF TOTAL 2000 POPULATION	POPULATION 2010	% OF TOTAL 2010 POPULATION	% CHANGE
UNDER 5 YEARS	590	6.1%	611	6.2%	3.5%
5-9 YEARS	642	6.6%	607	6.1%	
10-14 YEARS	723	7.4%	574	5.8%	-13%
15-19 YEARS	689	7.1%	598	6.1%	
20-24 YEARS	538	5.5%	548	5.6%	
25-34 YEARS	1,251	12.9%	1,201	12.2%	-9%
35-44 YEARS	1,594	16.4%	1,320	13.4%	
45-54 YEARS	1,369	14.1%	1,634	16.6%	
55-59 YEARS	497	5.1%	713	7.2%	33%
60-64 YEARS	349	3.6%	608	6.2%	
65-74 YEARS	662	6.8%	767	7.8%	
75-84 YEARS	613	6.3%	452	4.6%	<1%
85+ YEARS	190	2.0%	239	2.4%	
TOTAL POP.	9,707	100.0%	9,872	100.0%	
MEDIAN AGE	37.7	N/A	41.2	N/A	

Source: U.S. Census Bureau, 1990, 2000, & 2010 Decennial Census

Population by Race, Ethnicity & Ancestry

The Pioneer Valley Region continues to become more diverse in race and ethnicity. Immigration during the last few decades of the twentieth century and subsequent births, played a major role in changing the racial and ethnic composition of the Pioneer Valley as well as the overall U.S. population. The Pioneer Valley went from being 82 percent white in 2000 to 80 percent white in 2010. The region's Hispanic population grew significantly during this time from 12 percent in 2000 to 17 percent in 2010. Population by ethnicity in Ware remains predominantly white (94%) with a small Hispanic or Latino population following at 3.9% of the community (see Table 3-6).

Table 3-6: Population by Ethnicity				
	Massachusetts	% of Total	Ware	% of Total
Total	6,547,629	100%	9,872	100%
White	5,265,236	80.4%	9,292	94.1%
Black or African American	434,398	6.6%	102	1.0%
American Indian and Alaska Native	18,850	0.3%	30	0.3%
Asian	349,768	5.3%	71	0.7%
Native Hawaiian and Other Pacific Islander	2,223	0.0%	0	0.0%
Some Other Race	305,151	4.7%	137	1.4%
Two or More Races	172,003	2.6%	240	2.4%
Hispanic or Latino (of any race)	627,654	9.6%	389	3.9%
Source: U.S. Census Bureau, 2010 Decennial Census				

Household Income & Poverty

Median household income for Ware in 2010 was $66,564. While this is slightly higher than the $65,672 median household income for the Pioneer Valley Region, it is much lower than the $81,165 median household income for the state as a whole during this same period.

At the same time, 13.7% of Ware families had incomes below the poverty level. This has 581 children living in poverty. The Census Bureau uses income thresholds that vary by family size and composition to determine poverty. For example, a family of two adults and one child with an income at or below $17,552 is defined as below poverty. These thresholds do not change based on geography.

The percentage of students who receive free and reduced lunch at school and households receiving fuel assistance can also be used to gauge financial need in a community. According to the Massachusetts Department of Education, a total of 688 students, or 53% of all students received free or reduced school lunch in Ware[1]. Figure 3-3 shows how Ware compares to the other municipalities in the Pioneer Valley Regional Planning Commission's jurisdiction.

Economic Character & Employment Trends

Although the textile mills are gone, the mill buildings and accompanying neighborhoods give downtown Ware its architectural character. A number of the buildings have been converted to small manufacturing and retail spaces. Today, services and wholesale and retail trade have far surpassed manufacturing in employment, with over 83% of the total employment in the town. (See Tables 3-7 and 3-8.)

1 Children from families with incomes at or below 130 percent of the poverty level (currently $21,710 for a family of four) are eligible for free meals. Those between 130 percent and 185 percent of the poverty level (currently $30,895 for a family of four) are eligible for reduced-price meals, for which students can be charged no more than 40 cents.

Figure 3-3: Percentage of Students in Grade School From Low Income Families, 2010

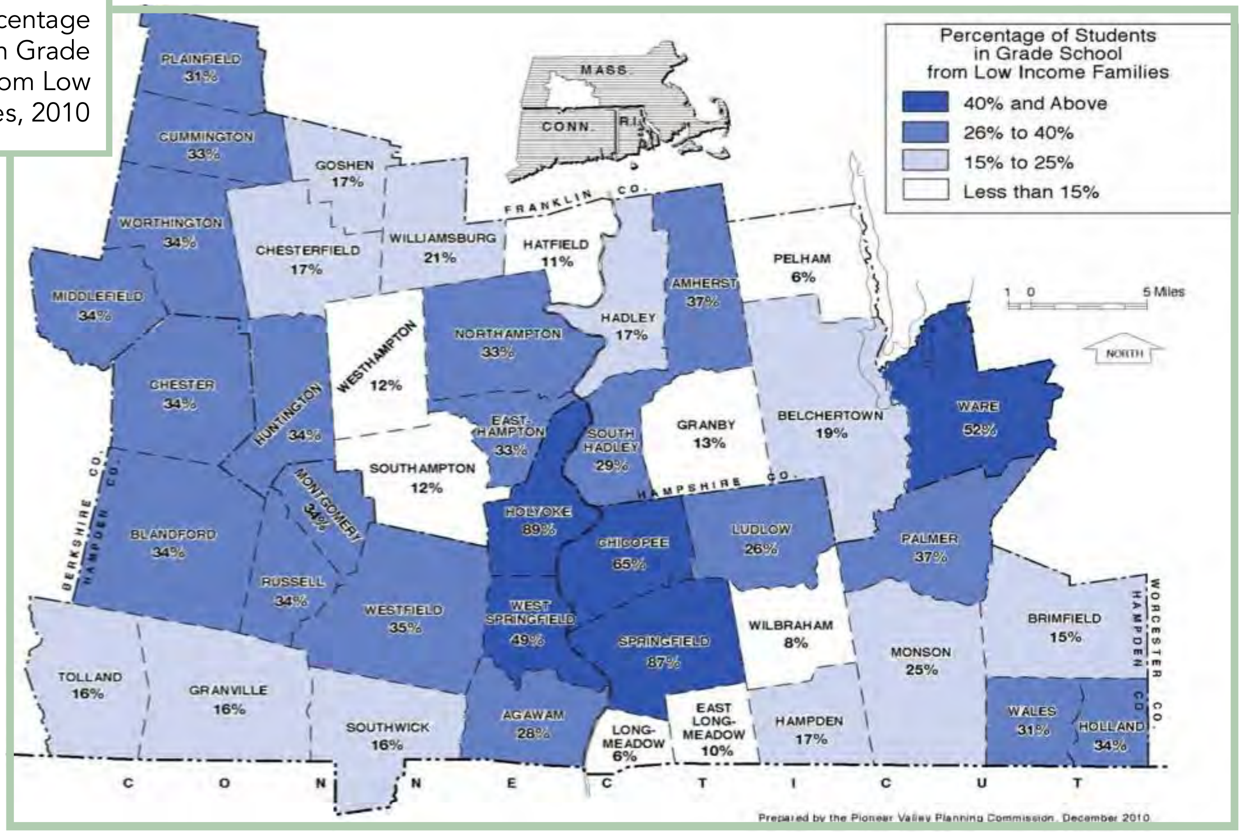


Table 3-7: Ware Industry Trends 2001 to 2010					
Number of Establishments		Average Monthly Employment		Average Weekly Wage	
2001	2010	2001	2010	2001	2010
212	261	2,691	2,677	$553	$736
Source: MA Department of Labor and Workforce Development, Employment and Wage (ES-202) data, 2010					

The millyard is now occupied by a variety of uses including manufacturing, office, service, retail, and warehousing. Today's industries generally need modern spaces with upgraded utilities, which the millyard cannot provide. A large shopping center on Route 32 near the Palmer town line services residents from all of the surrounding communities.

Two-thirds of residents who work travel to jobs outside of Ware. Less than one-fifth travel out of the Pioneer Valley to Worcester County, elsewhere in Massachusetts, Hartford, or elsewhere in Connecticut for work. Nearly one-half stay within the Pioneer Valley (see Table 3-9).





Table 3-8: Ware Industry by Number of Establishments, Employees and Wages, 2010			
Description	Number of Establishments	Average Monthly Employment	Average Weekly Wage
Total, All Industries	**261**	**2,677**	**$736**
Goods-Producing Domain	39	467	$1,198
Construction	29	85	$830
Manufacturing	10	381	$1,283
Durable Goods Manufacturing	6	92	$1,122
Non-Durable Goods Manufacturing	4	289	$1,335
Service-Providing Domain	222	2,210	$639
Trade, Transportation And Utilities	52	817	$502
42 - Wholesale Trade	10	17	$1,253
44-45 - Retail Trade	33	763	$464
48-49 - Transportation & Warehousing	8	30	$846
Financial Activities	14	53	$636
52 - Finance And Insurance	12	53	$633
Professional And Business Services	31	283	$945
54 - Professional & Technical Services	12	32	$518
55 - Management of Companies & Enterprises	4	201	$1,135
56 - Administrative And Waste Services	15	51	$448
Education And Health Services	21	575	$864
62 - Health Care And Social Assistance	17	380	$844
Leisure And Hospitality	23	235	$232
71 - Arts, Entertainment, & Recreation	3	10	$416
72 - Accommodation & Food Services	20	225	$224
Other Services	68	123	$257
81 - Other Services, Excluding Public Admin	68	123	$257
Public Administration	11	113	$990
92 - Public Administration	11	113	$990

Source: MA Department of Labor and Workforce Development, Employment and Wage (ES-202) data, 2010

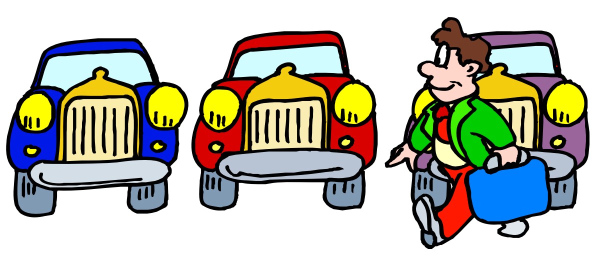
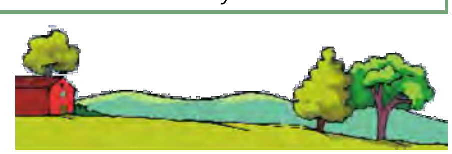


Table 3-9: Place of Work for Ware Residents, 2004		
Place of Work	Number	Percent
Ware	1,629	33.6%
Belchertown	136	2.8%
Springfield	638	13.2%
Elsewhere in Pioneer Valley	1,555	32.1%
Elsewhere in Massachusetts	81	1.7%
Worcester County	723	14.9%
Hartford County	57	1.2%
Elsewhere in Connecticut	18	0.4%
Total	4,846	100%

Source: U.S. Census Bureau, 2004 Commuter Survey



D. Growth and Development Patterns

Ware began as a small farming community located along a stream (Flat Brook), with a typical farmstead pattern of development. The Industrial Revolution brought a significant amount of growth in what is now the downtown area, where the Ware River had significant elevation changes allowing for damming of the river for a reliable power source for the mills. The development pattern in this area of town was a typical mill town, with high density residential and commercial development located close to the mills where people worked. Following the decline of that industrial base, along with the increasingly automotive dependent lifestyle adopted by the country following World War II, Ware has moved toward a pattern of rural-suburban residential development with a secondary commercial and industrial base. There are several factors at play that influence this pattern and that will directly affect the amount and form of recreation and conservation space, and thus will require careful thought and planning.

Ware is both isolated and centrally located. Rural/suburban development has been on the rise (with the exception of 2008-2012 due to the Recession) since Ware lies within 45 minutes of both Worcester and Springfield. Yet the town retains the quiet rural life it has always enjoyed.

Ware's physical character has a strong influence on where and what development can take place. The basic landform character is one of narrow valleys and ridges running north-south. These ridges limited the amount of open land available for farming and concentrated the amount of developable land within the valleys and divided the town into three basic development areas: Beaver Lake, Ware Center, and the Ware River/Route 32 Corridor.

Ware's real estate market has fluctuated over the years but as prices rose in surrounding regions, Ware's lower prices became an economic incentive for people to move here. Ware is now desirable for its lower cost of housing and land, both of which have already impacted and will continue to impact residential and business development. The land itself will also feel these impacts. With the increased growth it is important to plan in advance for critical ecological and recreation lands.

The presence of a strong downtown development pattern, civic organizations, social and health services, and infrastructure set Ware apart from other towns its size. Its history of being a mill town has given Ware some of the urban resources that will allow the town to both accommodate and attract additional growth and development.

Historically, Ware had been settled primarily in the downtown area or its immediate vicinity. However, in the last few decades the outlying "rural" areas have become popular locations for single family homes. The area surrounding Beaver Lake, which began as a vacation community in the late 1800s, has become increasingly developed with year round single family homes. In addition, there has been a trend of residential development within the agricultural areas in the northern part of town, along Fisherdick and Greenwich Roads, and in the areas along West Warren Road in the southern part of town.

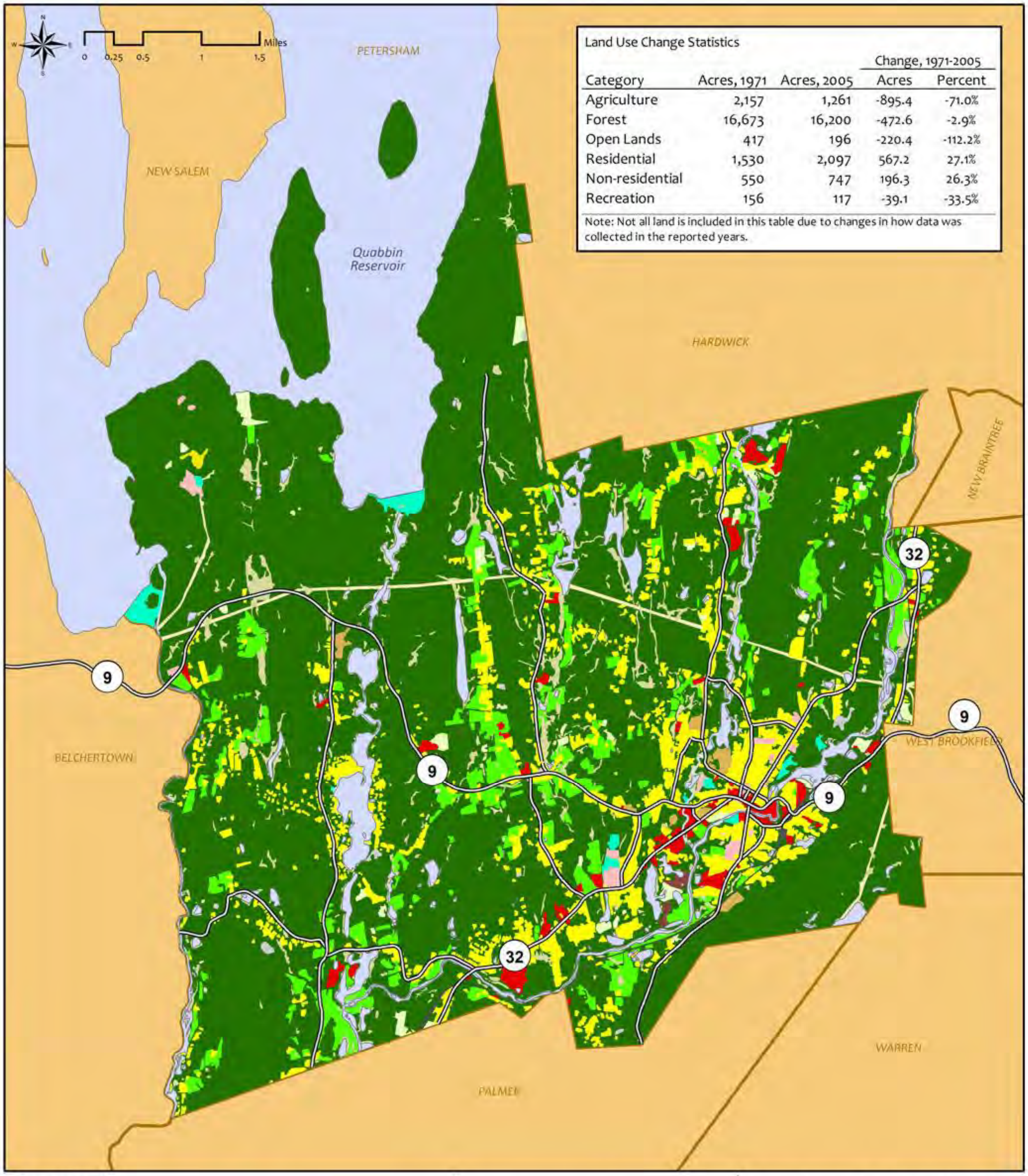
This development in the outer areas has caused some concern about the loss of rural character. All of the features that contribute to this rural character – farmland, historic buildings along Route 9 West and in the downtown, the beauty of the Beaver Lake area, Muddy Brook – have felt the effects of development. These features, in addition to tracts of open space and recreation areas, are in need of protection.

Map 6 shows the "current" land use – the 2005 data from MassGIS, which is the most recent data available. It shows that 63.3 percent of the town is forested, 15.1 percent is water (mostly within the Quabbin Reservoir), 8.2 percent is residential, 4.9 percent is agricultural, 2.4 percent is non-residential developed, and the remaining 6.1 percent is everything else, including 0.5 percent recreational. The map includes a summary table of land use changes between 1971 and 2005. The most significant changes are in open lands with a decrease of 112 percent and agriculture with a decrease of 71 percent. Residential development increased by 27 percent and non-residential development increased by 26 percent. It is somewhat alarming to see that recreational land decreased by 33 percent, with a loss of 39.1 acres. However, it should be noted that this data is based on fairly rough mapping procedures and thus these land use change figures should be taken with a grain of salt. Table 3-10 provides a more detailed review of land use changes during this period.

Table 3-10: Land Use Changes in Ware by Category

Category	1971	2005	Change (acres)	% Change
Active Agriculture	1,155	863	-292	-25%
Pasture	992	429	-563	-57%
Forest	16,673	16,802	129	1%
Non-Forested Wetland	381	542	161	42%
Mining, gravel pit etc.	34	15	-19	-56%
Open land, power lines, no vegetation	417	293	-124	-30%
Participation Recreation	153	82	-71	-46%
Spectator Recreation	0	0	0	0%
Water Recreation	3	35	32	1067%
Multi-Family	9	38	29	322%
Residential less than 1/4 acre lot	256	230	-26	-10%
Residential 1/4 - 1/2 acre lot	530	624	94	18%
Residential Greater than 1/2 acre lot	734	1,229	495	67%
Commercial	95	139	44	46%
Industrial	93	97	4	4%
Urban Open, parks, institutional, cemeteries	265	201	-64	-24%
Transportation	35	52	17	49%
Waste Disposal	29	25	-4	-14%
Water	3,723	3,859	136	4%
Woody Perennial, orchards, nurseries	10	15	5	50%
Total Acres	25,587	25,570	-17	

Source: MassGIS McConnell Land Use data 1971, 1985, 1999, 2005. Due to technological advances, the spatial accuracy of the 2005 data is substantially more accurate than data for the years 1971, 1985, and 1999. Prior to 2005, the state manually interpreted land cover and land use categories based on aerial photos. In 2005, the land use map was derived directly from an ortho image. This new method maintains much compatibility with the older system. Negative numbers mean loss of land.



Land Use Change Statistics

Category	Acres, 1971	Acres, 2005	Change, 1971-2005 Acres	Change, 1971-2005 Percent
Agriculture	2,157	1,261	-895.4	-71.0%
Forest	16,673	16,200	-472.6	-2.9%
Open Lands	417	196	-220.4	-112.2%
Residential	1,530	2,097	567.2	27.1%
Non-residential	550	747	196.3	26.3%
Recreation	156	117	-39.1	-33.5%

Note: Not all land is included in this table due to changes in how data was collected in the reported years.

Legend

- Waterbodies
- Rivers

Landuse (2005)

- Agriculture
- Brushland
- Forest
- Open Land
- Wetland
- Residential
- Non-residential
- Institutional
- Cemetery
- Recreation
- Transitional
- Utility
- Transportation
- Landfill
- Water

Category	Acres	Percent
Agriculture	1,261	4.9%
Brushland	21	0.1%
Forest	16,200	63.3%
Open Land	196	0.8%
Wetland	1,157	4.5%
Residential	2,097	8.2%
Non-residential	300	1.2%
Institutional	90	0.4%
Cemetery	67	0.3%
Recreation	117	0.5%
Transitional	27	0.1%
Utility	119	0.5%
Transportation	52	0.2%
Landfill	19	0.1%
Water	3,860	15.1%
	25,585	100.0%

Open Space & Recreation Plan

Map 6: Current Landuse

May 26, 2013

Sources:
MassGIS: Prime Forest, Waterbodies, Rivers, Roads, Towns
Ware: Open Space

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The increase in residential land use translates into a corresponding increase in the number of housing units. In 1990 there were a total of 4,095 housing units compared to 4,590 in 2010, a 12 % increase (see Table 3-11). Lot sizes required by the current Zoning Bylaw vary from as little as 8,000 square feet in the Downtown Residential zone to 80,000 square feet in the Rural Residential zone, which covers most of the town. Many lots, especially in the downtown area, are smaller than that.

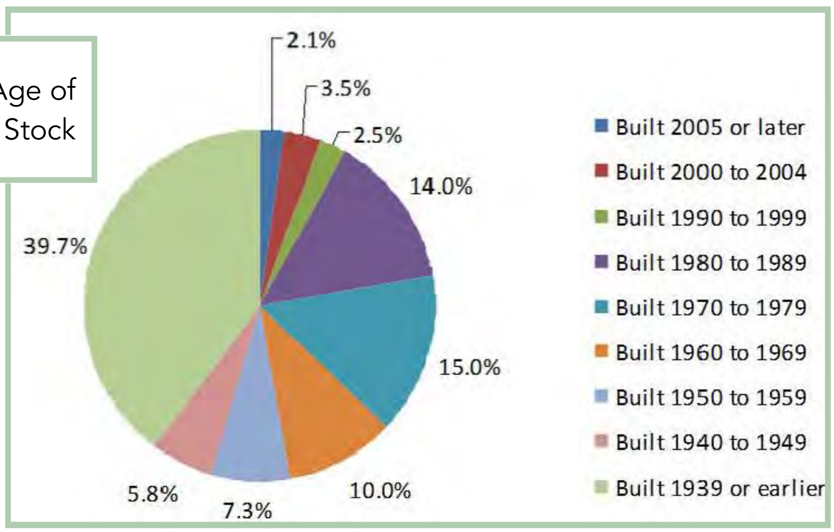
Only 22% of the housing units in Ware are new (built since 1980). A large proportion of Ware's housing stock (78%) was built before 1980 and 40% was built before 1939 (see Figure 3-4). It is not clear whether this accounts for the increase in the vacancy rate shown in Table 3-11.

Table 3-11: Housing Unit Change in Ware - 1990 to 2010

	1990		2000		2010		% Change 1990 to 2010
Occupied Housing Units	3,836	78%	4,027	93%	4,120	90%	7.4%
Vacant Housing Units	259	5%	309	7%	470	10%	81.5%
Vacant Housing Units that are Seasonal Units	40	1%	51	1%	51	1%	27.5%
Total Housing Units	4,095	100%	4,336	100%	4,590	100%	12.1%

Source: U.S. Census Bureau, 1990, 2000, 2010 Decennial Census

Figure 3-4: Age of Ware's Housing Stock



Source: ACS 5-Year Estimate, US Census Bureau 2006-2010

Recent building permit activity in Ware is slightly above average when compared to neighboring towns. This includes a low in 2008 of zero permits to a high of 120 permits in 2003. Overall, however, there has been a significant increase in the number of building permits issued in Ware when comparing the ten-year period in the 1990s when the Town issued 196 permits to the most recent decade when the Town issued 280 permits (see Figures 3-5 and 3-6). The rather significant increase in median sale prices of homes from 1990 to 2010 seem to track with this, indicating that there is demand, particularly for single family residential homes (see Table 3-12).

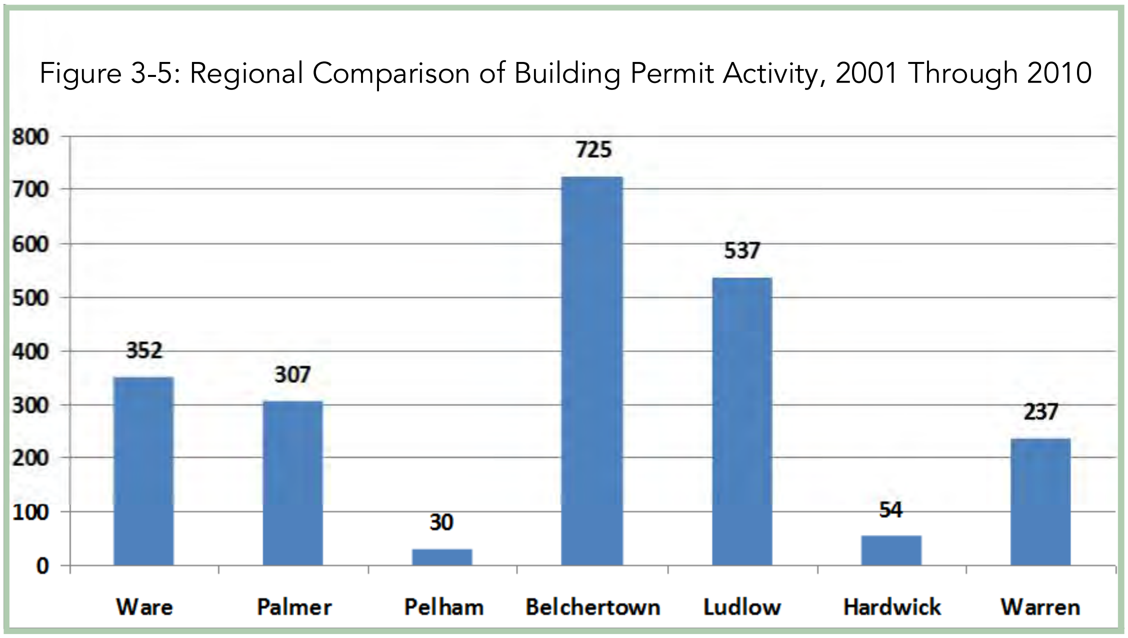
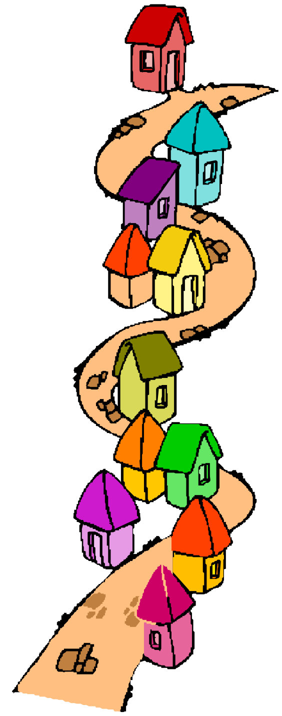
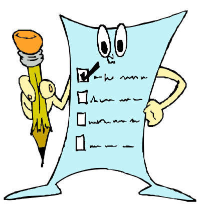


Figure 3-5: Regional Comparison of Building Permit Activity, 2001 Through 2010

Source: U.S. HUD State of the Cities Database





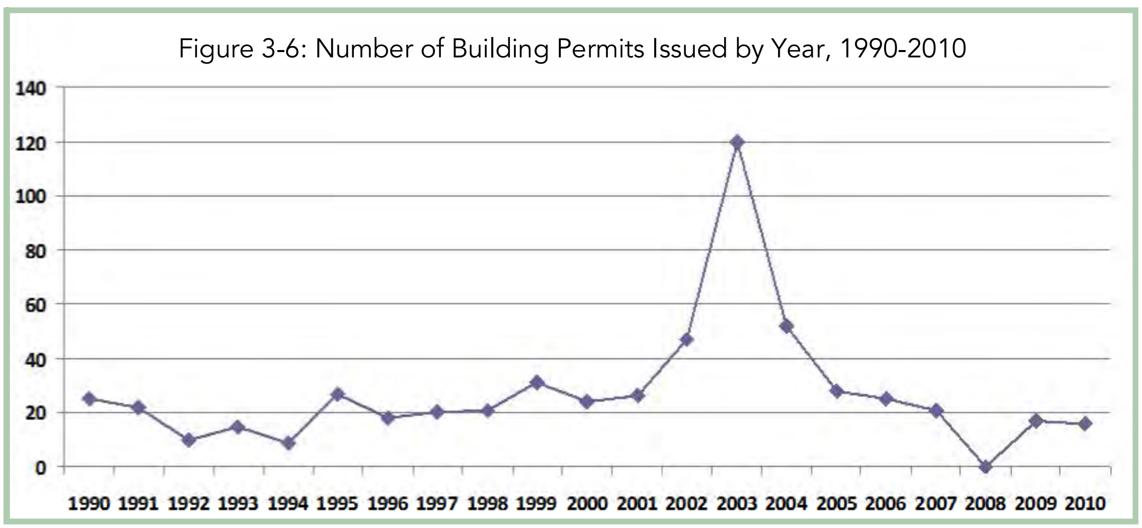


Figure 3-6: Number of Building Permits Issued by Year, 1990-2010

Source: U.S. HUD State of the Cities Database

Table 3-12: Median Sale Price of Homes in Ware - 1990 to 2010		
Year	Median Sale Price - All Homes	Median Sale Price - Single Family Homes
1990	$98,000	$108,750
1995	$69,000	$89,200
2000	$86,000	$114,553
2005	$180,000	$185,450
2010	$130,000	$169,000
Source: Warren Group		

Transportation

Ware has 121.1 miles of roads, 71% of which are town owned and maintained. Crossing each other in the center of downtown are Route 9, which runs east-west, and Route 32, which runs north-south. These two major routes provide convenient access to neighboring towns as well as Worcester, Springfield, Northampton, and Amherst. In addition, the following should be noted about these two major routes: Route 9 is the major east-west connector, running from downtown Ware east to the City of Worcester and west to the Town of Amherst and City of Northampton (where I-91 can be accessed). Ware's historic district is located along this road. West of the town center, farmhouses, agricultural fields, and stone walls make for a traditional New England landscape. Route 32 runs northeast to southwest, following the Ware River through town. The route has become a magnet for more recent commercial development, including "strip mall" development. Beyond Ware, Route 32 extends into Palmer where the Massachusetts Turnpike can be accessed.

Pedestrian facilities in Ware are concentrated in the more densely developed areas of downtown and extending south on Route 32 to the school campus. Most of the residential streets in and around downtown have sidewalks on both sides, and crosswalks are located at most intersections. ADA compliant ramps are becoming more common as these older neighborhood roads are rebuilt using CDBG funds, but it is a long slow process which will take many years to complete. Sidewalks exist on both sides of Route 32 south of downtown for eight-tenths of a mile, and on one side for another six-tenths of a mile to the school campus. There are two signalized crosswalks in this 1.4 mile stretch to allow pedestrians to safely cross Route 32, and another seven crosswalks with no signals.

In the downtown area, there are sidewalks on both sides of Route 9 for 1.3 miles from Boivin Avenue easterly to East Court, and then on one side of Route 9 for another 0.4 mile out to Guzik Motors. There are 2 signalized crosswalks in this 1.7 mile stretch (both downtown) and nine additional crosswalks, including one at the Reed Municipal Pool facility and one at Eddy & Barnes Streets where people can access the Kubinski Field. There are many more miles of sidewalks on the nearby residential streets, including along Church Street where Grenville Park is, four-tenths of a mile from Main Street. Sidewalks also exist on both sides of South Street, where Memorial Field is located about two-tenths of a mile from Main Street.

Facilities for cyclists are lacking in Ware, but with the recent opening of a 1.8 mile section of the Mass Central Rail Trail (Ware River Greenway) we are moving in the right direction. Currently there are no marked bicycle lanes on any of our roads, but they are being designed into a transportation improvement project for Main Street through the downtown. Bike racks are available at the Reed Pool and the Memorial Field recreational facilities, the public schools, and at some private locations in town as well.

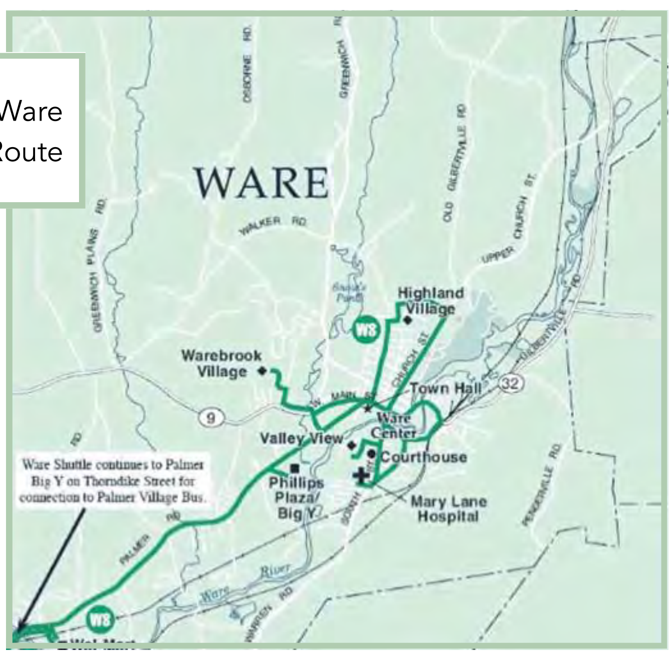
For public transportation, PVTA operates a shuttle that makes 7 trips on weekdays on a route around downtown and extending south along Route 32 to the Gibbs Crossing shopping center, where a connection can be made to the Palmer Village Bus, or to the Big Y Plaza in Palmer (depending on the time of day) (see Figure 3-7). Once in Palmer, connections can be made to get to Belchertown, Holyoke, or Springfield. Use of the shuttle has remained relatively consistent over the past four years with between 10,039 and 10,886 riders annually.   There is no shuttle service on weekends. A report was completed by the PVPC addressing the needs for transit in June 2013; this report includes several recommendations to improve service to Ware residents.

The major airport in proximity to Ware is Bradley International Airport, located in Windsor Locks, Connecticut, about 15 miles south of Springfield on Interstate 91. The Metropolitan Airport, a small privately owned general aviation facility in Palmer closed in early 2000 and the land has been redeveloped for housing.

Water Supply

Seventy percent of Ware's population is served by a central public water supply and the remainder draw from private wells. Private wells that are regulated by MA DEP as public water supplies include Quabbin Sunrise Co-op, which has a single well that supplies 65 households in the mobile home park, and Hampshire East Properties, LLC, which served a day care center with a single well. The public water supply in town draws from two source locations -- one well at Dismal Swamp and four wells and a cistern west of Barnes Street—each with its own pump station and treatment facilities. In 2015 the wells at the Barnes Street site were replaced with new gravel-packed wells. Drinking water is transported from these locations through town via 40 miles of water main. The system includes two standpipes (holding tanks), located at Church Street and Anderson Road. The wells have a daily capacity of 1.8 million gallons per day, and the town's average daily demand is 1.2 million gallons per day. The system is able to meet the average water demands of the present population.

Figure 3-7: Ware Shuttle Route



Source: Pioneer Valley Transit Authority

Sewage System

The Town's wastewater treatment plant and collection system are old and in need of significant work and upgrades. The collection system itself involves approximately 32 miles of gravity sewer mains and one small pump station serving approximately 1,548 accounts. This includes approximately 55% of town residents as well as several industries.

In 2012, citizens voted to support major improvements to the Town's wastewater treatment plant on Robbins Road including $120,000 to upgrade influent pumps - new motors, drives and controls and $100,000 to upgrade disinfection systems from current gaseous and de-chlorination systems to liquid ones. Kanzaki Specialty Papers, a major contributor to the municipal wastewater system, has built a $1.5 million pre-treatment facility on their own site to address the issues the town's treatment system had been forced to deal with from the waste coming in from the Kanzaki plant. Kanzaki's pre-treatment facility was built after a partnership with the Town dissolved which would have provided the Town with a $2.5 million grant from the state to upgrade the municipal treatment plant to handle not only Kanzaki's effluent but needed improvements to handle the municipal sewage as well. The Town had spent $300,000 in engineering costs for the project, some of those plans might be put to use in the future.

Stormwater

The Department of Public Works is responsible for the public storm drainage system, including catch basins, drain manholes, and pipes and culverts. Unlike Belchertown and Palmer, discharges from Ware's municipal system to nearby surface waters is not regulated by U.S. EPA. Regulation by EPA is triggered by total population and population density to define "urbanized areas." Ware participated along with 30 other towns in central Massachusetts in a 2012 Community Innovation Challenge Grant from the Massachusetts Office of Finance and Administration to develop a detailed map of their stormwater infrastructure that can be utilized to track operation and maintenance of the system.

As noted in Section 4, Beaver Lake is under treatment for Eurasion Water Milfoil, and elevated E. coli levels have been measured in the Ware River above the Ware Dam. It is likely that stormwater runoff contributes to the primary sources of both of these problems. The DPW's program to map stormwater infrastructure town-wide and develop a more systematic approach to operation and maintenance are important best management practices for reducing stormwater pollution.

For its 90 miles of public roads, the DPW has noted in the 2012 annual report that it placed 2,047 tons of sand and 1,114 tons of salt on local roadways. While spring street sweeping operations reduce the amount of sand entering the stormwater drainage system and Ware's waterways, some of this material – which is crucial to maintaining safe roadways during winter storm events – does make its way into the waterways of the town.

Solid Waste

At this time the Town does not have any active waste disposal facilities; instead residents and businesses contract with private haulers for solid waste disposal and recycling. The Town does hold special events from time to time to collect bulky waste such as furniture and appliances, in an effort to keep such unwanted items from being disposed of improperly (e.g. in the woods or on the side of the road). In addition, there is a company in Ware which deals in demolition materials and they will accept such items from residents.

Local Zoning

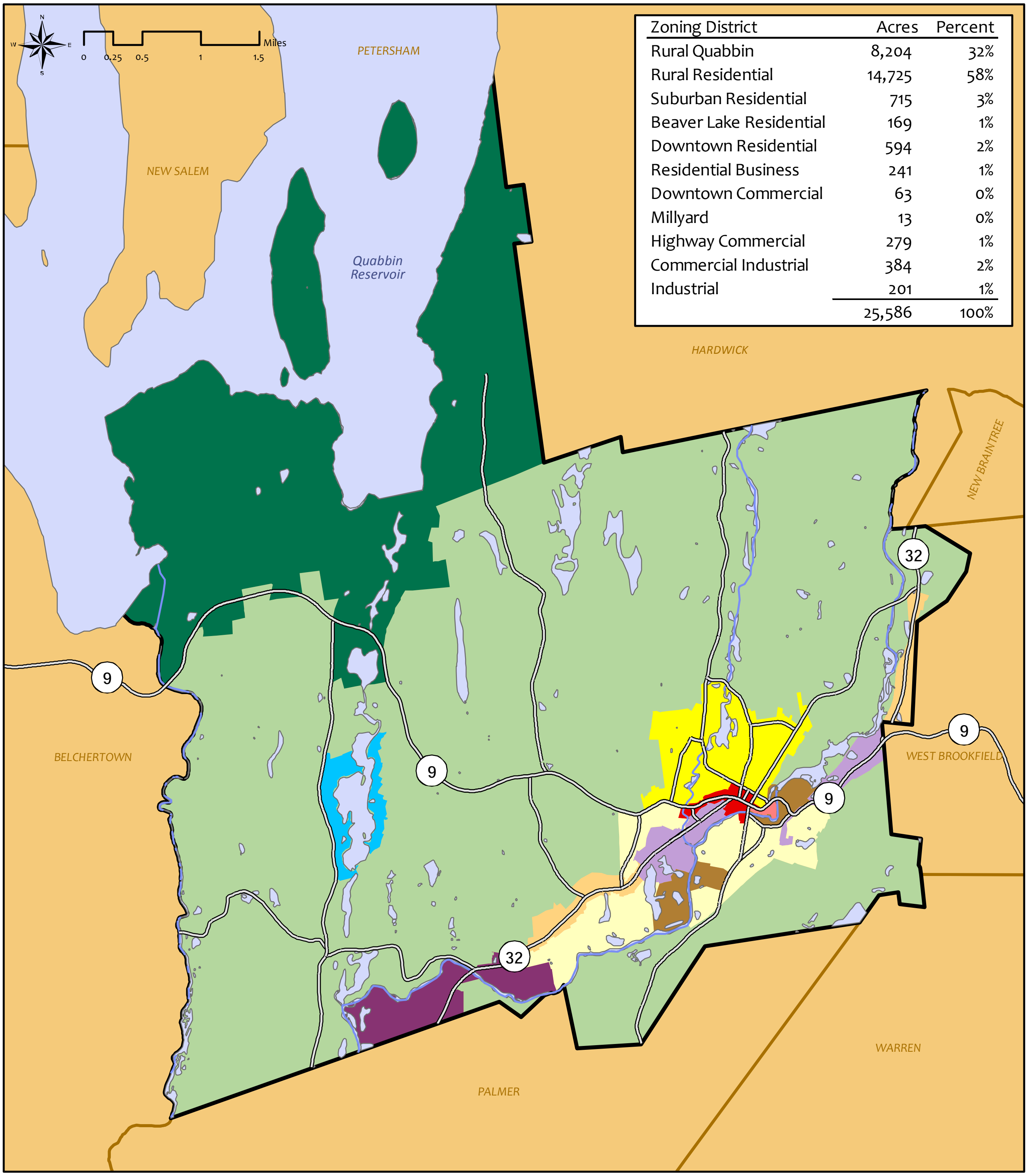
Without any zoning districts until 1987, land use patterns were well established based on proximity to customers (downtown) and, after World War II, roadways (Route 32 south of downtown). When Ware adopted its first zoning map in 1987, the district locations were based largely on this existing land use pattern. In 2012 the Town adopted a revised Zoning Bylaw with significant modifications to the zoning districts (see Map 7). Eighty percent of the town is zoned rural, and the ten percent in the nine other districts is almost entirely along the Route 32 corridor which follows the Ware River.

This indicates the extent to which the town remains rural and has kept the more compact forms of land use. A total of 32.1% of all lands (8,204 acres) are zoned to account for state ownership of the drinking water supply protection lands for the Quabbin Reservoir. Another 57.5% of lands (14,725 acres) are zoned for Rural Residential use, a district that the 2012 zoning bylaw identifies as "key to the rural character of the town." The balance of land in Ware is zoned for higher density residential uses (5.8% or 1,478 acres) or commercial and industrial uses (4.6% or 1,179 acres).

In 2008 the Town adopted the Flexible Residential Open Space Development (FROSD) zoning provision, which requires that 50% of the development be set aside as open space. However, no developer has proposed an FROSD since 1) as written, it has no provisions for density bonuses or other incentives to use it, and 2) the housing market has been too weak to support any new residential subdivisions since the Recession in 2007/08. In addition, developers have felt the market has been stronger for homes on larger lots than for homes on smaller lots with large areas of common open space. However, with the aging population and a desire for more manageable homes, coupled with amendments to improve the FROSD provisions, it can be expected that interest in this form of development will improve.

Ware also has two overlay districts. The Floodplain Overlay District, which includes the so-called "100-year" flood zones associated with the Quabbin Reservoir, Swift River, Beaver Brook, Flat Brook, Muddy Brook and the Ware River, is intended to safeguard public safety, protect property from the hazards of periodic flooding, preserve the natural flood storage capacity of floodplains, and maintain groundwater recharge areas within the floodplain.

To achieve these goals, Ware regulates the amount and type of development which can occur in these floodplains. Some of the permitted uses include agricultural, forestry and nursery uses, outdoor



Zoning District	Acres	Percent
Rural Quabbin	8,204	32%
Rural Residential	14,725	58%
Suburban Residential	715	3%
Beaver Lake Residential	169	1%
Downtown Residential	594	2%
Residential Business	241	1%
Downtown Commercial	63	0%
Millyard	13	0%
Highway Commercial	279	1%
Commercial Industrial	384	2%
Industrial	201	1%
	25,586	100%

Legend

Zoning Districts

- Rural Quabbin
- Rural Residential
- Suburban Residential
- Beaver Lake Residential
- Downtown Residential
- Residential Business
- Downtown Commercial
- Millyard
- Highway Commercial
- Commercial Industrial
- Industrial

Open Space & Recreation Plan

Map 7: Zoning Districts

May 24, 2013

Sources:
MassGIS - Towns, Roads, Waterbodies, Rivers
Ware - Zoning Districts

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recreation, and wildlife management areas. No structures or buildings can be built in this district without a special permit granted by the Planning Board. This regulation helps to minimize loss of property.

Floodplains are nature's way of dealing with floods, which are an occasional natural occurrence. When development occurs in these areas, there are two undesirable effects. First, homes and other buildings are flooded, causing damage which can be expensive to repair. Second, this development reduces the water storage capacity of the floodplain, so that what would have been a minor flood is often worse, possibly causing damage to structures that were previously not impacted by flooding.

The Aquifer Protection Overlay District includes the Zone II Groundwater Protection Areas, Interim Wellhead Protection Areas (IWPA), and areas designated as high and medium yield aquifer areas. This district is intended to protect, preserve, and maintain present and potential sources of public and private water supplies and their recharge areas. It is important to delineate such a district to protect against contamination and to insure that the aquifer is constantly being recharged. Because aquifers are underground, it is critical that rainfall be allowed to permeate into them, in order to maintain the supply of water.

Land uses permitted in the Aquifer Protection district are similar to those permitted in the floodplain district, but with residential development also permitted. However, when developing in the Aquifer Protection district, the lot may not be more than 50 percent impervious surface. Stricter regulations apply within the Zone II and IWPA areas, including restrictions concerning toxic and hazardous wastes and runoff. All runoff from impervious surfaces must be recharged on the site by being diverted to stormwater infiltration basins covered with natural vegetation. These restrictions protect both water quality and the amount of water available from the aquifer.

While not regulated under Zoning, undisturbed wetlands have the added bonus of a filtration system. Wetland plants are a natural filter, so that when runoff from parking lots, roads, and other paved surfaces reaches a wetland, pollutants like gasoline and oil are filtered out of the water before it reaches the groundwater system. When these wetlands are built upon, the pollutants are not filtered out and runoff from streets and parking lots may flow directly into groundwater or streams and rivers.

<u>Build-Out Scenario</u>

The 1999 EO 418 Buildout Analysis is the only information available on build out conditions. This information is outdated, but still worth noting as a snapshot of potential buildout based on demographic and land use conditions in 1999. The buildout analysis illustrates to a community, using a series of maps, the potential for the future growth of the community in terms of residential units and potential square footage of commercial and industrial space. The Buildout Analysis enables a community to examine its likely future based on its 1999 zoning and other regulations, and determine if that is the future that is desired by the community. The analysis provides community-based estimates of the impacts of the buildout on the number of residents and school children, the water supply needs of the community, the future trash production, and the additional road miles associated with the buildout. The model also allows the community to test the

Table 3-13: Summary of Build-Out Statistics, Impact of Additional Development	
Developable Land Area	13,025.37 Acres
Additional Residential Units	7,087 Housing Units
Additional Commercial/Industrial Floor Area	904,365 Square Feet
Additional Residential Water Use	1,428,414.62 Gallons Per Day
Additional Residential Solid Waste	9,306.4 Tons
Additional Students	2,516
Additional Roadway	115.46 Miles

Assumptions:
1. Additional Students figure is based on an average of 2.56 persons and 0.355students per household.
2. Additional Road Miles calculated for residential development only, based on frontages of 125 and 150 feet. Overall impacts on the transportation network in Ware should reflect the number of trips generated, level of service at key intersections, and other critical methods of measurement.
3. Water use figures do not reflect commercial water use.

implications of alternative zoning regulations.

Table 3-13 is a summary of the build-out statistics for the town of Ware and while now outdated, are the best statistics available at this time. The analysis shows that as of 1999, out of 13,000 developable acres in Ware, there was the potential for over 7,000 additional housing units and 900,000 square feet of commercial space in Ware. This could result in over one million additional gallons of water per day for residential uses, 9,000 tons of residential waste, over 100 miles of roadway, and an additional 2,500 students. In particular, the broader area around Beaver Lake is seen as an area which may have substantial amounts of residential development. While a definitive subdivision plan for a 67 home development was approved off of Monson Turnpike Road in this part of town in 2006, no work has been done on it and it remains a "paper development". The tract is currently on the market for sale, but the owners and their agents don't expect it to be sold for development of the subdivision and are seeking to market it for other potential uses, including a cluster development for an active adult community or development of a campground. There are several other unfinished approved subdivisions in town with a capacity for 75 new homes. One of these is likely to have additional phases approved in the future, with a capacity for another 24 lots.

Achieving Ware's vision for the future of a town with abundant parks and recreation opportunities, the safety and character of a small town with scenic roads and vistas, will require controlled growth and protection of those lands with recreation and conservation importance.

Environmental Inventory and Analysis Section 4

A. Geology, Soils, and Topography

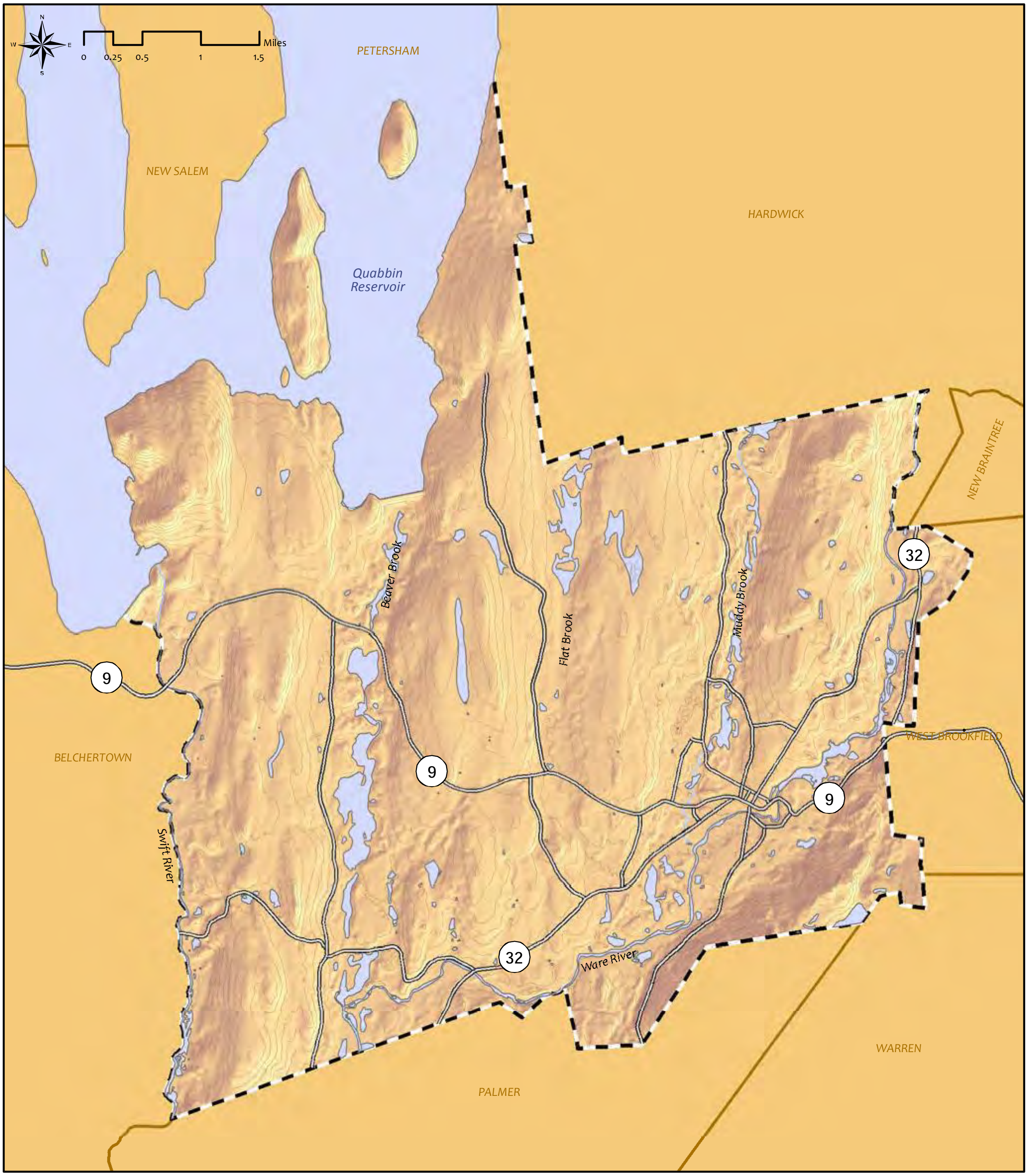
Ware is located in the easternmost part of Hampshire County, and encompasses 25,660 acres (40.09 square miles). The highest elevations in Ware are in the southeastern corner of the town (1,050 ft.) and Quabbin Hill (1,026 ft.). Approximately two-thirds of the area of the town falls in the 500-1,000 ft. elevation range, while the area which runs due south of the Quabbin Reservoir and then east through the commercial district is in the 0-500 ft. range.

The topography of much of Western Massachusetts was radically changed by glaciation during the Pleistocene period nearly one million years ago. The retreat of the last glacier, about 1,000 years ago, removed 10 to 15 feet of bedrock from the most exposed ledges, rounded the hills, deposited debris and created new land forms. The Muddy Brook valley is a glacial flute (small valley), and is an example of this geologic phenomenon. A considerable percentage of the soils in the Ware area was formed from glacial till and alluvial deposits. Glacial debris such as large stones and boulders often create serious problems for agricultural use, and the slow permeability of the soils is a severe limitation for septic systems. Map 8 shows these ridges and valleys.

The U.S. Natural Resource Conservation Service (NRCS) has organized the soils in Ware into two soil associations, each with distinctive patterns of soils, drainage pattern, topographic relief, development and agricultural constraints and opportunities, and other characteristics. Most of Ware's land is sloped which limits development of small scale commercial sites. Large rocks, a shallow depth to bedrock, droughtiness, or an occasionally high water table pose serious problems for forest or agriculture development. The two soil associations are as follows:

Southern and Central Ware: These areas contain Hinckley-Merrimac-Windsor soils. The Hinckley association contains soils that are characterized as being very deep, nearly level to steep, sandy, are excessively drained, and formed in outwash deposits. Topography ranges from rolling broad areas to narrow terraces. Many areas are dissected by drainage ways with slopes ranging from 0 to 35 percent. According to the NRCS, soils in this association are suited to cultivated crops, hay, and pasture. Management concerns include droughtiness and erosion on sloping to steep areas. The soil's low available water capacity is the main limitation for woodland production. In general, these soils are well-suited to building site development, but have the problem of readily absorbing, but not adequately filtering, the effluent from septic tank absorption fields. This should be taken into consideration when designing on-site sewage disposal systems in order to avoid polluting groundwater.

Northern and Central Ware, and areas around the Quabbin Reservoir: These areas contain Canton-Gloucester-Scituate soils. This association contains soils that are very deep, well-drained, and formed in



Legend

- 50 Foot Contours
- Open Space
- Waterbodies
- Rivers

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Map 8: Topography

May 25, 2013

Sources:
MassGIS: Topographic Elervations, Shaded Relief, Rivers, Waterbodies, Roads, Towns
Ware: Open Space (all types)

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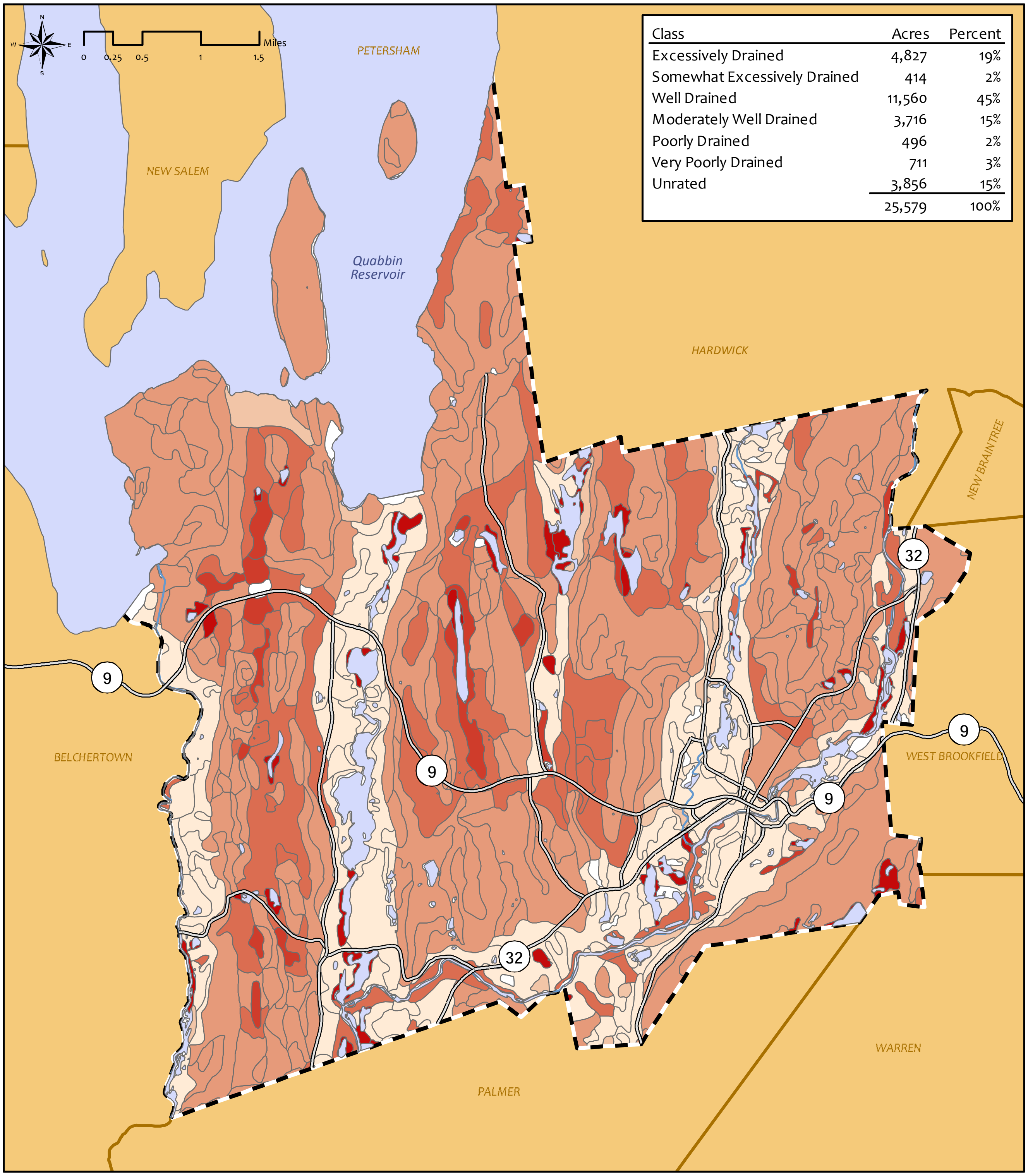
sandy glacial till. Most areas have stones and boulders on the surface that are 5 to 20 feet apart with slopes ranging from 0 to 45 percent. The NRCS describe these soils as being generally poorly suited to cultivated crops, hay, and pasture because of the stones that are found on the surface. They have a moderate potential for woodland production and upland areas are well-suited to building site development although wetness is a limitation in low areas and in depressions. Similar to the Hinckley soils, the Canton and Gloucester soils readily absorb but do not adequately filter effluent from septic tank absorption fields, so again on-site sewage disposal systems need to be designed accordingly to avoid polluting the groundwater.

Slope is an important factor when determining the development potential of an area. Areas with a slope of 15% or greater have limitations for building due to the significantly increased physical or financial requirements of such a project. Areas with a slope of 15% or greater form a series of north-south bands. The major areas with slopes of less than 15% are located in the Fisherdick Road area in a north-south pattern east of the Quabbin which continues due south to the southern town boundary, and into the western corner of town. In general, approximately 50-60 percent of the town's land area has a slope of 15% or less.

The NRCS rates soils for a variety of characteristics which are useful in coarse (i.e. non-site-specific) planning. Map 9 shows soil drainage; this is important not only for building development potential but also for various types of vegetation (both cultured and natural) and wildlife habitat. Map 10 shows hydric soils, which are the locations where wetland habitats are most likely to be sustainable. It should be noted that wetlands do occur in other types of soils; the map is not a representation of wetlands.

Combining soil characteristics with slope indicates whether an area can easily support on-site sewage disposal (a.k.a. septic) systems. All of the soils found in Ware have severe restrictions for septic tank absorption fields (see Map 11). This does not mean that septic systems cannot be constructed, it means that the site specific soil conditions must be considered for each system, and the system must be designed to accommodate the soil limitations. In most cases, limitations can be overcome with alternative designs, and while more costly to install and maintain, development – particularly at low densities – can be sustained.



Class	Acres	Percent
Excessively Drained	4,827	19%
Somewhat Excessively Drained	414	2%
Well Drained	11,560	45%
Moderately Well Drained	3,716	15%
Poorly Drained	496	2%
Very Poorly Drained	711	3%
Unrated	3,856	15%
	25,579	100%

Legend

Drainage Class

- Unrated
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Poorly drained
- Very poorly drained

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Map 9: Soil Drainage

May 25, 2013

Sources:
MassGIS: Towns, Roads, Waterbodies, Rivers
Ware: Open Space
NRCS: Soils, Drainage Classification (2007)

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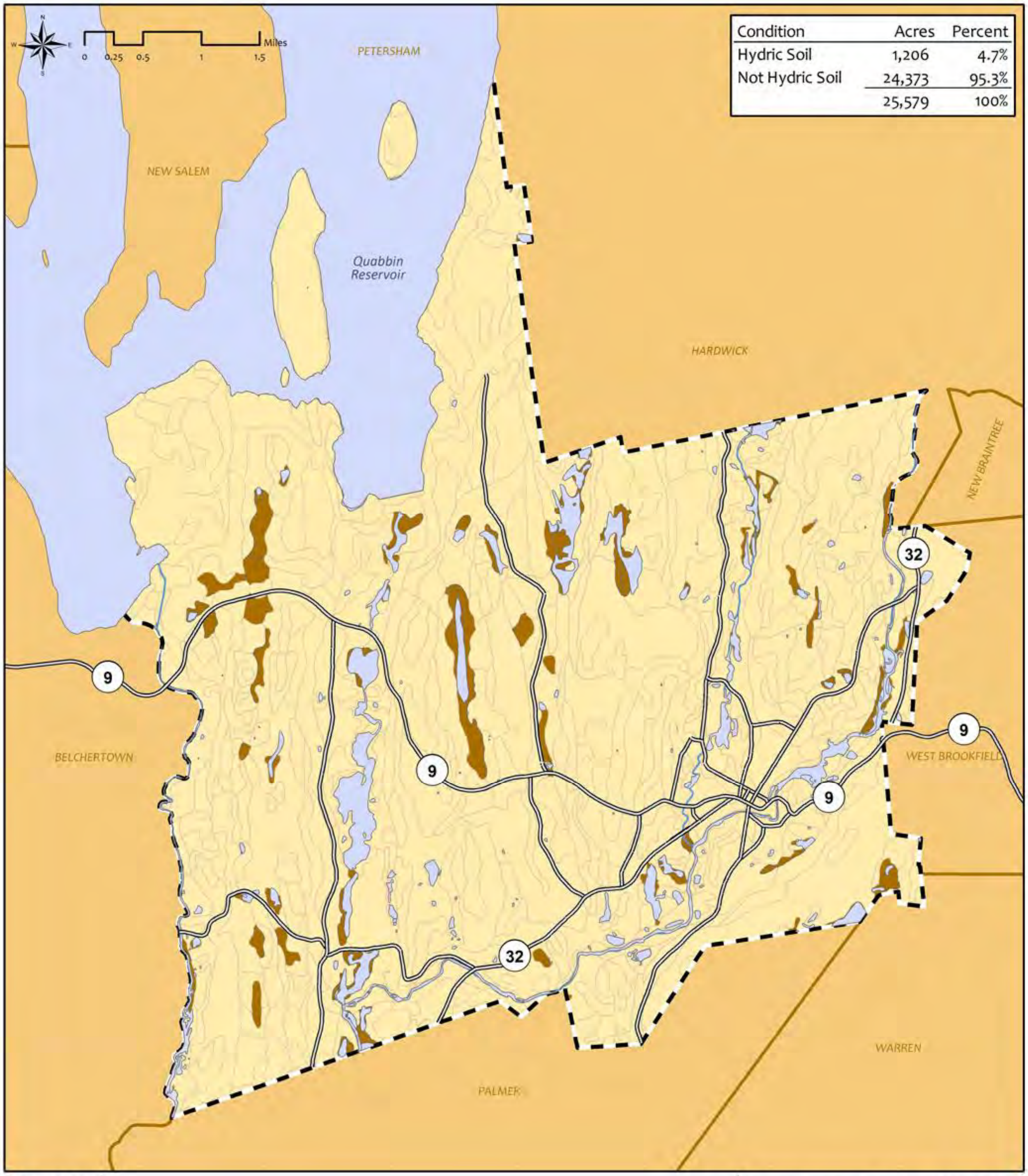

Condition	Acres	Percent
Hydric Soil	1,206	4.7%
Not Hydric Soil	24,373	95.3%
	25,579	100%

Legend

- Hydric Soils
- Not Hydric Soils

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Map 10: Hydric Soils

May 25, 2013

Sources:
MassGIS: Towns, Roads, Waterbodies, Rivers
Ware: Open Space
NRCS: Soils, Drainage Classification (2007)

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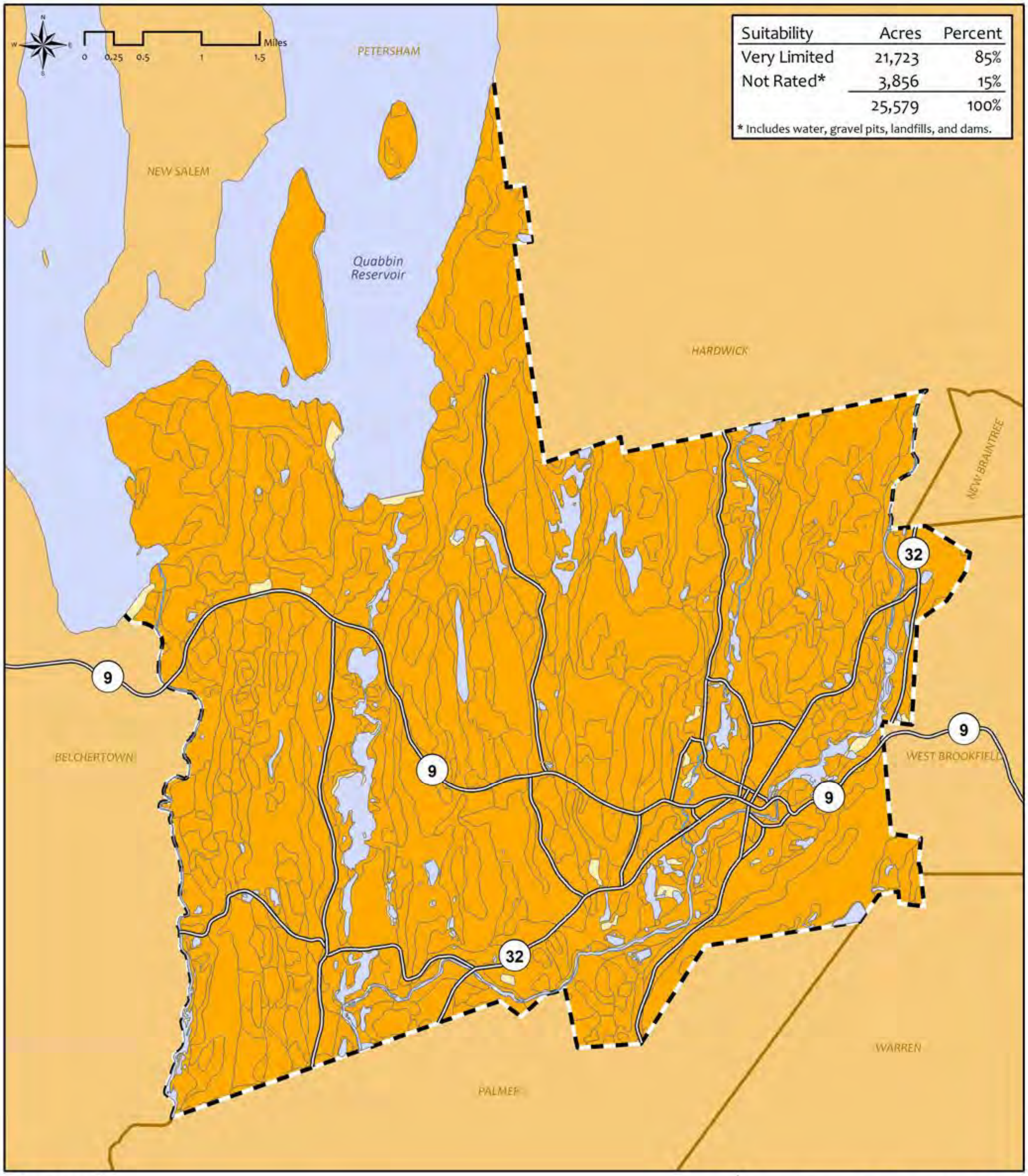

Legend

Suitability for Septic Absorbtion Fields

Very limited

Not rated

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Map 11: Septic Suitability

May 25, 2013

Sources:
MassGIS: Towns, Roads, Waterbodies, Rivers
Ware: Open Space
NRCS: Soils, Drainage Classification (2007)

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B. Landscape Character

At first glance, Ware looks like a typical western Massachusetts mill town, nestled among the glacial valleys and ridges with development concentrated along the major waterways. From many points in town and along major roadways, forested ridges and busy valleys with church spires and factory chimneys portray Ware as a community founded on the New England traditions of farming and mill manufacturing.

The old and the new coexist in Ware. Route 9 is the spine of the original town center (by Greenwich Plains Road), and is surrounded by historic buildings. The large residences along Route 9 and other roads close to the current town center (e.g. Church Street) testify to the prosperity the town enjoyed when manufacturing was at its peak in the millyard. Newer development has sprung up in the last fifty years, mostly along Route 32. The sprawling nature of today's commercial developments provides a less appealing and more generic solution to providing residents with goods and jobs.

The outer country roads of Ware provide a tour of the history of town, from the original farms, mills and covered bridge, to the newer residential lots that were created on the outskirts of town. Ware has a beautiful history that is still evident in the town's buildings. A good example of how Ware has retained its character while allowing for new development is found in the reuse of the large mills in the center of town. Now occupied by factory outlets, several small businesses, and some industrial uses, the mills serve a dual purpose of visual history and active commerce. Redevelopment is not at full capacity; underutilized space is still available. It is crucial to balance the value of the new, necessary improvements needed in town with the value of a rich history that should not be forgotten or replaced. Adopted in 2012, the Millyard zoning district was created to promote mixed use development in this area including residential, retail, office and light industrial.

Like many more urbanized communities with higher populations, Ware is trying to focus new residential development closer to the downtown area where public utilities (water and sewer) and facilities (parks and sports fields) are available. However, zoning alone cannot dictate where future residents live, and given the large amount of undeveloped, privately held land in Ware, it can be expected that recreational facilities will be needed in more remote parts of town. An example of this is Pennybrook Field, which had been a subdivision that was not developed and was eventually obtained by the Town. Only a small portion of this site has been developed into a ball field, and that was done by volunteers primarily for a practice field. The site could be improved with additional fields, parking, trails, and a picnic area. Located at the southern end of Beaver Lake, which is privately held, the site has significant potential which has yet to be realized. Map 5, in Section 4-F, shows many of the features that give Ware it's rural character.

C. Water Resources

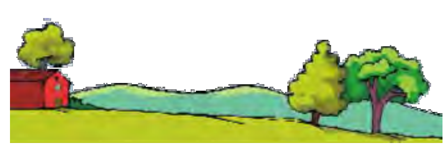
The entire town is located within the Chicopee River Basin, which encompasses a large network of tributaries that ultimately flow into the Connecticut River. Map 1 shows the watershed area. The watershed has a total drainage area of approximately 723 square miles. Five sub-watersheds of the Chicopee exist in Ware including Muddy Brook, Quabbin Reservoir, Quaboag River, Swift River and Ware River. The Quaboag, Swift and Ware Rivers converge in the Town of Palmer south of Ware to form the main stem of the Chicopee River.

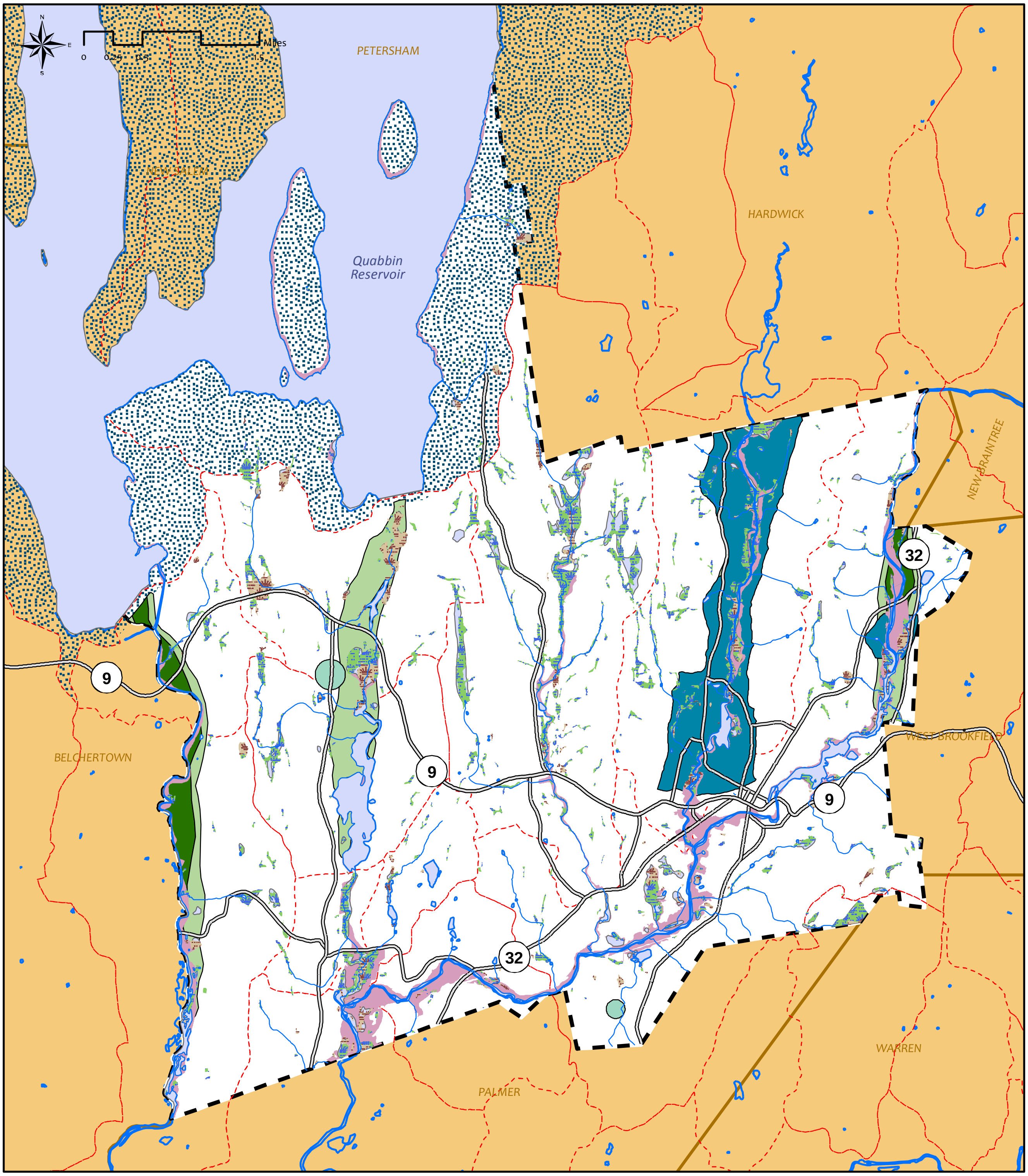
The three major surface waters in Ware are the Swift and Ware Rivers and the Quabbin Reservoir (see Map 12). The Swift River flows along the Ware-Belchertown boundary until it joins the Ware River at the Three Rivers junction. The Ware River originates in Hubbardston, Massachusetts and flows generally southwesterly through the town. The Quabbin Reservoir is located in seven towns including Ware, and is managed by the Massachusetts Department of Conservation and Recreation (DCR), and covers 24,705 acres. DCR replaced the Metropolitan District Commission (MDC) as the manager of the reservoir in 2003 when MDC and the Massachusetts Department of Environmental Management (DEM) merged forming the DCR. Created in 1984, the Massachusetts Water Resources Authority (MWRA) is responsible for treatment and distribution of wholesale water to local water departments in 48 communities: 42 in greater Boston and the Boston-MetroWest areas and three in central Massachusetts (Chicopee, South Hadley, and Wilbraham). MWRA also provides a back-up water supply in three other communities. See Table 4-1 for additional information on surface water resources in Ware.

The Quabbin Reservoir was created in the 1930's by inundating the Swift River valley behind the Winsor Dam, which lies across the boundary of Belchertown and Ware, and the Goodnough Dike, which is in Ware. The reservoir has an average depth of 51 feet, with a maximum depth of 150 feet, and holds 412 billion gallons. Much of the watershed is now home to many species of wildlife including bear, bobcat, moose, deer, and bald eagles.

Table 4-1: Surface Water Resources

Surface Water	Owner	Size (acres)	Use	Dam Height	Drainage (sq.mi)
Babcock Tavern Road Pond	Private	13	Recreation	none	unknown
Swift River and Ware River	Public		Recreation		
Beaver Lake	Private	155	Recreation	13	5.6
Martowski Pond	Private	8	Recreation	none	unknown
Penny Brook Pond	Private	8	Recreation	none	unknown
Cook's Pond (Peppers Mill Pond)	DCR	10	Fishing	10	2.7
Snow's Pond	Water Dept	25	Recreation	8	18.9
Quabbin Reservoir	DCR	24,705	Water Supply, Limited Rec.	170	185.9





Legend

Chicopee Basin
Sub-basin Watersheds
Rivers and Streams
Waterbodies

Wetlands

Marsh/Bog
Wooded marsh

Flood Hazard Zone
Outstanding Resource Watershed

Aquifers

Interim Wellhead Protection
High Yield
Medium Yield
Zone II

Open Space & Recreation Plan

Map 12: Water Resources

May 25, 2013

Sources:
MassGIS: Watersheds, Rivers, Waterbodies, Wetlands, Aquifers, Outstanding Water Resource Areas, Flood Hazard Zones (FEMA), Roads, Towns

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Swift River Sub-watershed

MA DEP's Chicopee River Watershed 2003 Water Quality Assessment Report is the source of information in the next two sections of this plan.

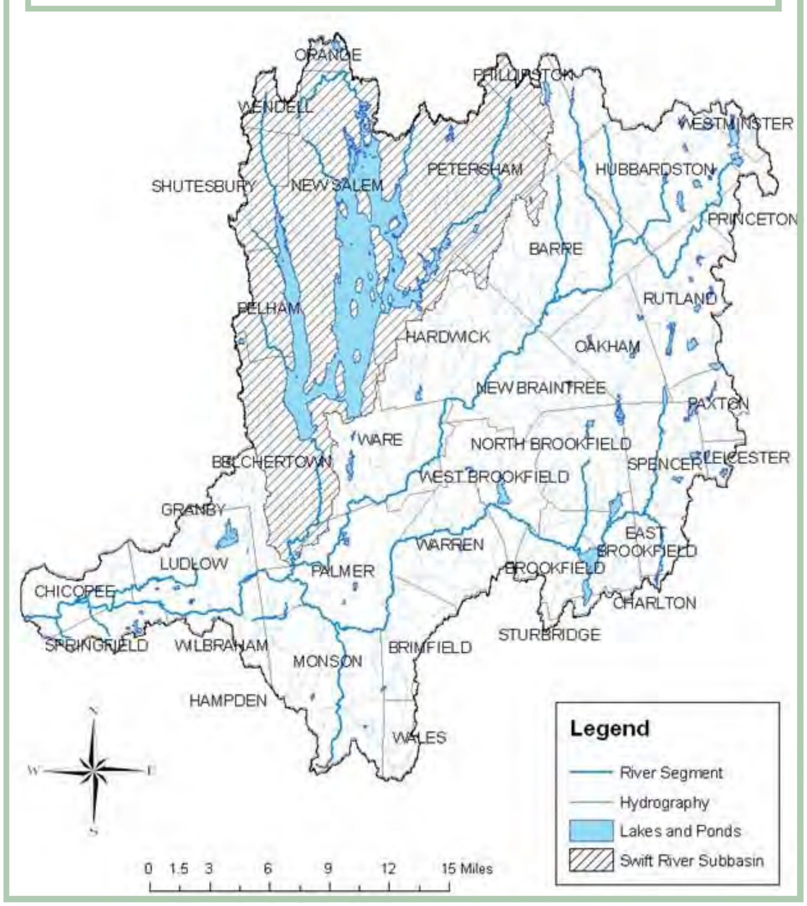
A portion of the Swift River (Segment MA36-09) flows through Ware forming the boundary with Belchertown. The Swift River is a Class B, Cold Water Fishery.

The U.S. Geological Survey (USGS) maintains a gage (Gage 01175500) on the Swift River in West Ware 1.4 miles downstream from the Quabbin Reservoir. The drainage area is 189 square miles including 1.6 square miles drained by Beaver Brook, flow that is diverted from the Ware River Basin (USGS, 2007). The period of record is July 1910 to present (USGS, 2007). The average discharge after the completion of Quabbin Reservoir (1940-2005) is 94.4 cubic feet per second (cfs) (USGS, 2007).

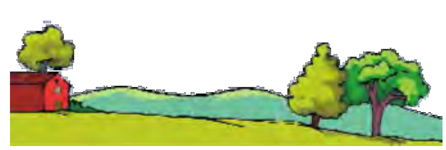
The USGS reports that flow has been regulated by Quabbin Reservoir since August 1939 (USGS, 2007). The flow has been diverted from the Ware River to Quabbin Reservoir since 1940; from Quabbin Reservoir to Wachusett Reservoir since 1941; from Quabbin Reservoir to Chicopee Valley aqueduct since 1950; and from Quabbin Reservoir to the city of Worcester periodically since 1966 (Socolow et al., 2004).

The Swift River begins at the Winsor Dam with flow regulated by the MWRA via a control structure in the Quabbin power plant. From December 1 through May 31, DCR is required to release 20 million gallons per day (mgd) from the Quabbin Reservoir to the Swift River. From June 1 through November 30, the required releases (per order of the US Army Corps of Engineers) are dependent on the stream flow of the Connecticut River at the USGS Montague gage. When the flow of the Connecticut River is less than 4,900 cfs, the required release at Quabbin Reservoir is 45 mgd, and when the flow is greater than 4,650 cfs, the required release at Quabbin Reservoir is 71 mgd. In practice, however, DCR releases either 20 or 71 mgd or more depending on reservoir operating conditions (Austin, 1993).

Figure 4-1: Chicopee River Basin, Swift River Subbasin



The wetlands and waterways in this segment of the Swift River are identified as habitat for rare and endangered species



by the state's Natural Heritage and Endangered Species Program (NHESP). The Swift River contains a variety of habitat types. The river's gradient, cold water coming from the depths of Quabbin Reservoir, and the impoundment and extensive wetlands formed by the Upper Bondsville Mill Dam in the village of Bondsville, Palmer, result in a mix of cold and warm water fisheries habitat.

The Swift River is heavily stocked with trout and is fished all year long. Special fishing regulations apply to two different portions of this river segment (see Massachusetts Department of Fish & Game (MA DFG) Abstracts of the Massachusetts Fish and Wildlife Laws). A survey done in 1998 by the state found the river exhibited a rich species diversity with a well-balanced aquatic community.

In July 2006, Massachusetts Riverways conducted a habitat improvement project on this segment. The project entitled "Swift River Rock Structure Removal" improved habitat by eliminating flow constriction caused by rock piles left in the river by a former bridge (Graber 2004). The goal was to change pool habitat into new riffles.

All water quality data for the Swift River in Ware meet state and federal standards except pH, which was found to be slightly lower than the standard on the majority of sampling events. Given the good water quality and the presence of multiple age classes of brook trout, this segment supports the Aquatic Life Use, as defined by BioMap2 Critical Natural Landscapes.

The Massachusetts Division of Watershed Management (MA DWM) conducted water quality monitoring at one station (SR03-Cold Spring/Old Belchertown Road, Belchertown) along this segment of the Swift River from April to October 2003. The geometric mean of E. coli counts was 5.1 colony forming units (cfu)/100 mL. Both Primary and Secondary Contact Recreational Uses are supported given the low bacteria levels found at this site. The "Aesthetics Use" (aquatic life, primary contact such as swimming, secondary contact such as boating, and visual aesthetics) is also supported by the Swift River due to its high water quality.

Ware River Sub-watershed

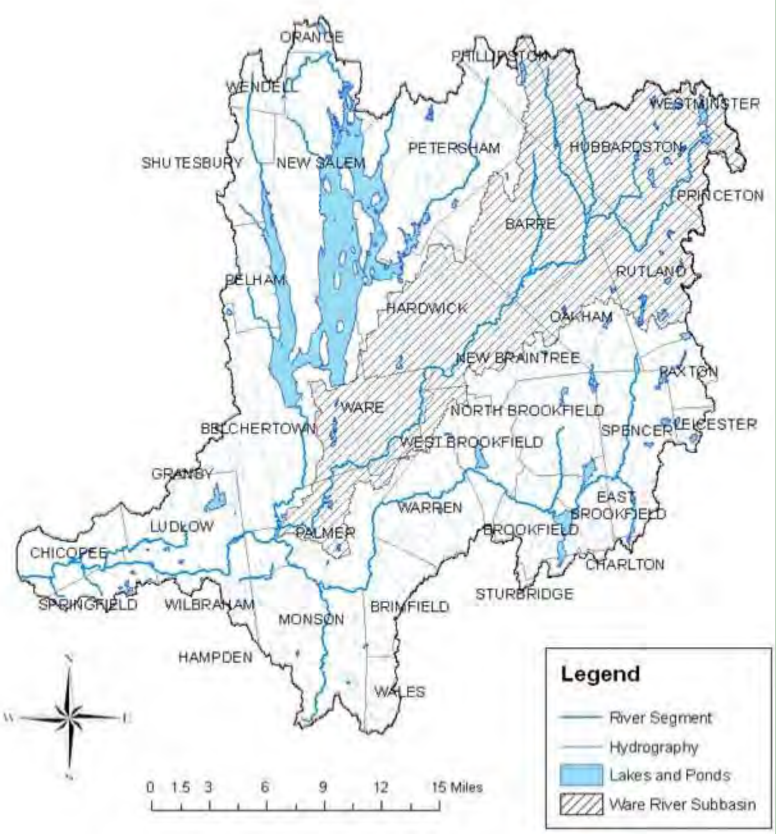
Two segments of the Ware River flow through Ware: Segment MA 36-05 (Wheelwright Dam in New Braintree to Ware Dam in Ware) and Segment MA 36-06 (Ware Dam in Ware to Thorndike Dam in Palmer). Both are Class B, Warm Water Fisheries. The following information is from the Massachusetts Department of Environmental Protection's (DEP) 2003 Chicopee River Watershed Assessment.

The USGS maintains a gage on the Ware River (Gage 01173500) 0.5 miles upstream from Gibbs Crossing, south of the Ware Dam. The drainage area for this gage is 197 square miles and the average annual discharge is 294 cfs (period of record 1931-2005 (USGS 2007).

MA DFG stocks the Ware River with trout. (DFG, 2007). In 2003, DFG conducted fish population sampling in the Ware River off Route 32 in Hardwick and collected fallfish, yellow perch, yellow bullhead, golden shiner, spot-tail shiner, bluegill, redbreast sunfish, longnose dace, tessellated darter, chain pickerel, rock bass, white sucker, pumpkinseed, common shiner, eastern blacknose dace, and largemouth. The fish assemblage consisted of a diverse mix of macrohabitat generalists and fluvial specialist/dependent species. The Hardwick Waste Water Treatment Plant is upstream of Ware in Hardwick. All water quality data meets criteria.

The Aquatic Life Use is assessed as supported for this segment based upon good survival of test organisms exposed to river water at all three locations, the presence of fluvial specialists/dependent fish species and good water quality conditions. The segment is given "Alert Status" due to acute whole effluent toxicity in both the Hardwick Water Pollution Control Facilities in Wheelwright and Gilbertville discharges and the slightly elevated total phosphorus concentrations.

Figure 4-2: Chicopee River Basin, Ware River Subbasin



The Primary Contact Recreational Use is assessed as supported in the upper 3.8 mile reach of Segment 36-05 based on bacteria counts. The lower 7.7 miles of this segment is assessed as impaired for this use due to elevated E. coli counts at one sampling location. The Secondary Contact Recreational Use is supported as bacteria levels at both stations meet the criterion. The Aesthetics Use is assessed as supported given the lack of objectionable conditions.

Outstanding Resource Waters

Outstanding Resource Waters (ORW) is a classification under the Massachusetts Surface Water Quality Standards of 1995 for certain watershed areas. According to 314 CMR 4.00, "Certain waters shall be designated for protection under this provision in 314 CMR 4.06(3) including Public Water Supplies (314 CMR 4.06(1)(d)1.). These waters constitute an outstanding resource as determined by their outstanding socioeconomic, recreational, ecological and/or aesthetic values. The quality of these waters shall be protected and maintained" (1995). The Quabbin Reservoir is a designated Outstanding Resource Waters with 3,357 acres of surface waters in Ware. This area is shown on Map 12.

Flood Hazard Areas

The major floodplain areas in Ware are located primarily along the Ware River and the Quabbin Reservoir. Other floodplain areas are located along the Swift River, Flat Brook, Muddy Brook, and in the Beaver Lake and Peppers Mill Pond area. Ware has restrictions on development in these areas to protect the community against resource degradation due to unsuitable uses occur along these waterways, and also to reduce flooding. These areas are shown on Map 12.

Aquifer Recharge Areas

There are a number of aquifer recharge areas in Ware. One is located along the Swift River toward River Road, and another from the Goodnough Dike south to Beaver Lake. The most important and largest aquifer in Ware is the one now designated as a Zone II protection area by DEP which runs along Muddy Brook and Greenwich Road, down to Snow's Pond, which supplies the town wells off of Barnes Street. An additional well is located off Gilbertville Road, fed by another Zone II area along the Ware River. Various development and use restrictions exist in these areas in order to protect both water quality and potable water availability for the town. These areas are shown on Map 6. It should be noted that based on geologic data, there are other aquifer areas in the town, but due to previous development or potential for providing sufficient water for a public water supply, the Town has chosen not to regulate them specifically for groundwater resources.

Wetlands

Wetlands can be found throughout Ware and are typically associated with rivers, streams and ponds. There are 66 Certified Vernal Pools. Vernal pools are temporary wet areas that provide habitat to plants and animals and often form in the spring with snow melt. Several of the BioMap2 Core Habitats include Wetland Cores 1573, 1610, 1650, 1664, 1688, 1837, 1872, and 2335. Wetland Cores are the least disturbed wetlands in the state within undeveloped landscapes. These wetlands are most likely to support critical wetland functions (i.e. natural hydrologic conditions, diverse plant and animal habitats, etc.) and are most likely to maintain these functions into the future. Two of the Wetland Cores (1573 – 80 acres; 1837 – 111 acres) are among the largest 20% of Wetland Cores in this ecoregion. Two other Wetland Cores are of significant size (1664 – 25 acres; 1688 – 17 acres).

In BioMap 2 Critical Natural Landscapes, six Wetland Core Buffers have been identified: 742, 775, 834, 849, 852, and 1322. Methodologies for BioMap2 considered unfragmented habitats surrounding wetlands and analyzed rare species habitats. These approaches identified protective upland buffers around wetlands and rivers that support the habitats and functionality of each individual wetland, as well as the adjacent uplands (important to species moving between habitats). The BioMap2 maps are included in this chapter under Vegetation Mapping.

D. Vegetation

General Inventory

Ware's landscape of rich fertile floodplains is a patchwork of croplands reaching the gently sloping hillsides of mostly mature woodlands. The October 2011 snowstorm caused a significant amount of damage to trees throughout the region, and Ware was no exception. While trees in populated areas were trimmed or cut down, most damaged trees remained as-is out in the woods where people don't notice them. Some of these will likely become diseased, but generally speaking, the forest should not experience unnatural decline due to the storm.

Forest Land

In 1985, 64% of Ware's land was covered with forest (see Map 13). Current estimates of forest cover are unavailable. However one example of extensive forest cover is the Dougal Range (2,000+ contiguous acres) in the northeastern part of Ware, extending into Hardwick. The major forest types in Ware are Appalachian-Oak (Northern Red Oak, White Oak, Chestnut Oak, American Chestnut) and Northern Hardwood (Sugar Maple, Beech, Yellow Birch, White Birch, Paper Birch, Hemlock). Many of these species may be harvested for furniture, flooring, and fuel. These mature forests are excellent places for recreational trails due to the lack of substantial undergrowth. A maturing (younger) forest has fewer recreation opportunities but does provides game for hunting and wildlife viewing.

Public Shade Trees

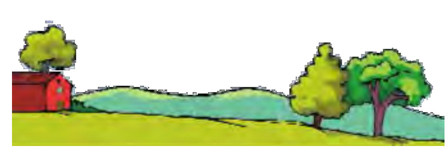
Ware, like most New England towns, is blessed by many shade trees growing on public lands and along public roads. The town does not have a formal inventory of these trees, with the exception of the trees on Main Street and those in the Aspen Grove Cemetery (see below). The DPW has a good handle of the shade trees in town, since they are responsible for maintaining the roads throughout town. Tree maintenance is typically done during the winter, with trimming and removal when necessary. The Tree Warden is an employee of the DPW and as such, the department handles any tree removal or pruning that is needed. Ware is not a Tree City, and the town has no designated Scenic Roads either. About 12 years ago, the Town planted two American Liberty Elm trees at the entrance to Grenville Park.

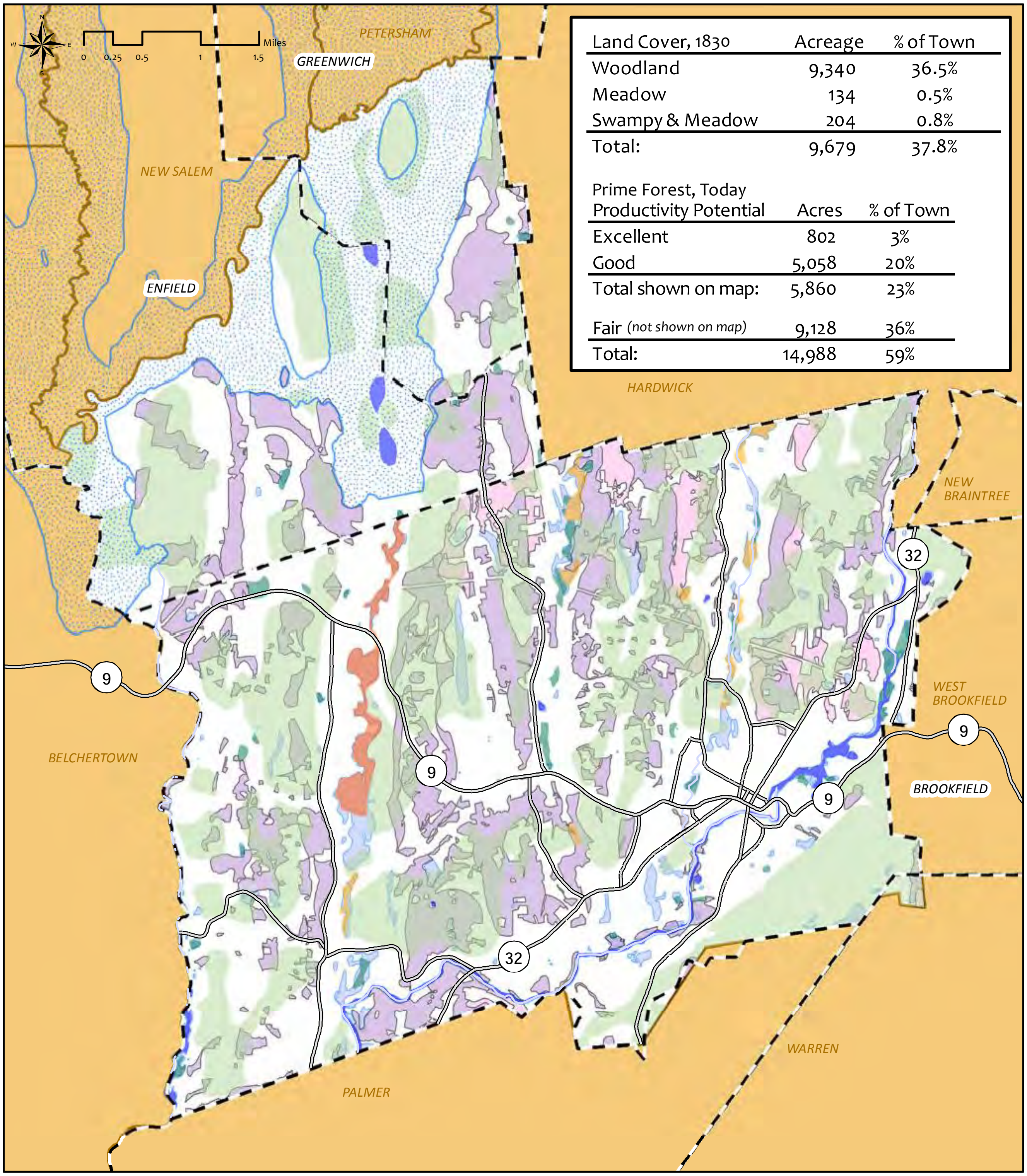
The street trees in downtown Ware are in fair condition, but many of those originally planted in the 1980s have died and been removed and not replaced. The community is planning the Main Street streetscape in anticipation of the reconstruction of the roadway in 2019 or so; this effort includes street trees. Given the width of the roadway (four lanes wide) there is insufficient room to ever see the majestic elm trees that once lined Ware's Main Street again.

In 2012, a tree survey was completed for Aspen Grove Cemetery in order to determine a maintenance work plan. As a result, a number of trees were trimmed and removed under the supervision of the Town Tree Warden. *Wooly Adelgid*, an invasive insect, has been identified on hemlock trees in the cemetery.

Agricultural Land

The many fields in Ware provide some of the most scenic views in town. Open lands provide viewsheds to the surrounding communities and region. The typically flat and well-drained lands may also convert easily to active recreation fields, such as ball fields. Converting former agricultural fields to





Land Cover, 1830	Acreage	% of Town
Woodland	9,340	36.5%
Meadow	134	0.5%
Swampy & Meadow	204	0.8%
Total:	9,679	37.8%

Prime Forest, Today Productivity Potential	Acres	% of Town
Excellent	802	3%
Good	5,058	20%
Total shown on map:	5,860	23%
Fair *(not shown on map)*	9,128	36%
Total:	14,988	59%

Legend

Land Cover, 1830

- Woodland
- Water
- Meadow
- Wetland (MassGIS)
- Swampy & Meadow Land
- Town Boundaries, 1830

Prime Forest, Today

- Excellent
- Good
- Town Boundaries, 2013
- Quabbin Reservoir
- Waterbodies
- Rivers

Note: Town names shown in black & white relate to the 1830 boundaries; those in brown relate to the current boundaries.

Open Space & Recreation Plan

Map 13: Forest Cover

July 22, 2013

Sources:
MassGIS: Quabbin Reservoir, Waterbodies, Rivers, Roads, Towns (2013), and Prime Forest (Today) which is derived from soil data along with 1999 land use/land cover, topography, and wetlands information.
Harvard Forest: 1830 Land Cover, Town Boundaries (1830) [2002. 1830 Map Project. Harvard Forest Archives, Petersham, MA.]

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Farmland Soils	Acres	Percent of Town
Prime	723	3%
Statewide Importance	3,012	12%
Unique Importance	451	2%
	4,186	16%

Legend

Open Space by Purpose

Agricultural

Other

Farmland Soils

Prime Farmland

Statewide Importance

Unique Importance

Other Soils

49.29 acres of prime or statewide farmland soils are protected with APR.
756.3 acres of farmland soils are protected with other types of protection; however 23.1 acres have only temporary protection through Chapter 61A or 61B.

Open Space & Recreation Plan

Map 14: Farmland Soils

May 24, 2013

Sources:
MassGIS: Towns, Roads, Waterbodies, Rivers
Ware: Open Space
NRCS: Soils, Farmland Classification (2007)

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recreation fields requires little to no forest cutting. Much of Ware's undeveloped, unforested land is in private ownership. Currently, over 1,647 acres of privately owned open lands are enrolled in MGL Chapter 61A for agricultural use, or 6.4% of town acreage. Between 1971 and 2005 Ware's farmland acreage decreased by 71%. Map 14 shows the soils best suited for farming, as well as the land in Ware that is protected for agricultural or other purposes. Note that lands in the "chapter land" tax reduction program are not shown on this map since they are not permanently protected. The land areas shown as prime farmland on this map should be where efforts for agricultural protection are emphasized.

Wetland Vegetation

Ware's wetlands are regulated by the Wetlands Protection Act (WPA) under the local jurisdiction of the Conservation Commission. Typical wetland plants (highbush blueberry, ferns, red maple, quaking aspen, birches, junipers and dogwoods) are popular foraging plants for many birds and other wildlife. Development limitations and strict legislation concerning wetland areas prevent these ecosystems from being used for anything more than conservation and recreation use. Recreation opportunities in and around them include bird watching and hiking.

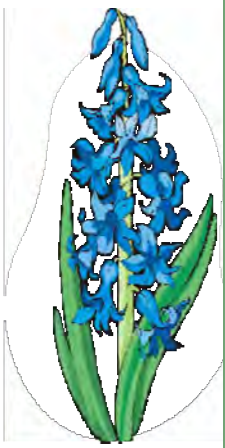
Early planning and review of development projects under the WPA and the Massachusetts Endangered Species Act (MESA) play an important role in protecting rare species habitats. The NHESP produces maps for the Commission's use under the WPA (Priority and Estimated Habitat) and the Massachusetts Endangered Species Act. Estimated Habitats are a complete subset of Priority Habitats that identify habitats of rare wetlands wildlife. Priority Habitats are drawn for all rare species. The NHESP maps and BioMap2 Core Habitat and Critical Natural Landscape Maps in this Plan offer more information about the location of wetlands in Ware.

Rare Species – Vascular Plants

Of the uncommon plants in Ware, several species have declined in recent decades due to succession to forest throughout the state (see Table 4-2 for MESA status). New England Blazing Star is an endemic, globally rare, perennial composite that grows in dry, sandy grasslands and clearings. In Massachusetts, New England Blazing Star inhabits open, dry, low-nutrient sandy soils of grasslands, heathlands, and barrens. It thrives in fire-influenced natural communities that are periodically disturbed and devoid of dense woody plant cover. Bush's Sedge occurs in dry to moist non-acidic meadows and pastures in Massachusetts. Wild Lupine is an herbaceous perennial of the pea family that has large sprays of purple flowers in early June. It grows in direct sun on dry, sandy soil in open woods and fields. It, too, has declined throughout the state as forest has reclaimed many of the former agricultural lands, and now is mostly found along edges of forests on sandy soils.

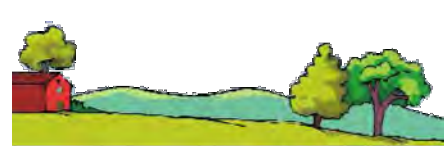
Ware has several plants found in rocky open woods: Climbing Fumitory is an herbaceous biennial vine that can reach lengths of 10 feet. It is usually found in the shade climbing over talus at the base of cliffs. Purple Milkweed is an herbaceous perennial of open sparsely vegetated woodlands and borders.

Table 4-2: Rare Species and Natural Plant Communities in Ware		
Common Name	Massachusetts Endangered Species Act (MESA) Status	Most Recent Year Observed
VASCULAR PLANTS		
Climbing Fumitory *(Adlumia fungosa)*	SC	2008
Purple Milkweed *(Asclepias purpurascens)*	E	2011
Bush's Sedge *(Carex bushii)*	E	2007
Narrow-leaved Spring Beauty *(Claytonia virginica)*	E	2008
Butternut *(Juglans cinerea)*	WL	2006
New England Blazing Star *(Liatris scariosa var. novae-angliae)*	SC	1931
Wild Lupine *(Lupinus perennis)*	WL	2008
One-flowered Pyrola *(Moneses uniflora)*	WL	1995
Swamp Lousewort *(Pedicularis lanceolata)*	E	Historic
Great Laurel *(Rhododendron maximum)*	T	2007
NATURAL COMMUNITIES		
Circumneutral talus forest/woodland	S3 – Vulnerable	2006
Hickory-hop hornbeam forest/woodland	S2 – Imperiled	2006
MESA Status: SC = Special Concern; E = Endangered; WL = Watch List; T = Threatened		



Several rare plants in Ware grow in moist woods along streams or in swamps. Narrow-leaved Spring Beauty typically occurs in deciduous forests on upper floodplain terraces and adjacent toe slopes. These areas have moist fertile soils and are subject to infrequent flooding events. Swamp Lousewort grows in open areas that are periodically flooded such as wet meadows, marsh edges, and stream banks. It occurs primarily in calcareous soils. Great Laurel, a member of the Heath family, is an evergreen shrub or small tree that grows up to 10 meters high. Its natural habitat is moist woods, swamps, and the edges of ponds. One-flowered Pyrola (also called Single Delight) is a short herbaceous plant of moist forests with a single white, waxy flower.

Natural Communities are recurring assemblages of plants and animals in similar chemical, moisture, geological, and topographic environments. In Massachusetts, the types are defined in the Classification of Natural Communities of Massachusetts, available on the NHESP website. Occurrences of uncommon types, called Priority Natural Communities, are considered to be priority for conservation. All types of natural communities provide important habitat for common and uncommon species and support the biodiversity of the town. NHESP keeps track of occurrences of Priority Types of Natural Communities, a complete list of



which is on the NHESP website. Two types of Priority Natural Communities have been identified in Ware. In addition, there are several other types in adjoining towns that might also be present in Ware. Patches of Ridgetop Pitch Pine-Scrub Oak community are found in both Hardwick and Palmer, and might be expected in Ware. In the lowlands between the ridges, Belchertown and Hardwick have Spruce-Tamarack Bogs and other types of bogs that may also occur in Ware.

Circumneutral Talus Forest/Woodland communities develop on boulder strewn slopes below slightly acidic cliffs or rock outcrops. There is often a gradient of vegetation density as the slope changes, with more trees on the lower slope. Occurrences in Ware are along a ridge that continues into Hardwick. Multiple patches of the community occur within a large contiguous forest area. Diversity of native species is good, but some patches are impacted by invasive species. One patch is next to an occurrence of Hickory-Hop hornbeam Forest/Woodland. Hickory-Hop Hornbeam Forests are open, hardwood forests dominated by various hickory species with significant Hop Hornbeam in the subcanopy. This type of community is characterized by a sparse shrub layer, and a nearly continuous cover of grasses and sedges. The very small example of Hickory - Hop Hornbeam Forest / Woodlands in Ware abuts and blends into a Circumneutral Talus Forest and other oak forest types. It has good species diversity and is in a large roadless area.

Unique Resources

The most important areas of Ware to protect in order to maintain biodiversity are around the Quabbin, and the Ware River and its tributaries. Additionally, the Dougal ridge in the northeastern part of town, shown as BioMap2 Supporting Natural Landscape (SNL) between Muddy Brook and the Ware River supports several recent rare species observations (since the BioMap work), many vernal pools (certified and potential), and older forest, all of biodiversity interest.

Ware has a very good, large area of protected lands around the Quabbin. That area includes BioMap2 cores Core Habitats and 1830s forest areas (see next section) that provide a remarkable example of relatively unfragmented habitat. Completing conservation protection of remaining unprotected land in that area, with buffers included, would enhance the viability of these special areas. Size and continuity of open space is particularly important for supporting wildlife populations. Preventing habitat fragmentation is vital in protecting the ecosystems for the rare species on the enclosed list, as well as for additional common species.

The two types of NHESP Priority Natural Communities recently identified in Ware (Circumneutral Talus Forest/Woodland and Hickory Hop-Hornbeam Forest/Woodland) are both forests of variable height and openness. Talus forests develop on boulder strewn slopes, usually below cliffs. There is often a gradient of vegetation, with exposed rocks at the base of the cliffs and taller, older trees near the bottom and sides of the slopes. "Circumneutral" refers to the chemistry of the rocks having low acidity, which allows the soils to have more nutrients available for plant growth than in the more acidic conditions that occur in much of Massachusetts (part of the reason for their relative scarcity in the state).

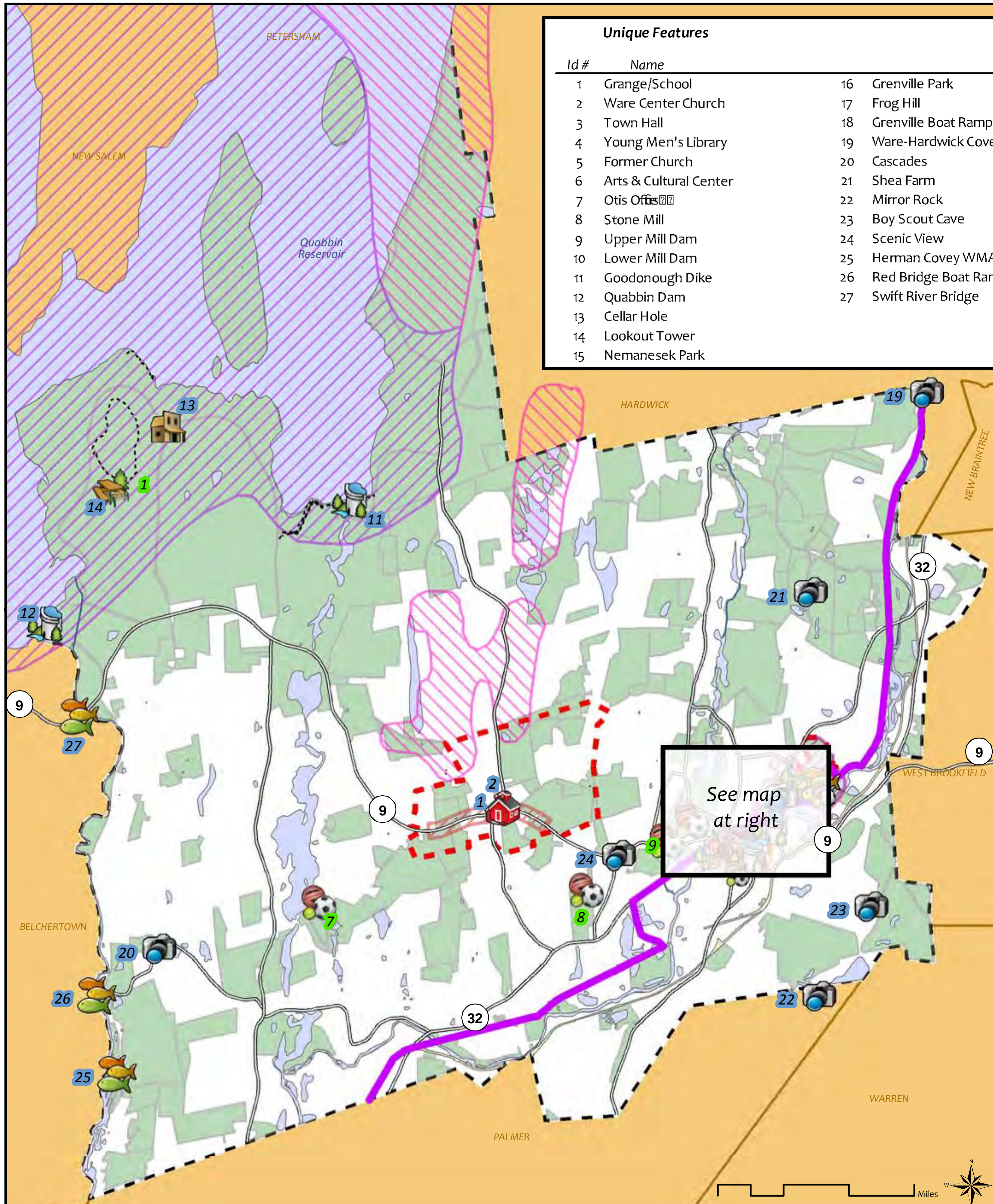
Circumneutral Talus Forest/Woodlands have a greater diversity of plant species than Acidic Talus

Forests. Some species associated with richer (more nutrients, especially calcium) conditions typically occur in Circumneutral Talus communities, including sugar maple, hickories, hop-hornbeam and some of the spring wild flowers. Hickory – Hop Hornbeam communities are mixed hardwood, open and usually short, forests/ woodlands with a sparse shrub layer, almost park-like in appearance. There is often a nearly continuous layer of grasses and sedges below the trees, which are dominated by hickories with a subcanopy of hop hornbeam. Hickory – Hop Hornbeam communities often occur on east or southeast facing midslopes with shallow soils – usually relatively dry areas. Many occurrences are small patches of a few acres each within a matrix of oak dominated forests. There are several herbaceous plant species that are found predominately in Hickory – Hop Hornbeam communities.

Map 15 shows the unique features in Ware. It includes our scenic landscapes and heritage landscapes, which were identified in the 2009 Ware Reconnaissance Report of the MA Heritage Landscape Inventory Program. These are the landscapes identified by participants as the most important to the townspeople in that they embody the community's unique character. Fifty five landscapes were identified in Ware, and of those, six were designated as heritage landscapes: Grenville Park; Ware Downtown including Nenameseck Square, Town Hall, Library, and Casino Theater; Ware Center Historic District; Ware-Hardwick Covered Bridge; Breckenridge-Rich Farm; and the Ware River Rail Trail. Of these, the Casino Theater in the downtown has been lost to neglect. Grenville Park, Nenameseck Square, and the Town Hall have all had improvements done since 2009 to help preserve them. The Covered Bridge has been rebuilt and reopened to the public since the Reconnaissance Report was published, preserving this important part of our heritage and history for many decades to come. The southern section of the Ware River Rail Trail (aka the Ware River Greenway rail trail) has been opened with the installation of two bridges in 2015. Plans to develop the section from Robbins Road to downtown Ware are underway, and negotiations continue with property owners north of Grenville Park to continue the trail to the north.

Map 15 also shows the historic districts in Ware. These districts showcase the historic structures within them, but to date no action has been taken to establish local historic districts with local regulation of alterations to the historic structures in them. Happily, many property owners with historic buildings have maintained the historic character on their own. Ware did adopt a demolition delay bylaw in 2015 to provide an opportunity for preservation of buildings slated to be torn down. So far, no significant buildings, like the Casino Theater, have been targeted for demolition.

Recreational assets are also shown on the map and include active recreational facilities such as ball fields as well as passive recreational areas such as special places and water access points. Special places include scenic vista points, locally known spots such as "the Cascades", "Mirror Rock", and "Boy Scout Caves." "Mirror Rock" is a spot on Coy Hill where if one were to take a small mirror, they could aim it such that the sun would reflect on it and people in the town below could see it, thus knowing that someone was there. Folklore has it that local boys would signal their mothers this way.

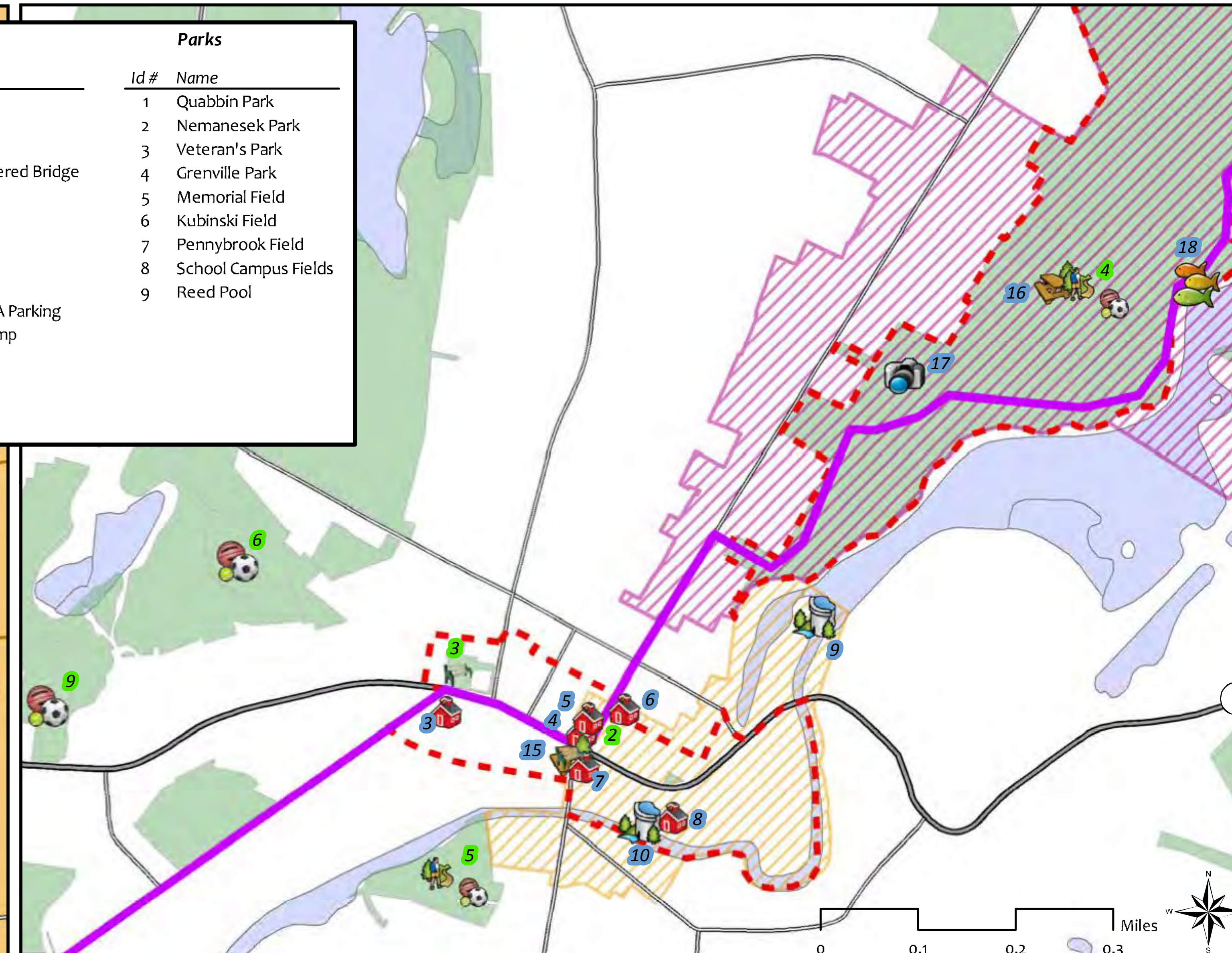


Unique Features

Id #	Name
1	Grange/School
2	Ware Center Church
3	Town Hall
4	Young Men's Library
5	Former Church
6	Arts & Cultural Center
7	Otis Offi[illegible]
8	Stone Mill
9	Upper Mill Dam
10	Lower Mill Dam
11	Goodonough Dike
12	Quabbin Dam
13	Cellar Hole
14	Lookout Tower
15	Nemanesek Park
16	Grenville Park
17	Frog Hill
18	Grenville Boat Ramp
19	Ware-Hardwick Covered Bridge
20	Cascades
21	Shea Farm
22	Mirror Rock
23	Boy Scout Cave
24	Scenic View
25	Herman Covey WMA Parking
26	Red Bridge Boat Ramp
27	Swift River Bridge

Parks

Id #	Name
1	Quabbin Park
2	Nemanesek Park
3	Veteran's Park
4	Grenville Park
5	Memorial Field
6	Kubinski Field
7	Pennybrook Field
8	School Campus Fields
9	Reed Pool



Legend

- Open Space
- Rail Trail Corridor
- Hiking Trails
- Passive Park ID #
- Active Park
- Passive + Active Park

Unique Features ID #

- Park
- Building
- Cellar Hole
- Dam
- Water Access
- Special Place

Historic Districts

- Church Street
- Millyard
- Ware Center
- Ware/Hardwick Covered Bridge

Scenic Landscapes

- Distinctive
- Noteworthy
- Heritage Landscapes
- Waterbodies
- Rivers

Open Space & Recreation Plan

Map 15: Unique Features

July 14, 2013

Sources:
MassGIS: Scenic Landscapes, Roads, Waterbodies, Rivers, Towns
Ware: Historic Sites
UMass LARP: Trails

Town of Ware
126 Main Street
Ware, MA 01082
www.townofware.com

Sources:
MassGIS: roads, waterbodies, rivers
Ware: open space (permanent + limited protection), historic districts, parks, unique features
MA DCR: heritage landscapes (2006), scenic landscapes (with The Nature Conservancy, 1982)

Blank

(back of fold-out map)

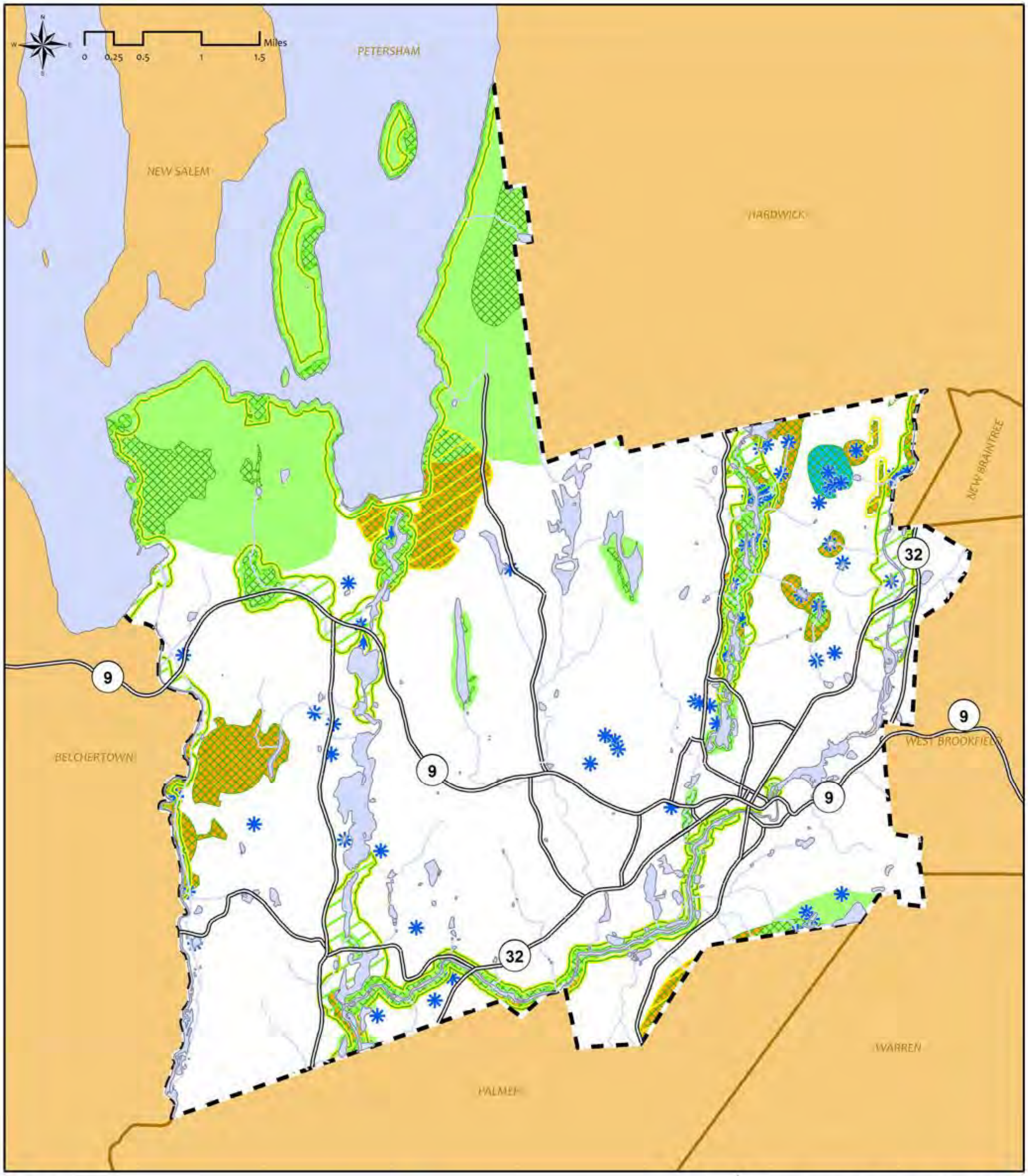
Vegetation Mapping Projects

Forested Land 1830s: The Harvard Forest map of 1830s woodlands forests shows portions of Ware as forested, areas of possible Primary Forest, untilled woodlots and wooded pastures. Such lands have greater biodiversity than areas that have been tilled. These are not Old Growth forests; they have been harvested and pastured, but the ground may not have been tilled. Harvard Forest digitized maps from the 1830s to show several categories of land cover. Ware's map shows areas that were forested in the 1830s (see Map 13, Forest Cover). NHESP GIS staff took that data and combined it with information from MassGIS' landcover datalayer made from 1999 aerial photos. Although a great deal will have changed in those areas during the 170 years between the map dates, some areas showing forested land during both periods have never been tilled. Surveys of the soil structure in the individual sites would be needed in order to determine whether those sites are primary forest. Primary forests retain more native biodiversity than sites that have been tilled such as soil, fauna and flora, microorganisms and plants that reproduce primarily without seed or spore (vegetatively). In addition, a variety of species of wildflowers are more common in untilled forests than previously tilled lands. The areas of 1830s forest on private land would be good targets for conservation acquisition in order to maintain the biodiversity of the Town and region, particularly the ridge between the Ware River and Muddy Brook and lands north of the DFW Herman Covey Wildlife Management Area (WMA) in the western part of town.

BioMap2: This map was produced by NHESP in 2012 to identify the areas of highest importance for biodiversity based on known locations of rare species and uncommon natural communities (see Map 16). It incorporates the habitats needed by rare species to maintain the local populations. Large unfragmented conservation land provides the best opportunities to maintain populations of species and limit further species loss. Land protection by towns that connects other protected open space is one way to provide important large areas of biodiversity protection. There are 6,294 acres of BioMap 2 Core Habitat and 7,892 acres of Critical Natural Landscape in Ware. Core habitat identifies specific areas necessary to promote the long-term persistence of rare species, other Species of Special Concern, exemplary natural communities, and intact ecosystems. Critical Natural Landscape identifies intact landscapes in Massachusetts that are better able to support ecological processes and disturbance regimes, and a wide array of species and habitats over long time periods.

It is important to differentiate the BioMap 2 core areas from the Priority and Estimated Habitats described above. BioMap and Living Waters (a 2003 companion report to BioMap that identifies rivers, streams, lakes and ponds that are critical to freshwater biodiversity) Core Areas identify areas particularly important for conservation planning purposes whereas Priority and Estimated Habitats are regulatory.

CAPS: The Conservation Assessment and Prioritization System (CAPS) is an ecosystem-based (coarse-filter) approach for assessing the ecological integrity of lands and waters and subsequently identifying and prioritizing land for habitat and biodiversity conservation. CAPS defines ecological integrity as the ability of an area to support biodiversity and the ecosystem processes necessary to sustain biodiversity over the long



Legend

- Open Space (all types)
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- BioMap2 Core Habitat
- BioMap2 Critical Natural Landscape
- BioMap2 CH Forest Core
- BioMap2 CH Vernal Pool Core

BioMap2 CH BioMap2 Wetlands

- Priority Natural Community Wetlands and Selected Oxbows
- Wetland core - least disturbed wetlands within undeveloped landscapes

- BioMap2 CH Aquatic Core
- BioMap2 CH Species of Conservation Concern
- BioMap2 CNL Landscape Blocks

BioMap2 CNL Wetland Buffer

- Least-disturbed wetland complexes
- Priority Natural Community Wetlands and Selected Oxbows
- Upland buffer

BioMap2 CNL Aquatic Buffer

- Aquatic Core
- Upland Buffer of Aq. Core
- Waterbodies
- Rivers and Streams

Open Space & Recreation Plan

Map 16: BioMap and Habitats

May 26, 2013

Sources:
MassGIS: BioMap 2, NHESP Habitats, Waterbodies, Rivers, Roads, Towns
Ware: Open Space

Town of Ware
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term. CAPS is a computer software program and an approach to prioritizing land for conservation, based on the assessment of ecological integrity for various ecological communities (e.g., forest, shrub swamp, headwater stream) within an area. This process results in an Index of Ecological Integrity (IEI) for each point in the landscape based upon models constructed separately for each ecological community.

In November 2011, the Landscape Ecology Program at the University of Massachusetts, Amherst completed its first comprehensive, statewide assessment of ecological integrity using CAPS. IEI maps depicting the top 50% of lands with the highest ecological integrity have been completed for all cities and towns in Massachusetts (see Map 17).

E. Fisheries and Wildlife

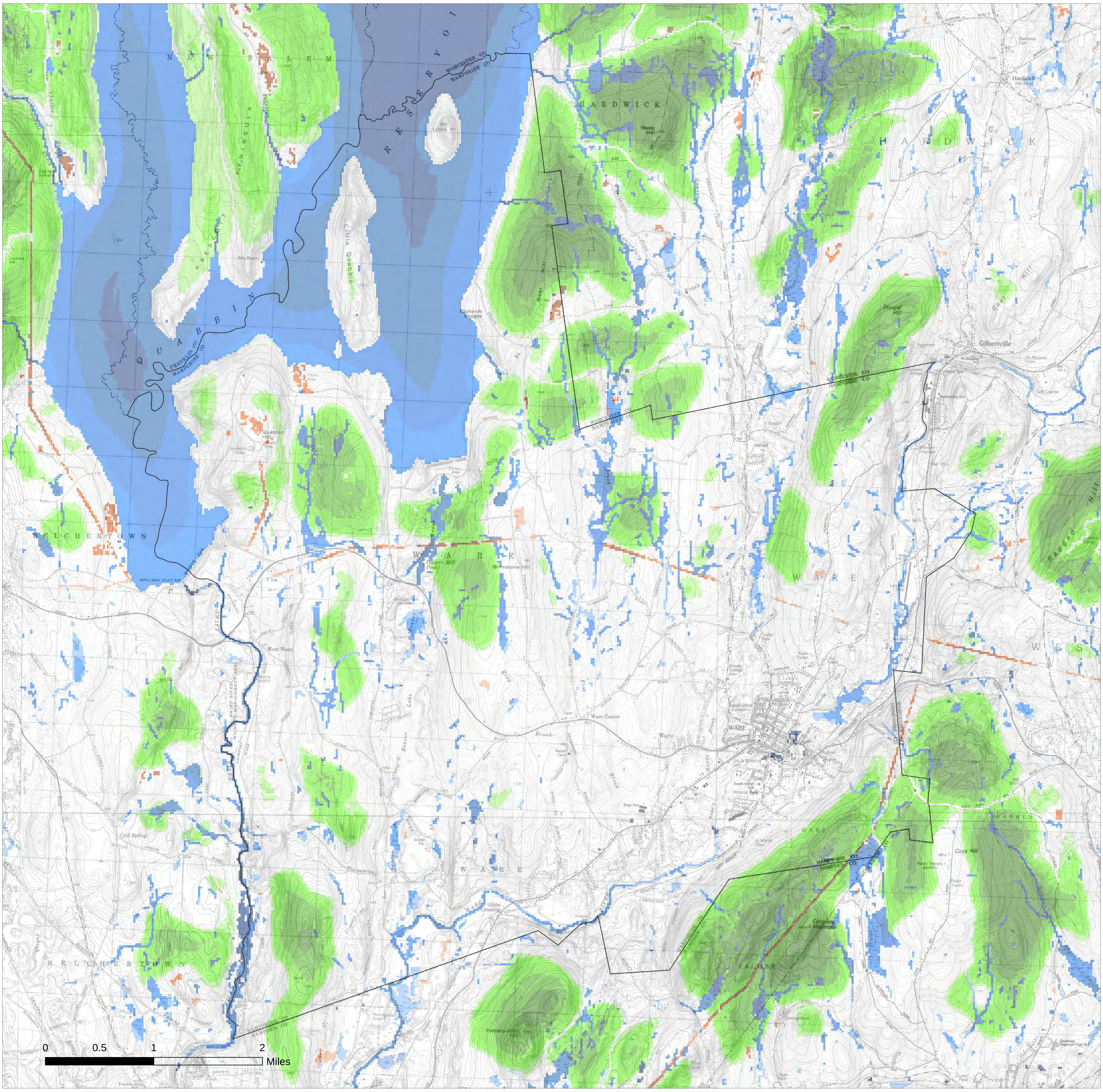
Inventory

Numerous physical factors influence the sustainability of animal species communities, including plant species coverage, elevation, climate, development, pollution, and the availability of food and water. A species may decline or increase based upon a small change in any of these elements. Generally, Ware's physical characteristics provide a variety of wildlife habitats, including mixed and hardwood forestlands, agricultural and abandoned open fields, ponds and lakes, streams and rivers, wetlands, and even residential backyards. The most common species found in western Massachusetts in these categories are listed in Table 4.3. Many of these species may be hunted periodically with a valid hunting or fishing license.

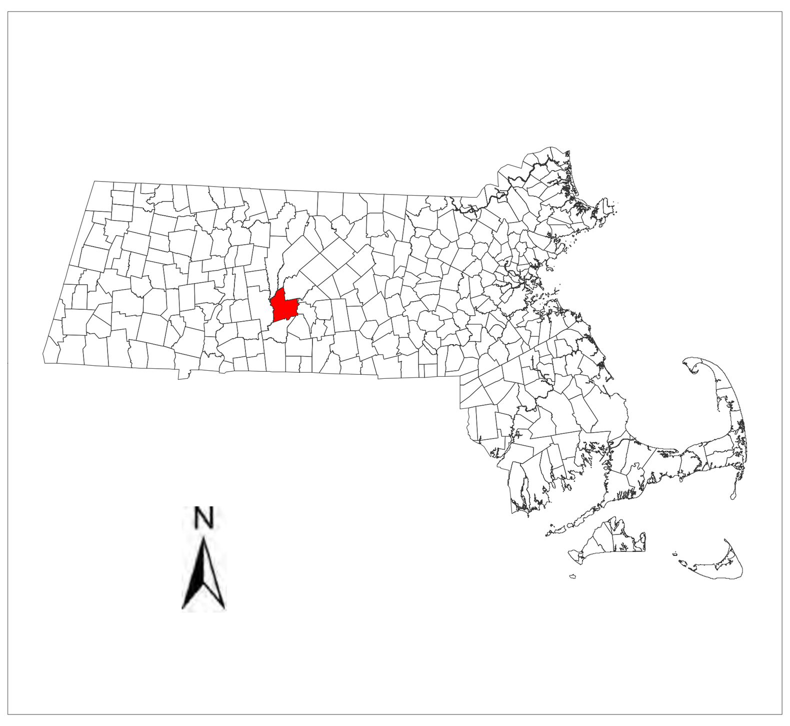
Map 18 shows the soils that are best suited to support wetland wildlife. It should be noted that wetlands can occur on other soil types, but they are most sustainable on soils rated fair or good.

CAPS: The MassDEP's Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands (June 2006) adopted a new approach for assessing wildlife habitat impacts associated with work in wetlands. This approach utilizes maps developed at the University of Massachusetts, Amherst using the Conservation Assessment and Prioritization System (CAPS). The maps depict "Habitat of Potential Regional or Statewide Importance" which may require further review when work is proposed in these areas (see Map 19). These maps are known as "Important Habitat" and are based upon the integrated index of ecological integrity and depict all areas (not just regulated "resource areas") that score in the top 40% for Index for Ecological Integrity-Integrated (IEI-I). Areas designated as "Habitat of Potential Regional and Statewide Importance" represent 40% of the undeveloped landscape as well as 40% of each ecological community (e.g. forest, shallow marsh, shrub swamp, forested wetland, salt marsh). Areas within the polygons that are also within Wetland Protection Act jurisdiction represent "Habitat of Potential Regional or Statewide Importance" and may trigger detailed review.

CAPS Index of Ecological Integrity (IEI)
Town of WARE, MA



Updated November 2011



IEI, Index of Ecological Integrity
Top 50% of the Landscape

Forests

Shrublands

Coastal Upland

Freshwater Wetland & Aquatic

Coastal Wetland & Aquatic

50-60 60-70 70-80 80-90 90-100% **IEI**

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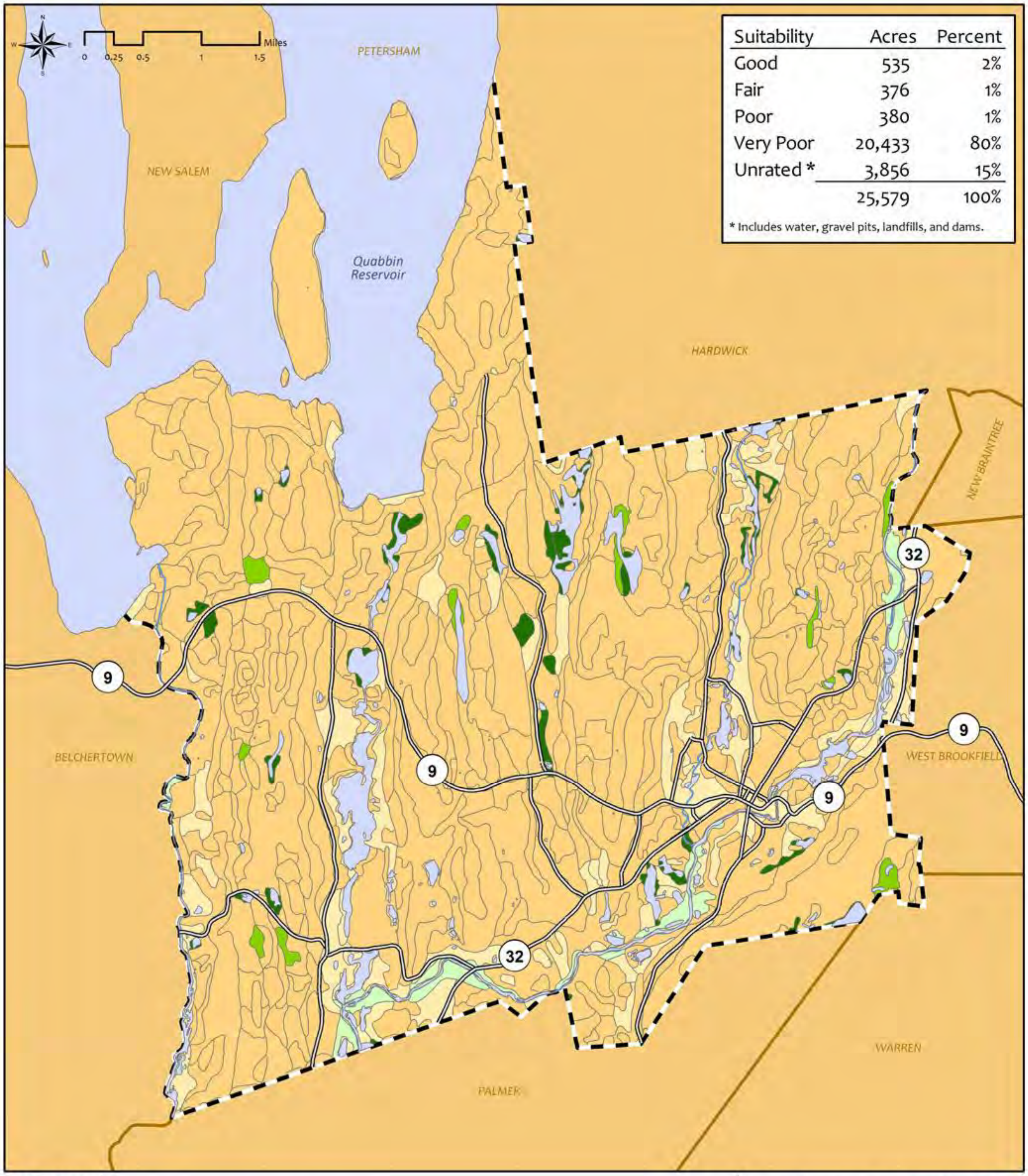
The IEI, or Index of Ecological Integrity, delineates the relative wildlife habitat and biodiversity value of any point on the landscape based on landscape ecology principles and expert opinion. The IEI is calculated by the Conservation Assessment and Prioritization System (CAPS) computer program developed at the University of Massachusetts, Amherst. Depicted on this map are those areas representing 50% of the landscape with the highest IEI values; the darker the color the higher the integrity value. For more information see: http://www.masscaps.org.

Coastal beaches and rocky intertidal shores are included as Coastal Wetland and Aquatic.

These maps were funded by grants from The Nature Conservancy and the Federal Highway Administration via a grant administered by the Massachusetts Department of Transportation, the Massachusetts Department of Environmental Protection and the U.S. Environmental Protection Agency under section 104 (b) (3) of the U.S. Clean Water Act. Data sources include the Office of Geographic and Environmental Information (MassGIS).

Table 4-3: Common Wildlife by Habitat in Hampshire County		
Habitat Type	**Animal Type**	**Common Species**
Woodland	Reptiles	turtle, snake
	Amphibians	salamander, tree frog, toad
	Birds	ruffed grouse, crow, hawks, turkey, woodpeckers, owls, songbirds
	Mammals	deer, rabbit, squirrel, woodchuck, chipmunk, raccoon, fox, skunk, porcupine, American Black Bear, bobcat, coyote, fisher, woodland jumping mouse, voles
Open Land	Insects	spiders, wasps, bees, ants, flies, moths, butterflies, beetles, mosquitoes, dragonflies
	Reptiles	snakes
	Birds	pheasant, crow, hawks, swallow, songbirds
	Mammals	cottontail, skunk, woodchuck, moles, shrews, bats, meadow jumping mouse, voles, mice
Open Water	Insects	mosquito, dragonfly, horsefly, moths
	Fish	herring, shad, trout, salmon, pickerel, pike, carp, catfish, perch, bass
	Reptiles	turtles
	Amphibians	frogs, toads, salamanders, newts
	Birds	Canada goose, mallard, osprey, bald eagle, kingfisher, swallow
	Mammals	beaver, otter
Wetland	Insects	mosquito, earthworms, beetles, snails, flies, dragonfly
	Fish	pickerel, carp, shiner, shad
	Reptiles	turtles, snakes
	Amphibians	salamanders, frogs, peepers
	Birds	ducks, herons, egrets, osprey, killdeer, kingfisher, grouse, pheasant, goose, songbirds
	Mammals	deer, rabbit, opossum, raccoon, fox, mink, beaver, otter, muskrat, skunk, moose
Residential	Insects	flies, mosquitoes, bees, wasps, beetles
	Reptiles	snakes
	Amphibians	toads, frogs
	Birds	crows, songbirds
	Mammals	squirrel, chipmunk, raccoon, rabbit, mice

Sources: A Natural Resource Inventory Atlas for Hampshire County, Cooperative Extension Service, UMass Amherst, 1979; with additions based on the current state mammal list, obtained from the MA Division of Fish & Wildlife 1/15/2016 at: http://www.mass.gov/eea/agencies/dfg/dfw/fish-wildlife-plants/state-mammal-list.html



Suitability	Acres	Percent
Good	535	2%
Fair	376	1%
Poor	380	1%
Very Poor	20,433	80%
Unrated *	3,856	15%
	25,579	100%

* Includes water, gravel pits, landfills, and dams.

Legend

Suitability for Wetland Wildlife

- Good
- Fair
- Poor
- Very poor
- Unrated

Open Space & Recreation Plan

Map 18: Suitability of Soil for Wetland Wildlife

May 25, 2013

Sources:
MassGIS: Towns, Roads, Waterbodies, Rivers
Ware: Open Space
NRCS: Soils (2007)

Town of Ware
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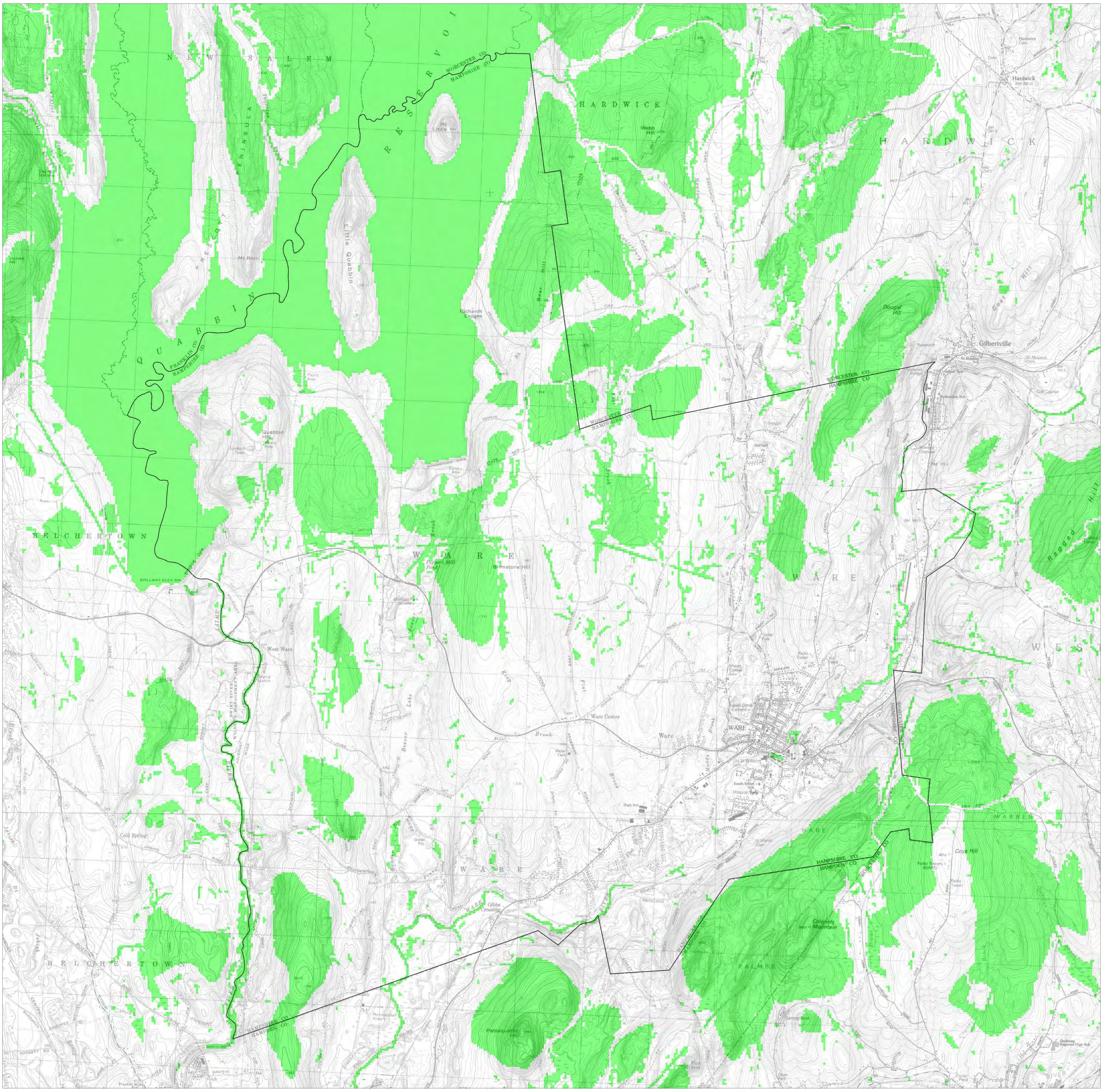
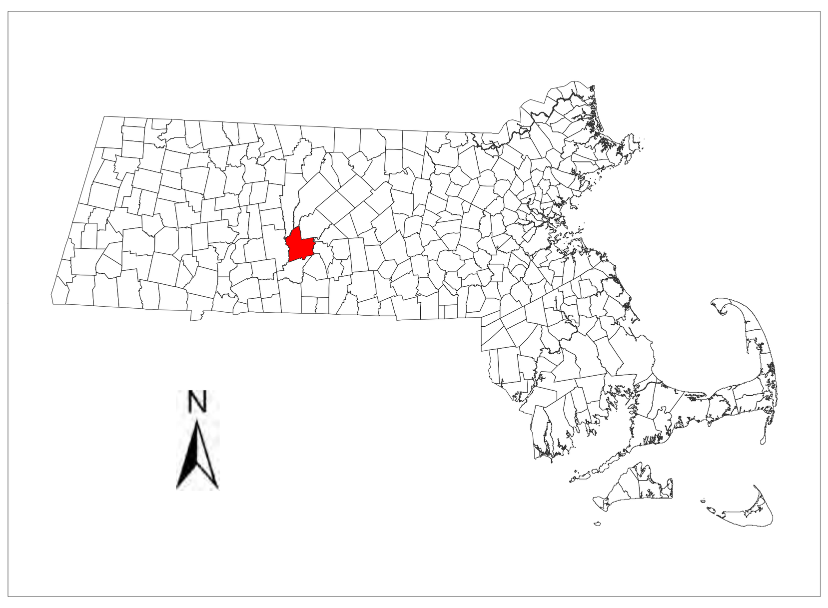
Habitat of Potential Regional or Statewide Importance
Town of WARE, MA



0 0.5 1 2 Miles

Important Wildlife Habitat

Updated November 2011



The MassDEP s Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands, June 2006 adopted a new approach for assessing wildlife habitat impacts associated with work in wetlands. This approach utilizes maps developed at the University of Massachusetts Amherst using the Conservation Assessment and Prioritization System (CAPS). The maps depict Habitat of Potential Regional or Statewide Importance that may trigger more intensive levels of review. For more information on how to assess wildlife habitat impacts, see Section III of the Guidance document: http://www.mass.gov/dep/water/laws/wldhab.pdf.

The CAPS model assesses the ecological integrity of Massachusetts landscape features as influenced by environmental stressor metrics (e.g. pollution, fragmentation). CAPS relies on data that are broadly available across Massachusetts. Ecological features which are not consistently surveyed or uniformly available, such as certified vernal pools, rare species, and contamination sites are not included in CAPS. When available, this more specific ecological information may be used in conjunction with the CAPS outputs to better understand particular sites in Massachusetts and support informed conservation decision-making. For more information on the statewide maps produced by the CAPS model, see: http://www.masscaps.org.

These maps are funded in part by the Massachusetts Executive Office of Energy and Environmental Affairs, the Massachusetts Department of Environmental Protection and the U.S. Environmental Protection Agency under section 104 (b)(3) of the U.S. Clean Water Act. Environmental data sources include the Office of Geographic and Environmental Information (MassGIS).

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Vernal Pools

Ware has 66 Certified Vernal Pools (CVPs) and 145 Potential Vernal Pools (PVPs) (identified from aerial photographs, needing verification on the ground). In addition, areas of swamps will provide habitat for vernal pool species. Ware's vernal pools are shown on map 16 with the natural communities. Clusters of vernal pools provide particularly good habitat for species that depend on this habitat. The clusters mean that there are alternate habitats if something happens to one pool, and slightly different conditions in each may provide different habitats for pool dependent species. There is a Vernal Pool Core in BioMap2 Core 1694.

Corridors for Wildlife Migration

Wildlife diversity is a function of the size and shape of undeveloped land, and the variety of habitat types available to animals. Species often must occupy more than one land type during its day, year, or lifetime. For example, the white tail deer will shelter in the thick evergreen forest, forage for berries along the edge of a field, and drink from a small stream, all in the same day. In addition, many species require overland migration routes to hunt or forage for food and water as well as seek shelter and propagate. Major natural corridors must be recognized as potential migration routes for many animals. Recreation trails or undeveloped floodplains and riverfronts can successfully serve as wildlife migration routes.

Rare Species

Bridle Shiners are small (<5 cm) minnows that swim in schools, moving in and out of vegetation along the edges of open, clear water in lakes and ponds and slack areas of streams and rivers. They feed on small insects and other aquatic animals (see Table 4-4 for MESA status).

Blue-spotted Salamanders were reported from Ware in the 1800s, but not since then. Although the species is known from only scattered occurrences in the Quabbin area, there are recent records in nearby towns. Working in cooperation with landowners to survey vernal pools in the spring might locate the species. Blue-spotted Salamanders inhabit upland forest during most of the year. In the spring, adults migrate to breed and lay their eggs in vernal pools, swamps, marshes, and other predominantly fish-free wetlands. After larvae metamorphose during late spring they disperse into upland forest.

Four-toed Salamanders nest in patches of sphagnum moss that overhang streams. The young drop into the streams where they live until maturity, at which time they move to nearby forests. Protecting healthy populations will help prevent them from needing additional protections of the Endangered Species Act. While not an obligate vernal pool species, the occurrences in Ware are in an area with a cluster of certified and potential vernal pools in BioMap2 Core 1694 as well as in Core 1704 in the Aquatic Core along Muddy Brook.

Wood Turtles have been reported from multiple areas in Ware, particularly along Muddy Brook. Wood Turtle habitat is comprised of streams and rivers, preferably with long corridors of connected uplands extending on both sides of the waterways. Both of the turtle species known in Ware nest in sandy upland areas and are susceptible to a high mortality rate when they move among parts of their habitats, particularly where they must cross roads. Because turtles have low nest and juvenile survivorship, losing only a few adults annually can cause populations to decline because of low replacement rates.

Eastern Box Turtles spend most of their adult lives in Oak-Pine forests, but juveniles live in wetlands and adults favor wetlands during the hottest part of the summer. In Massachusetts, the best and most viable populations of Eastern Box Turtles are in the southeastern part of the state. The turtle has seldom been reported in Ware, with a report in 1928 and one more recently. Like the Blue-spotted Salamander, records from Quabbin area towns are very scattered, despite being relatively common (for a rare species) along the Connecticut River and south of the Quaboag River nearer the Connecticut border.

The three state-listed birds most recently observed in Ware occupy quite different habitats from each other. Pied-billed Grebes are secretive marsh birds that typically nest in dense cattail beds adjacent to open water. They are very sensitive to disturbance and changes in water levels.

Bald Eagles nest in tall trees along large lakes and rivers. Large lakes and rivers also support important winter congregations of Bald Eagles. Fish make up the bulk of their diet. Missing from the local environment since the early 1900s, they were reintroduced at the Quabbin in the 1980s. The effort was successful and today Bald Eagle populations are increasing and the Quabbin area is both a nesting area and an overwintering area for the species.

The Eastern Whippoorwill is a ground-nesting, nocturnal bird that is uncommon and declining. It has largely disappeared as a breeding bird from the Berkshires and the more developed areas of eastern Massachusetts. In Massachusetts, it occurs most commonly in the woodlands of the southeastern part of the state, but there are still populations in the Connecticut River Valley and the Quabbin area.

Southern Bog Lemming are small unobtrusive voles that live in tunnels, eat stems and leaves of grasses, and live in bogs and other, often drier, grassy habitats. Ware has one of very few currently known occurrences of the species in Massachusetts. The best management strategy is to leave them alone.

Ware has two state-listed species of freshwater mussel and another that was recently removed from the list and remains of conservation interest. The presence of these species in local streams, particularly Muddy Brook and the Ware River, confirms the importance of maintaining the clean, flowing waters for these species and others that share these habitats.

Brook Floater (or Swollen Wedge mussel) are small freshwater mussels that inhabit streams and rivers with low to moderate water velocities, stable substrates, low nutrients and good water quality. They are currently known in only four water bodies in the state, making Ware's population very important.

Creepers are freshwater mussels that inhabit low-gradient reaches of small to large rivers with sand or gravel substrates. Creepers are best supported by cool to warm waters with diverse fish assemblages.

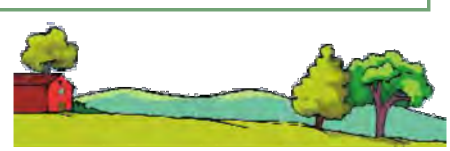
Triangle Floaters are commonly found in low-gradient river reaches with sand and gravel substrates and low to moderate water velocities.

Both listed and recently delisted species of dragonflies are known in Ware. Clustered along the Ware River, these species also occur in and near other wetlands. Although each has its own distinct habitat, the nymphs of all species are aquatic and burrow in sediments of the wetland types they prefer. As with the freshwater mussels, maintaining clean, free flowing water is important for maintaining the species. Young adults of all the species use surrounding upland forests for protection while they reach maturity.

Two state-listed species of moths have been identified in Ware. Orange Sallow Moths inhabit dry, open oak woodlands on rocky uplands. Females lay their eggs on false foxgloves where the larvae feed on flowers, seeds, and foliage. Melsheimer's Sack Bearer known only historically in Ware, inhabits sandplain pitch pine/scrub oak barrens, especially scrub oak thickets within frost pockets. Larvae feed exclusively on scrub oak *(Quercus ilicifolia)* in Massachusetts. The species is now limited to Cape Cod and the offshore islands, west to Plymouth.

Table 4-4: Rare Species

Name	Massachusetts Endangered Species Act (MESA) Status	Most Recent Year Observed
VERTEBRATES		
Bird, Bald Eagle *(Haliaeetus leucocephalus)*	T	2012
Bird, Eastern Whippoorwill *(Caprimulgus vociferous)*	SC	2012
Bird, Pied-billed Grebe *(Podilymbus podiceps)*	E	2000
Fish, Bridle Shiner *(Notropis bifrenatus)*	SC	2005
Lemming, Southern Bog *(Synaptomys cooperi)*	SC	1992
Salamander Blue-spotted *(Ambystoma laterale)*	SC	1800s
Salamander, Four-toed *(Hemidactylium scutatum)*	Delisted	2007
Turtle, Eastern Box Turtle *(Terrapene Carolina)*	SC	1928
Turtle, Wood Turtle *(Glyptemys insculpta)*	SC	2010
INVERETBRATES		
Dragonfly, Arrow Clubtail *(Stylurus spiniceps)*	Delisted	2004
Dragonfly, Beaverpond Clubtail *(Gomphus borealis)*	Delisted	1991
Dragonfly, Brook Snaketail *(Ophiogomphus aspersus)*	SC	2004
Dragonfly, Riffle Snaketail *(Ophiogomphus carolus)*	T	2004
Dragonfly, Spine-crowned Clubtail *(Gomphus abbreviates)*	SC	2004
Moth, Melsheimer's Sack Bearer *(Cicinnus melsheimeri)*	T	Historic
Moth, Orange Sallow Moth *(Pyrrhia aurantiago)*	SC	2010
Mussel, Brook Floater/Swollen Wedgemussel *(Alasmidonta undulate)*	E	2009
Mussel, Creeper *(Strophitus undulates)*	SC	2009
Mussel, Triangle Floater *(Alasmidonta undulata)*	Delisted	2009



F. Scenic Resources and Unique Environments

Scenic Landscapes

Most of the Town could be considered scenic. From its open farmland to its historic downtown, Ware is filled with beautiful landscapes. Citizens have described some exceptional places where the scenery is particularly noteworthy. This is the scenery that Ware residents cherish, that attracts new residents, and that visitors remember. These places should be given the highest priority when considering scenic open space protection. These scenic areas should be integrated with certain recreation activities, such as hiking and biking trails. These places are shown on Map 15 and include:

- Several spots along the Ware River afford great views of the river and surrounding countryside.
- The dams near East and South Streets are very popular scenic spots. These dams could serve as trail nodes or designated picnic areas, but currently all surrounding land is in private ownership. Public safety should be considered if improvements are made.
- The Quabbin Reservation is a favorite place for hiking, picnicking and birdwatching. Creating a trail network linking the populated areas of town with the Quabbin Reservation should be examined.
- Snow's Pond is a favorite destination for fishing, walking and picnicking, and is close to the center of town.
- Fisherdick Road provides views of Mount Tom and the Quabbin Tower.
- Route 9 eastbound before the descent to downtown and along Warren Road provide glimpses of Ware.
- The Cascades is an intermittent stream with waterfall at the intersection of Old Belchertown Road and Sczgiel Road.
- The Shea Farm on Gilbertville Road provides beautiful views of the surrounding area.
- The Covered Bridge at Old Gilbertville Road is a unique scenic site in Ware and Gilbertville.
- Grenville Park provides an incredible view of the Ware River from Frog's Hill.
- Mirror Rock on Coy Hill provides views of the Holyoke Range, Mt. Monadnock, and Ware.

Major Characteristics

Ware is a town comprised of a series of glacial ridges and valleys. Typical of the region, many of the town's ridges have steep slopes and rocky soil, and therefore were never developed for agriculture. These ridges are thickly forested and provide critical habitat for certain species of birds and mammals that could not survive elsewhere. Waters shed from these ridges fill the rivers upon which the town was founded. The steep landforms provide climatic shelter for the valley inhabitants, and add to the scenic quality of Ware.

Planning efforts should include protection of these ridges from development. Clear-cut logging practices increase runoff which can lead to flooding and siltation of wetlands. Structures built upon the ridges would impact the scenic quality of the landscape. Wildlife habitat will certainly diminish with intense human use. These ridges help to make the valleys of Ware such great places to live.

Cultural, Archeological, and Historic Areas

The past must be remembered in order to assess the present. Preserving places and districts creates a bridge between then and now, over which we can cross to learn and reflect. Preservation of irreplaceable heritage is in the public interest so that cultural, educational, aesthetic, inspirational, economic, and energy benefits can be maintained and enriched for future generations.

Pursuant to the 1966 National Historic Act, the National Register of Historic Places has a central role in identifying buildings, sites, districts, structures, etc., worthy of preservation. Areas proposed for historic district designation do not need to be of national or state importance. Historic districts should be created by cities and towns to protect areas that are significant to their locality. A historic district may be established when “the relationship to each other of a sufficient number of buildings creates a whole which is greater than the sum of its parts.” (Cambridge Historic District Study Committee, Final Report, Cambridge, 1962.) According to the National Register of Historic Places, Ware has five national historic districts (see Map 5):

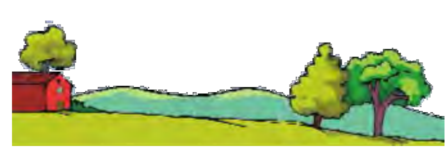
Church Street Historic District - from Church Street between Park Avenue and Highland Street. Dating from 1800 to 1900 and later, this district contains 73 structures and is architecturally and historically significant as a substantially intact residential part of a 19th century New England factory village.

Ware Center Historic District - Route 9, east and west of Greenwich Plains Road. Dating from 1700 to 1899, this district of twenty structures. It is significant for its spatial organization and architectural forms of the 18th century colonial settlement of Ware, as well as aspects of the town’s 19th century development.

Ware-Hardwick Covered Bridge – spans the Ware River in Ware from Old Gilbertville Road and in Gilbertville village in Hardwick from Bridge Street. It dates from approximately 1886 and is significant because it is only one of four 19th century wooden bridges in Massachusetts still standing in its original location. It was rebuilt in 2010 after being closed for 8 years due to structural deficiencies.

Millyard District – in the downtown along South, Church, Canal, Main, Park, Pleasant, and Otis Streets, contains forty-five structures. Beginning in 1821, the structures were built by three manufacturing companies over a 10-year period. These structures are noteworthy as exceptionally intact examples of the style used in this era of industrial development and its corresponding impact on residential development.

Town Hall - corner of Routes 9 and 32, dates from 1885-1886 and is a Romanesque Revival building with strong Richardsonian overtones. The Town Hall is also significant for its importance in centralizing Ware’s activities in the present downtown.



Grenville Park

In the early 1900s there were no large parks in Ware. Aspen Grove Cemetery and the Pumping Station Grounds (where the town wells are located, off Barnes Street) were the most important open spaces owned by the Town and were used for pleasure strolling and driving. The public also enjoyed the vacant lands on the outskirts of town for playing ball, picnicking, and accessing other parts of town. While this use did not create serious objection from land owners, there was a great need for a permanent public park to provide recreation. Through the civic spirit of one of the park commissioners, Mr. J.H.G. Gilbert, Ware secured land that provided ample outdoor recreation facilities within a few minutes' walk of the downtown: Grenville Park.

Grenville Park commemorates Grenville Gilbert, Jr., the beloved son of Mr. and Mrs. Gilbert. They felt that the best way to perpetuate the memory of their son was to associate his name with a permanent feature in the daily life of the community. It assured their home town a lasting and beautiful environment on the site where natural beauty lay in abundance.

The park was designed by Arthur A. Shurtleff of Boston, a landscape architect and urban planner. His ambition was to design a park that was reminiscent of the best natural wild landscapes of New England including tree and shrubbery arrangements and the choice of native vegetation. The Park includes ball fields, intimate spaces, and open spaces, which gives people many opportunities for different kinds of recreation. The plan includes maintenance schedules, descriptions of the various trees and shrubs, and specific details about the reasoning behind such design decisions such as leaving open spaces open and footpaths graveled instead of paved (Arthur A. Shurtleff, 1923). The park is also an integral part of the Ware River Valley Greenway Trails Project (see Chapter 5). Grenville Park is truly a gem in the Town of Ware.

Quabbin Park Cemetery

Also noteworthy is the Quabbin Park Cemetery. In 1938, the towns of Dana, Prescott, Enfield and Greenwich were disincorporated in order to create the Quabbin Reservoir. The 6,500 graves from these towns were moved here forming the Quabbin Park Cemetery, located on Route 9 in Ware.

Unique Environments

There are no designated Areas of Critical Environmental Concern in Ware. An Area of Critical Environmental Concern (ACEC) boundary is delineated upon designation by the Secretary of Environmental Affairs and includes any areas needed to protect and preserve significant natural resource features such as estuaries, wetlands, floodplain, and forested upland.

G. Environmental Challenges

Hazardous Waste and Brownfield Sites

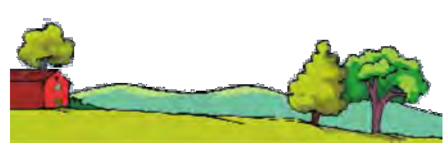
Former Ware Farm Equipment Company, 200 West Street: The roughly 14 acre site was formerly the Ware Farm Equipment Company and was contaminated with both hazardous material and petroleum substances. Approximately 5 to 7 acres of the property was also a solid waste disposal area that was last used in the mid-1920s and is now capped and inspected annually. Burning waste at the disposal site led to elevated concentrations of total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs) in the soil, groundwater and surface water samples. The parcel was subdivided in 2010 and 4.4 acres, where the old buildings were located, has been cleaned up and redeveloped into the town fire and rescue station.

Former Ware Coal Gasification Plant, Monroe Street, Ware RTN 1-17892: The site was formerly owned by Amerigas Eagle Propane, Limited, which had acquired it in the holdings of previous owners; the Ware Gas Company had used the site to manufacture gas from coal. The site was found to have evidence of coal tar during a 2010 Phase I Environmental Site Assessment. In 2012 DEP issued a Notice of Intent to Mobilize and began an environmental site assessment. This assessment identified contamination at the site which could potentially be contained on site with a "cap in place" method. The Town acquired the property in 2014 by tax taking, which provides limited liability for the Town regarding contamination cleanup. The Town is currently working with DEP to perform additional assessments of the site in order to determine if a portion of it is clean enough to allow some recreational use. The Town plans to redevelop this site primarily as a parking lot to serve the adjacent Memorial Field recreational facility. If DEP permits, a portion of the site will be used to build recreational facilities such as a basketball court and playground, as an extension of the Memorial Field facility.

Landfills

The town landfill located off Robbins Road was capped in 2008. Landfill leachate can pose an environmental hazard, especially given its proximity to the Ware River. The site is undergoing long-term post -closure groundwater, surface water and gas emission monitoring under the supervision of MA DEP to identify any migrating contaminants. The landfill is located next to the town-owned Banas Farm, an important conservation property with recreational potential. Any future recreational use of this property should be planned in consultation with the Board of Health and MA DEP's Solid Waste Division to prevent potential public health risks from landfill leachate. For environmental and public safety reasons, access to the capped landfill is restricted except for designated monitoring and maintenance.

A parcel of land on Sheehy Road was used as a dump at one time for approximately one year. The DEP required site assessment and remediation, which has been completed with the installation of a cap in 2015. The site is located in the Zone II Groundwater Protection Area, with groundwater contributing to the town wells.



Erosion and Sedimentation

The Town has minimal erosion and sediment controls that establish requirements and procedures to control the adverse impacts associated with stormwater runoff from land development. Additional measures to address erosion and sedimentation were also mentioned in the town's Pre-Disaster Mitigation Plan, developed with funding from Massachusetts Emergency Management Agency in 2007.

During the winters of 2011 and 2012, the DPW applied 2,047 tons of sand and 1,114 tons of salt on the roads.

Chronic Flooding

Because Ware has so many water sources and floodplains that have long been built upon, the town has an infamous history of flooding. Ware's rivers exceeding their banks have caused much damage. The Ware River, being the largest and closest to town, has flooded many times, especially along upper Church Street near the airport, and again along Route 32. The Muddy Brook has been known to flood near Reed Pool, and the Flat Brook along Route 9. Ware has always been concerned about flooding in town.

In 2013, a focus for the Department of Public Works included several significant drainage repairs, a culvert replacement at the Pines, and substantial road re-surfacing.

New Development

New development in town remains very limited and at this time is well regulated by local zoning. A new solar field has been approved for property that borders West Brookfield; the solar installation will also include a large area in West Brookfield and construction is likely to be completed in 2016.

Ground and Surface Water Pollution

As noted in Table 4-5 Beaver Lake is impaired for Eurasion Water Milfoil, and the segment of the Ware River above the Ware Dam has had elevated E. coli levels. MassDEP is requiring a Total Maximum Daily Load (TMDL) report be designed for this segment to address the bacteria issue.

Table 4-5: Massachusetts Year 2012 Integrated List of Waters

Surface Water	Segment ID	Size	Category
Beaver Lake	MA36010	150 acres	Category 4c Impairment not caused by a Pollutant (Eurasion Water Milfoil, Myriophyllum spicatum)
Ware River	MA36-05; Wheelwright Dam, New Braintree/ Hardwick to Ware Dam, Ware.	11.5 miles	Category 5 Requiring aTMDL (Escherichia coli)
Ware River	MA36-06; Ware Dam, Ware to Thorndike Dam, Palmer	10.1 miles	Category 5 Requiring a TMDL (Fecal Coliform)

Source: MA DEP

Invasive Species

Like most of New England, invasive species have become quite common in Ware. Eurasion Water Milfoil in Beaver Lake has been under treatment annually for 10 to 15 years. Grenville Park manages its most publicly used areas for bittersweet, multiflora rose, barberry, and Euonymous. The 66 acre town forest is heavily infested with invasive species including bittersweet, barberry, honeysuckle, multiflora rose, winged euonymous, and buckthorn.

Environmental Equity

The vast majority of the recreational facilities in Ware are located close to the downtown area, within or close to the Environmental Justice area. Two exceptions to this are the Pennybrook soccer field and the Quabbin Reservation. Most of the open space in town is located outside of the Environmental Justice area, including land no longer available for development that is owned by the state (e.g. wildlife management areas, Quabbin Reservation), town (e.g. town forests, cemeteries), non-profit organizations (e.g. conservation restrictions on land trust properties), or private landowners (e.g. conservation or agricultural preservation restrictions on private land). Maps 5, 15, and 20 illustrate this.

The Town should consider the potential for increasing active recreation facilities in the more rural parts of town. Examples include developing new ball fields at the Pennybrook site, developing trails and trailhead parking at the Town Forests, partnering with landowners of properties with conservation restrictions for trailhead parking to provide better access to trails on those properties, and exploring opportunities to increase access to the waterways and waterbodies in Ware. The Town should also continue efforts to develop the northern section of the Ware River Greenway rail trail, working with Massachusetts Electric Company, the East Quabbin Land Trust, and a private property owner to secure land and/or the rights for the public to use the old rail bed through their properties.

Inventory of Lands of Conservation and Recreation Interest

Section 5

This inventory of lands of conservation and recreation interest describes the ownership, agency management, current use, condition, recreation potential, public access, type of public funding, zoning, and degree of protection for each parcel. The degree of protection from destruction or degradation that is afforded to various parcels of land owned by private, public, and nonprofit owners is also evaluated. Protecting open space is important to ensure that future generations have land available for farming, timber production, and recreation. It also protects water supplies from degradation due to increased development. Protecting open space is critical to preserving habitats and habitat corridors for wildlife, from insects to moose and bears. Open space helps maintain clean air which all life depends on, whether plant or animal. Protecting land for recreational purposes – both active and passive – is important to ensure that future generations have places to play sports or simply walk among fields or trees, observing the natural world. Such activities are important for human health, helping with issues such as weight control, cardio-vascular health, and stress reduction among many other benefits. As a town's population grows, more people want to participate in sports, and the recreational facilities for such sports need to be increased to ensure they are not overused to the point where, for example, grass can no longer grow on the fields.

- Private lands, including non-profit ownership, can be protected in perpetuity through deed restrictions, or conservation easements. Some easements only run for a period of 30 years and those lands are therefore not permanently protected open space.
- Lands under special taxation programs, including Chapter 61, 61A or 61B, are actively managed by their owners for forestry, agricultural, horticultural, or recreational use. The town has the right of first refusal should the landowner decide to sell and change the use of the land; therefore, it is important to prioritize these lands and consider steps the community should take to permanently protect these properties.
- Lands acquired for watershed and aquifer protection are often permanently protected open space.
- Public recreation and conservation lands may be permanently protected open space, provided that they have been dedicated to such uses as conservation or recreation by deed. Municipal properties may be protected via a town meeting vote to acquire them.

A. Private Parcels

There are 4,050 acres enrolled in Chapter 61, 61A, and 61B as identified in the table on Map 20. A detailed inventory by owner is included as Table 5-1, which corresponds to Map 20, Open Space by Type. The Agricultural Preservation Restriction (APR) Program is a voluntary program that offers a non-development alternative to farmland owners that are faced with a decision regarding future use and

Chapter 61 Tax Program

Each program provides a means to assess land at its current use (forest, agriculture, or open space/recreation) as opposed to its development value.

Chapter 61 - Intended for landowners with long-term, active forest management. Assessment of forestland based on the land's ability to grow timber.

Chapter 61A - Intended for landowners engaged in agricultural or horticultural use. Assessment based on the land's ability to produce the agricultural or horticultural product being grown. Forestland may be enrolled and is based on the land's ability to grow timber.

Chapter 61B- Intended for landowners maintaining the land in a substantially natural, wild or open condition. Assessment of forestland under Ch. 61B is 25% of the current assessed value of the land.

deposition of their farms. The program, operated by the Massachusetts Department of Agricultural Resources (MDAR), offers farmers a payment up to the difference between the "fair market value" and the "fair market agricultural value" of their farmland in exchange for a permanent deed restriction, which precludes any use of the property that will have a negative impact on its agricultural viability. Ware is one of 162 cities and towns in Massachusetts with APR protected farms.

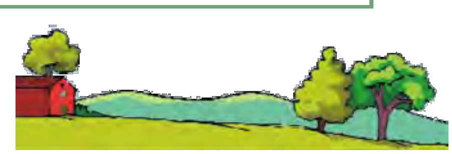
A Conservation Restriction (CR), sometimes called a conservation easement, is a legal agreement between a landowner and a qualified conservation organization or government agency that permanently limits a property's uses in order to protect its conservation values. CRs can be flexible and written to meet the particular needs of the landowner while protecting the property's resources. For example, the easement may allow for sustainable forestry practices, recreational uses such as the construction of trails, or management of the land for particular wildlife habitat or control of invasive species. The easement is permanently recorded with the deed, remaining in force when the land changes ownership.

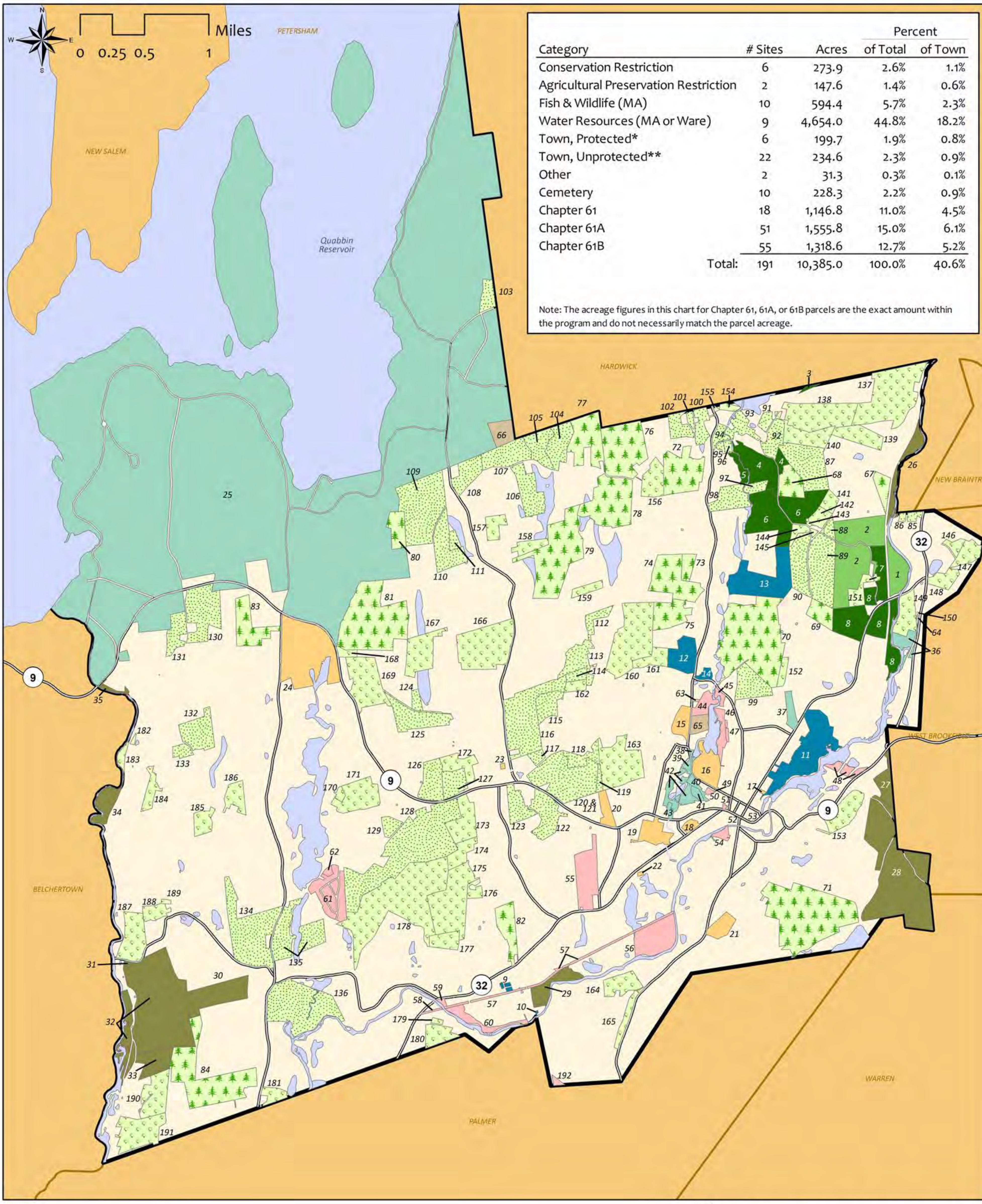
There are two agricultural preservation restrictions in Ware totaling 148 acres, and six CRs totaling 274 acres, as identified in Table 5-2 and shown on Map 20.

Table 5-2: Conservation and Agricultural Preservation Restrictions

OS Map ID	Restriction Type	Site Name	Fee Owner	Restriction Holder
1	APR	Lincoln	Lincoln, W. Chandler III	MA DAR
2	APR	Lincoln CR	Lincoln, W. Chandler III	East Quabbin Land Trust
3	CR	Baker CR	East Quabbin Land Trust	Hardwick Conservation Commission
4	CR	Klassanos CR	Klassanos, Brian and Martha	Ware Water Commission and East Quabbin Land Trust
5	CR	Strawberry Fields	Penny Lane Development LLC	Ware Conservation Commission
6	CR	Hyde Conservation Initiative CR	East Quabbin Land Trust	Ware Conservation Commission
7	CR	Lincoln	Lincoln, W. Chandler III	MA DAR
8	CR	Frohloff Farm CR	East Quabbin Land Trust	Ware Conservation Commission

Source: Ware Planning & Community Development Department





Category	# Sites	Acres	Percent of Total	Percent of Town
Conservation Restriction	6	273.9	2.6%	1.1%
Agricultural Preservation Restriction	2	147.6	1.4%	0.6%
Fish & Wildlife (MA)	10	594.4	5.7%	2.3%
Water Resources (MA or Ware)	9	4,654.0	44.8%	18.2%
Town, Protected*	6	199.7	1.9%	0.8%
Town, Unprotected**	22	234.6	2.3%	0.9%
Other	2	31.3	0.3%	0.1%
Cemetery	10	228.3	2.2%	0.9%
Chapter 61	18	1,146.8	11.0%	4.5%
Chapter 61A	51	1,555.8	15.0%	6.1%
Chapter 61B	55	1,318.6	12.7%	5.2%
Total:	191	10,385.0	100.0%	40.6%

Note: The acreage figures in this chart for Chapter 61, 61A, or 61B parcels are the exact amount within the program and do not necessarily match the parcel acreage.

Legend

Open Space by Type

- Conservation Restriction
- Agric. Pres. Restriction
- Fish and Wildlife
- Water Resources
- Town, Protected*
- Town, Unprotected**
- Other
- Cemetery
- 61 - Forest
- 61A - Agriculture
- 61B - Recreation

* Protected Town lands include parcels that have either deed restrictions or town meeting votes which permanently protected the land.

** Unprotected Town lands include parcels that, even if originally meant for a specific use, were never given any permanent protection through a deed restriction or town meeting vote.

Open Space & Recreation Plan
Map 20: Open Space by Type

November 5, 2014

Sources:
MassGIS: Open Space*, Waterbodies, Rivers, Roads, Towns
Ware: Open Space*

* Open Space database is a combination of data obtained from MassGIS, the Town of Ware Assessor's and Conservation Commission offices, the UMass LARP Fall 2012 "Prelude to a Master Plan," and research by Karen Cullen, Director of Planning & Community Development.

Town of Ware
126 Main Street
Ware, MA 01082

www.townofware.com

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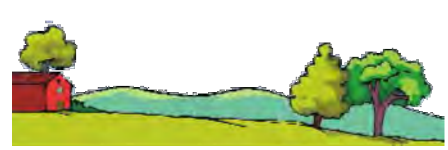


OS Id #	Type	Site Name	Owner	Acres*	Primary Purpose	Public Access	Level of Protection	Assessor Parcel ID	Owner Type
1	APR	Lincoln	LINCOLN W CHANDLER III	29.1	A	L	Permanent	36-5-1	P
2	APR	Lincoln CR	LINCOLN W CHANDLER III	118.5	A	L	Permanent	36-0-53	P
3	CR	Baker CR	EAST QUABBIN LAND TRUST INC	1.6	C	Y	Permanent	44-0-4	L
4	CR	Klassanos CR	KLASSANOS BRIAN T + MARTHA S	51.5	C	Y	Permanent	40-0-38	P
5	CR	Strawberry Fields	PENNY LANE DEVELOPMENT LLC	8.1	C	N	Permanent	40-44-5	P
6	CR	Hyde Conservation Initiative CR	EAST QUABBIN LAND TRUST INC	100.3	C	Y	Permanent	40-0-80	L
7	CR	Lincoln	LINCOLN W CHANDLER III	23.7	A	L	Permanent	36-0-5	L
8	CR	Frohloff Farm CR	EAST QUABBIN LAND TRUST INC	88.7	C	L	Permanent	36-0-50	L
9	TP	Zoller Parcels	WARE TOWN OF	2.4	C	Y	Permanent	10-96-1	M
10	TP	Zoller Parcels	WARE TOWN OF	0.3	C	Y	Permanent	6-0-20	M
11	TP	Grenville Park	WARE TOWN OF	87.5	R	Y	Permanent	23-0-15	M
12	TP	Town Forest	WARE TOWN OF	32.0	C	Y	Permanent	29-0-15	M
13	TP	Town Forest	WARE INHABITANTS OF THE TOWN	72.2	B	Y	Permanent	35-15-1	M
14	TP	Town Forest	WARE TOWN OF	5.3	B	Y	Permanent	29-0-46	M
15	C	Mount Carmel Cemetery	ROMAN CATHOLIC BISHOP OF SPFLD	17.2	H	Y	Permanent	23-0-6	N
16	C	Aspen Grove Cemetery	WARE TOWN OF	31.7	H	Y	Permanent	60-0-72	M
17	C	East Church Cemetery	UNITED CHURCH OF WARE	0.7	H	Y	Permanent	61-0-41	N
18	C	St Williams Cemetery	ROMAN CATHOLIC BISHOP OF SPFLD	5.5	H	Y	Permanent	56-0-26	P
19	C	St Williams Cemetery	ROMAN CATHOLIC BISHOP OF SPFLD	24.1	H	Y	Permanent	56-0-110	P
20	C	Holy Cross National Cemetery	HOLY CROSS POLISH NATIONAL	14.1	H	Y	Permanent	16-0-22	M
21	C	St Marys Cemetery	ROMAN CATHOLIC BISHOP OF SPFLD	16.9	H	Y	Permanent	11-0-19	M
22	C	Indian Cemetery	WARE TOWN OF	0.9	H	Y	Permanent	52-0-91	M
23	C	Ware Center Cemetery	WARE TOWN OF	0.9	H	Y	Permanent	21-0-51	M
24	C	Quabbin Reservoir Cemetery	MASS- DCR WATER SUPPLY	116.2	W	L	Permanent	64-0-1	S
25	WR	Quabbin Reservoir	MASS - DFW	7,931.0	W	L	Permanent	64-0-1	S
26	FW	Ware River Access	MASS - DFW	21.4	B	Y	Permanent	41-0-22	S
27	FW	Coy Hill WMA	MASS - DFW	17.7	C	Y	Permanent	24-0-25	S
28	FW	Coy Hill WMA	MASS - DFW	198.1	C	Y	Permanent	18-0-4	S
29	FW	Ware River Access	MOULSON CHARLOTTE R & BERNARD V	26.7	C	Y	Permanent	10-0-3	S
30	FW	Herman Covey WMA	MASS - DFW	51.7	C	Y	Permanent	8-1-1	S
31	FW	Herman Covey WMA	MASS - DFW	1.5	C	Y	Permanent	7-0-4	S
32	FW	Herman Covey WMA	MASS - DFW	221.9	C	Y	Permanent	3-0-10	S
33	FW	Herman Covey WMA	MASS - DFW	28.9	C	Y	Permanent	3-13-3	S
34	FW	Herman Covey WMA	MASS - DFW	22.7	C	Y	Permanent	19-0-1	S
35	FW	Herman Covey WMA	MASS - DFW	3.8	C	Y	Permanent	25-0-23	S
36	WR	Dismal Swamp Well Field	WARE TOWN OF	14.4	W	Y	Very High	30-44-1	M
37	WR	Church St Water Tank	WARE TOWN OF	11.4	W	N	Very High	23-0-13	M
38	WR	Snow's Pond Dam	WARE TOWN OF	1.3	W	X	Very High	62-0-44	M
39	WR	THE PINES - WATERWORKS DEPT.	WARE TOWN OF	3.2	W	X	Very High	62-0-45	M
40	WR	THE PINES - WATERWORKS DEPT.	WARE TOWN OF	5.3	W	Y	Very High	60-0-177	M
41	WR	Kubinski Field	WARE TOWN OF	4.1	W	Y	Very High	60-0-70	M
42	WR	THE PINES - WATERWORKS DEPT.	WARE TOWN OF	21.0	W	Y	Very High	60-0-70	M
43	WR	Reed Memorial Pool	WARE TOWN OF	3.2	W	Y	Very High	60-0-70	M
44	TU	Future Cemetery	WARE TOWN OF	13.1	B	Y	Low	29-0-72	M
45	TU	Snow's Pond	WARE TOWN OF	3.9	B	Y	Low	29-0-67	M
46	TU	Snow's Pond	WARE TOWN OF	12.9	B	Y	Low	23-0-8	M
47	TU	Snow's Pond	WARE TOWN OF	2.1	B	Y	Low	63-0-45	M
48	TU	East Street Riverfront	WARE TOWN OF	10.1	X	Y	Low	24-0-14	M
49	TU	Pleasant Street Lot	WARE TOWN OF	0.2	B	Y	Low	60-0-228	M
50	TU	Pleasant Street Lot	WARE TOWN OF	1.6	B	Y	Low	60-232-1	M
51	TU	Veteran's Memorial Park	WARE TOWN OF	0.9	R	Y	Low	61-0-6	M
52	TU	Nenamesek Park	WARE TOWN OF	0.1	H	Y	Low	57-0-91	M
53	TU	Pocket Park	WARE TOWN OF	0.1	H	Y	Low	57-0-98	M
54	TU	Memorial Field	WARE TOWN OF	5.4	R	Y	Low	57-0-62	M
55	TU	Ware School Campus	WARE TOWN OF	47.4	O	Y	Low	16-0-14	M
56	TU	Banas Farm	WARE TOWN OF	48.0	X	N	Low	11-0-21	M
57	TU	Old Railroad Bed	WARE TOWN OF	17.1	R	Y	Low	10-0-136	M
58	TU	Old Railroad Bed	MASSACHUSETTS CENTRAL RAILROAD	3.4	R	Y	Low	5-0-33	M
59	TU	Walmart Riverfront	WARE TOWN OF	1.7	X	Y	Low	9-0-170	M
60	TU	Walmart Riverfront	WARE TOWN OF	16.9	X	Y	Low	9-170-2	M
61	TU	Penybrook	WARE TOWN OF	43.8	B	Y	Low	14-0-8	M
62	TU	Penybrook	WARE TOWN OF	2.6	R	Y	Low	14-8-66	M
63	TU	Greenwich Road Drainage	WARE TOWN OF	0.6	O	N	Low	29-69-1	M
64	TU	Gilbertville Road Slice	WARE TOWN OF	0.3	C	N	Low	36-0-38	M
65	OTHER	Catholic Church	ROMAN CATHOLIC BISHOP OF SPFLD	12.0	H	Y	Low	23-0-7	N
66	OTHER	Beaver Lake Lot	BEAVER LAKE ASSOC.	19.3		N	Low	64-0-3	N
67	61		OBERG CARL O + DEBORAH A	11.9			Temporary	41-0-15	P
68	61		FINN DANIEL L	25.1			Temporary	40-0-36	P
69	61		MURPHY MARTIN & ROBIN M	17.6			Temporary	30-1-1	P
70	61		MOULTON GARY C & LORNA J	159.8			Temporary	29-0-48	P
71	61		RICHARDS LINDA T + EUGENE A	147.7			Temporary	17-0-17	P
72	61		SMITH CECILIA A	57.6			Temporary	40-0-8	P
73	61		MOULTON CHARLES A TRUSTEE OF THE CHARLES A MOULTON	11.6			Temporary	35-2-4	P
74	61		MOULTON ROBERT A + JILL M	58.8			Temporary	35-2-1	P
75	61		MOULTON CHARLES A TRUSTEE OF THE CHARLES A MOULTON	33.5			Temporary	35-0-2	P
76	61		REYNOLDS EDWARD G TRUSTEE	51.0			Temporary	39-0-4	P
77	61		SUPKA MARJORIE T &	63.4			Temporary	39-0-3	P
78	61		REYNOLDS EDWARD G TRUSTEE	70.0			Temporary	39-21-1	P
79	61		VADNAIS GERARD E & MARIA J	143.1			Temporary	34-0-4	P
80	61		KING WILLIAM C SR + PATRICIA L	18.8			Temporary	33-0-14	P
81	61		HULL FORESTLANDS LP	126.0			Temporary	26-0-16	P
82	61		SUNNY SIDE STORAGE LLC	20.0			Temporary	10-0-105	P
83	61		KRANTZ DARYL L + ANITA E	37.4			Temporary	26-0-6	P
84	61		BERGERON DARLENE A	96.0			Temporary	4-0-1	P
85	61A		CROCKETT LAWRENCE M +	4.2			Temporary	41-0-23	P
86	61A		CROCKETT LAWRENCE M	2.2			Temporary	41-22-1	P
87	61A		SINCLAIR LINDA A & COUTURE RICHARD P &	86.0			Temporary	40-36-2	P
88	61A		SHEA KEVIN T	6.8			Temporary	36-0-4	P
89	61A		SHEA KEVIN T	63.4			Temporary	36-0-54	P
90	61A		SHEA KEVIN T	27.1			Temporary	36-0-1	P
91	61A		CARLSON DONALD R	8.7			Temporary	40-0-26	P
92	61A		CARLSON DONALD R	22.3			Temporary	40-0-27	P
93	61A		CARLSON DONALD R	14.4			Temporary	40-0-25	P
94	61A		CARLSON DONALD R	6.5			Temporary	40-0-23	P
95	61A		CARLSON DONALD R	2.6			Temporary	40-41-1	P
96	61A		CARLSON DONALD R	3.5			Temporary	40-0-41	P
97	61A		SINCLAIR LINDA A & COUTURE RICHARD P &	8.7			Temporary	40-0-79	P
98	61A		SINCLAIR LINDA A & COUTURE RICHARD P &	29.2			Temporary	40-0-79	P
99	61A		MOULTON ERIC J SR	31.3			Temporary	29-53-1	P
100	61A		CAMPBELL EDWARD R +	17.0			Temporary	43-0-2	P
101	61A		CAMPBELL EDWARD R	1.5			Temporary	43-0-1	P
102	61A		CAMPBELL EDWARD R	17.1			Temporary	43-1-2	P
103	61A		WENZEL FRANKLIN D & DEBORAH L	13.6			Temporary	64-0-2	P
104	61A		STUTZMAN BYRON W + NANCY C TR	21.7			Temporary	39-0-2	P
105	61A		STUTZMAN BYRON W + NANCY C TR	25.0			Temporary	39-0-1	P
106	61A		SIEGEL DAVID T	36.1			Temporary	39-0-27	P

OS Id #	Type	Site Name	Owner	Acres*	Primary Purpose	Public Access	Level of Protection	Assessor Parcel ID	Owner Type
107	61A		PULCHTOPEK MICHAEL T & MELISSA LYNN	30.6			Temporary	38-0-8	P
108	61A		SMITH TERRANCE & IVY	26.4			Temporary	38-0-7	P
109	61A		JUDA MICHAEL F	97.0			Temporary	33-0-15	P
110	61A		JUDA STANLEY P LIFE EST	41.5			Temporary	33-0-17	P
111	61A		JUDA MICHAEL F & DEBRA R	6.6			Temporary	33-0-16	P
112	61A		LAGRANT FRANK E JR & BERNADET	12.3			Temporary	34-0-10	P
113	61A		KADRA CLAUDIA M & JAMES V TRUSTEES OF THE SHEA	30.6			Temporary	28-0-6	P
114	61A		KADRA CLAUDIA M & JAMES V TRUSTEES OF THE SHEA	8.2			Temporary	28-4-1	P
115	61A		SOPER JOHN C & MURRAY JAMIE A	22.0			Temporary	22-12-1	P
116	61A		SOPER JOHN C & MURRAY JAMIE A	45.4			Temporary	22-0-12	P
117	61A		CHRABASZCZ STANLEY + THEODOR	6.4			Temporary	22-19-1	P
118	61A		SZCZEPANEK JOSEPH S JR + JODI S	23.8			Temporary	22-0-46	P
119	61A		SZCZEPANEK JOSEPH S JR + JODI S	5.0			Temporary	22-0-45	P
120	61A		CHRABASZCZ STANLEY + THEODOR	85.8			Temporary	22-0-53	P
121	61A		CHRABASZCZ STANLEY + THEODOR	0.1			Temporary	22-51-1	P
122	61A		CHRABASZCZ STANLEY + THEODOR	36.9			Temporary	22-0-5	P
123	61A		COOK DAVID G CATHERINE M	31.6			Temporary	22-0-9	P
124	61A		JUDA STEVEN T	9.0			Temporary	27-0-6	P
125	61A		JUDA STEVEN T	46.0			Temporary	27-0-1	P
126	61A		LETENDRE LLC	31.0			Temporary	21-0-31	P
127	61A		BISKUP MICHAEL S & SHARON A	19.0			Temporary	21-0-32	P
128	61A		LETENDRE LLC	176.1			Temporary	21-0-5	P
129	61A		LETENDRE LLC	10.0			Temporary	15-0-25	P
130	61A		TUREK ROBERT S & CYNTHIA A	60.4			Temporary	31-0-4	P
131	61A		TUREK ROBERT & CYNTHIA	23.6			Temporary	25-0-10	P
132	61A		KOKOSKI MARK E	35.1			Temporary	19-0-29	P
133	61A		KOKOSKI FRANK W JR	8.8			Temporary	19-0-24	P
134	61A		MORIARTY LORETTE C LIFE ESTATE	89.0			Temporary	8-0-17	P
135	61A		MORIARTY MICHAEL + MICHAEL JR	13.0			Temporary	8-0-18	P
136	61A		MORIARTY MICHAEL + MICHAEL JR	76.0			Temporary	8-0-20	P
137	61B		SULLIVAN JOHN E JR +	87.8			Temporary	44-0-1	P
138	61B		BROWN PATRICK J	62.9			Temporary	43-16-1	P
139	61B		EATON GREGORY & PATRICIA	26.3			Temporary	41-0-10	P
140	61B		WIEDERSHEIM LEO P	31.4			Temporary	43-0-17	P
141	61B		CLOUTIER KATHLEEN A	8.0			Temporary	41-0-1	P
142	61B		HORTON MATTHEW F & LORRI A	9.6			Temporary	41-0-26	P
143	61B		ROOT KENNETH R	1.4			Temporary	36-0-55	P
144	61B		ROOT KENNETH R	4.7			Temporary	36-0-2	P
145	61B		ROOT KENNETH R	1.7			Temporary	36-2-1	P
146	61B		SIEGEL JAMES L & SHELLEY A	5.1			Temporary	37-0-4	P
147	61B		SIDUR SIMONE L WARBURTON SUSAN L	17.1			Temporary	37-0-8	P
148	61B		BISH WILLIAM J JR	14.3			Temporary	36-0-27	P
149	61B		O`RILEY RICHARD C + JOAN M CO-	25.0			Temporary	36-0-48	P
150	61B		O`RILEY RICHARD C + JOAN M CO-	0.3			Temporary	36-0-39	P
151	61B		LINCOLN ROGER N & ELIZABETH HOWE LIFE ESTATE	14.6			Temporary	36-0-52	P
152	61B		DEVINE MATTHEW D ET AL	7.8			Temporary	29-73-1	P
153	61B		KNAPP JOSEPH & PATRICIA	37.3			Temporary	24-0-34	P
154	61B		SINKOSKI MARK J & DONNA A	6.0			Temporary	43-0-7	P
155	61B		SINKOSKI MARK J & DONNA A	0.9			Temporary	43-6-3	P
156	61B		SCIORTINO FAMILY PARTNERSHIP NUMBER 1 &	26.5			Temporary	39-0-9	P
157	61B		LETENDRE LEO F	14.4			Temporary	38-0-12	P
158	61B		LOBODA EDWARD JR	13.7			Temporary	34-0-3	P
159	61B		COUNTRYLAND REALTY INC	10.0			Temporary	34-0-7	P
160	61B		DEECHER ANDREW & CECILIA	70.7			Temporary	28-42-1	P
161	61B		BREEDON KENNETH & RUBY L	12.0			Temporary	28-0-46	P
162	61B		HARDER PETER	8.2			Temporary	28-0-4	P
163	61B		PODKOWKA JOHN S & BARBARA LOU	64.0			Temporary	22-0-42	P
164	61B		MARTOWSKI JOSEPH T	23.0			Temporary	10-140-1	P
165	61B		MARTOWSKI STANLEY J	14.0			Temporary	6-0-16	P
166	61B		DESANTIS CHRISTOPHER J	82.2			Temporary	28-0-30	P
167	61B		ELDRIDGE CHRISTOPHER	38.0			Temporary	27-0-17	P
168	61B		LEMON CHESTER L + DEBRA J	5.0			Temporary	26-16-1	P
169	61B		LEMON CHESTER L + DEBRA J	46.0			Temporary	26-0-19	P
170	61B		KENYON JAMES W + LINDA M	2.7			Temporary	49-100-2	P
171	61B		KENYON JAMES W	41.4			Temporary	20-0-5	P
172	61B		BORONSKI WALTER	23.1			Temporary	21-0-33	P
173	61B		HARDER CRAIG S + DOREEN M	33.3			Temporary	21-0-4	P
174	61B		PILCH JOHN J	17.5			Temporary	15-0-19	P
175	61B		PILCH JOHN J	84.1			Temporary	15-0-17	P
176	61B		PILCH CHRISTINE	8.4			Temporary	15-0-16	P
177	61B		PILCH JOHN J	15.0			Temporary	9-0-44	P
178	61B		PILCH JOHN J	77.5			Temporary	8-0-44	P
179	61B		BOSS GLADYS R +	4.6			Temporary	5-27-1	P
180	61B		BOSS GLADYS R	9.0			Temporary	5-0-27	P
181	61B		HANCOCK JAMES D	10.6			Temporary	4-0-15	P
182	61B		SKOWRON BOLAC J & JOSEPH S	1.4			Temporary	19-0-10	P
183	61B		SKOWRON BOLAC J	6.8			Temporary	19-0-9	P
184	61B		GRENIER PAUL E + TARA S	13.4			Temporary	19-12-50	P
185	61B		YOUNG DONNA A	11.0			Temporary	19-22-5	P
186	61B		DANE ERIC R	17.4			Temporary	20-6-1	P
187	61B		SKOWRON BOLAC J	38.6			Temporary	7-0-15	P
188	61B		DESJARDINS GARY E & LAURIE A	12.1			Temporary	13-0-1	P
189	61B		DESJARDINS LAURIE A	1.6			Temporary	13-3-1	P
190	61B		BIRK GENE E & BIRK GLEN E	37.8			Temporary	3-13-1	P
191	61B		PISARSKI JOSEPH S &	61.1			Temporary	1-0-15	P
192	TU	Palmer Consv Comm	PALMER TOWN OF	2.5	C	X	Low	6-1-1	M

** Acreage data for the privately held lands in Chapter 61, 61A, and 61B are the acreage actually within the program, not the entire acreage of the parcel. (Data from the Assessor's Office, Oct. 2014).*

Key:

Type:

- *APR - Agricultural Preservation Restriction*
- *CR - Conservation Restriction*
- *FW - MA Fish & Wildlife*
- *WR - Water Resources (MA DCR or Ware Water Dept.)*
- *TP - Town of Ware, protected permanently*
- *TU - Town of Ware, Not protected permanently*
- *OTHER - other forms of protecton*
- *C - Cemetery*
- *61 - Chapter 61, Forest*
- *61A - Chapter 61A, Agriculture*
- *61B - Chapter 61B, Recreation*

Primary Purpose:

- *A - Agriculture*
- *B - Recreation & Conservation*
- *C - Conservation*
- *F - Flood Control*
- *H - Historical / Cultural*
- *O - Other*
- *Q - Habitat*
- *R - Recreation*
- *S - Scenic*
- *U - Underwater*
- *W - Water Supply*
- *X - Unknown*

Public Access:

- *Y - Full*
- *N - None*
- *L - Limited*
- *X - Unknown*

Owner Type:

- *S - State*
- *M - Municipal*
- *L - Land Trust*
- *N - Private Non-profit*
- *P - Private*

B. Public and Nonprofit Parcels

The Town of Ware owns 529.2 acres of land for conservation and recreation purposes as identified in Table 5-3 Municipal Lands. Most of the town-owned land, with the exception of public water supply source locations, is open for passive or active recreation uses. Table 5-3 includes both current and potential use of these lands. Other publicly owned land for conservation or recreation purposes is identified in Table 5-4. The following paragraphs describe Ware's most prominent public and non-profit owned spaces.

Grenville Park

J. H. Grenville Gilbert (1851-1932) and his wife Grace (neé Brown) donated Grenville Park in memory of their son, Grenville Gilbert, Jr., who died while attending preparatory school. Construction of the park took many years and the park was officially accepted by the town in 1907. In 1911, the Gilberts donated an additional 30 acres west of the river, and another 10 acres on the east to enhance and protect the view. In 1917, suitable land in the park was plowed and given over to gardening under the Food Conservation Committee. In the early 1920s, Sylvester Baxter wrote an article for the Boston Transcript that described Grenville Park as Massachusetts's "most notable instance of a public park established as a memorial." He called the park "Ware's loveliest adornment," which "preserves the landscape by uniting the woodlands with the river" (Conkey, 1961). Tennis courts were constructed in the mid 1920s and in 1941 the park also boasted a ski jump! Today, Grenville Park is open year round with the back section seasonally closed to vehicular traffic. Among its 100+ acres, one will find:

- 2 Little League baseball diamonds
- 1 multi-purpose field
- 1 bandstand (rebuilt in 2014 with PARC grant, town match, and private funding)
- 1 boat ramp and new dock
- 2 handicap fishing piers
- 1 picnic pavilion
- 6 picnic areas
- 1 steel-framed playground area
- 1 regulation-sized basketball court
- 2 miles of oil/stone roadway
- Walking trails leading through 80+ acres of woods and along the Ware River
- Winter walking, snowshoeing, cross-country skiing, and sledding
- Opportunities for bird-watching and wildlife viewing

Veterans' Memorial Field & William H. Dearden Memorial Field House, Monroe Street

In 1942, property from the former Gilbert mill yard, George H. Piper and the Ware Gas Company, was donated to create a four-acre ball field off Monroe Street, abutting the Ware River. The field house was named after William H. Dearden, late editor of the Ware River News, and member of the special committee that created the athletic field. The field itself is named in honor of all the men and women of Ware who had served their country during periods of war. The park was dedicated on July 18, 1948.

Today, parking is available on South Street. During spring and summer the field is home to Ware's varsity baseball team. Other leagues, including Babe Ruth, Mickey Mantle, Connie Mack and an Over-30 traveling baseball team, use the field. During fall months, youth football and soccer leagues practice and play here as well. Features include a field house, bleachers, storage shed, and a lighted basketball court.

In March 2012, the town began making improvements here using Community Development Block Grant (CDBG) funds; most notably, state-of-the-art lighting, a new path system, and general field improvements. These improvements were completed in 2014.

Reed Municipal Pool: The Reed Municipal Pool is located at 119 West Main Street next to Beauregard Memorial Playground. This is an outdoor pool that opens at the end of June and closes at the end of August. The dimensions of the pool are 60 feet wide by 110 feet long, and ranges in depth from 3 feet to 10 feet. There is also a playground and picnic tables at this site.

Kubinski Field: Kubinski Field is located close to some of the municipal water supply wells and is thus under the jurisdiction of the DPW. The baseball diamond is maintained by the Parks Department. The field is used by both youth and adult baseball programs.

Pennybrook: Most of the land at the Pennybrook site is not formally being used, but area residents do use it for walking, nature study, and walking their dogs. Through volunteer efforts, a small portion of the site has been developed into a soccer field, which is heavily used by many of the youth soccer teams. Discussions about expanding recreational opportunities at the site are ongoing.

Banas Farm: The Banas Farm offers access to the Ware River as well as opportunities for passive and active recreation. Its scenic hillside views, open meadows, river frontage, and easily viewed wetlands contribute to its beauty. The Ware River Greenway, a rail trail which is part of the Mass Central Rail Trail system, abuts this large property.

Frohloff Farm: The Frohloff Farm, owned by the East Quabbin Land Trust, is an 89 acre site comprised of open fields and forest land abutting the Ware River. It is located on Church Street and includes a quarter mile of old railroad bed which is destined to become part of the Ware River Greenway rail trail when the adjacent sections are developed. There are trails open to the public on the property. Part of the site is actively farmed with a focus on small livestock. The land trust purchased the adjacent farmhouse in 2010 and after renovations leased it to the farmer who farms the property. The land trust has also begun work to restore a pitch pine and oak woodland on the site. The project, funded in part by the USDA's Natural

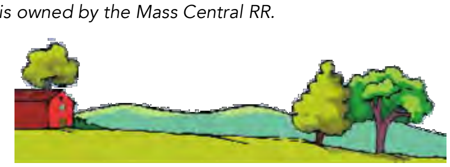
Resource Conservation Service, will improve wildlife habitat and restore the regionally declining pitch pine and oak woodland along the Ware River.

Hyde Woodland Preserve: This 100 acre parcel is owned by the East Quabbin Land Trust and is located along the southern flank of the Dougal Range. The property is entirely forested and is dominated by white pine and a mixture of hardwoods. The property is divided by the heavily eroded and abandoned Old Stagecoach Road, a public way, which is currently overtaken by a host of invasive plants. This old town road once connected Old Gilbertville Road to Hardwick Pond Road. Interesting stone walls, cellar holes, and unique landscape features such as steep talus slopes are found throughout the property. Some of the wildlife occurring in the area include white-tailed deer, beaver, black bear, bobcat, gray and red fox, coyote, moose, turkey, bald eagle, and a large variety of migratory birds including interior nesting songbirds. The property is currently open for hunting, fishing, and passive recreation. Access is from existing trails along the Dougal Range, such as through the adjacent Ware Town Forest parcel or from Hardwick Pond Road via the abandoned section of Old Stagecoach Road. In 2016 the land trust and the Town are working to establish a small trailhead parking area on Old Gilbertville Road, with a trail leading to the Hyde Woodland Preserve via Old Stagecoach Road.

Table 5.3: Municipal Lands

OS Id #	Type	Site Name	Management Agency	Acres	Current Use
9	TP	Zoller Parcels	Conservation Commission	2.4	C
10	TP	Zoller Parcels	Conservation Commission	0.3	C
11	TP	Grenville Park	Town; Parks & Rec Comm	87.5	R
12	TP	Town Forest @ Walker and Greenwich Roads	Town	32.0	C
13	TP	Town Forest	Town	72.2	B
14	TP	Town Forest	Town	5.3	B
16	C	Aspen Grove Cemetery	Ware Cemetery Comm	31.7	H
22	C	Indian Cemetery	Ware Cemetery Comm	0.9	H
23	C	Ware Center Cemetery	Ware Cemetery Comm	0.9	H
36	WR	Dismal Swamp Well Field	Town; DPW	14.4	W
37	WR	Church St Water Tank	Town; DPW	11.4	W
38	WR	Snow's Pond Dam	Town; DPW	1.3	W
39	WR	The Pines - Waterworks Dept.	Town; DPW	3.2	W
40	WR	The Pines - Waterworks Dept.	Town; DPW	5.3	W
41	WR	Kubinski Field	Town; DPW	4.1	W
42	WR	The Pines - Waterworks Dept.	Town; DPW	21.0	W
43	WR	Reed Memorial Pool and Ball Field	Town; DPW	3.2	W
44	TU	Open Space	Town	13.1	B
45	TU	Snow's Pond	Town	3.9	B
46	TU	Snow's Pond	Town	12.9	B
47	TU	Snow's Pond	Town	2.1	B
48	TU	East Street Riverfront	Town	10.1	X
49	TU	Pleasant Street Lot	Town	0.2	B
50	TU	Pleasant Street Lot	Town	1.6	B
51	TU	Veteran's Memorial Park	Town	0.9	R
52	TU	Nenamesek Park	Town	0.1	H
53	TU	Pocket Park	Town	0.1	H
54	TU	Memorial Field	Town; Parks & Rec Comm	5.4	R
55	TU	Ware School Campus	Town; School Dept	47.4	O
56	TU	Banas Farm	Town	48.0	X
57	TU	Old Railroad Bed	Town	17.1	R
58	TU	Old Railroad Bed*	Town	3.4	R
59	TU	Walmart Riverfront	Town	1.7	X
60	TU	Walmart Riverfront	Town	16.9	X
61	TU	Pennybrook	Town	43.8	B
62	TU	Pennybrook	Town	2.6	R
63	TU	Greenwich Road Drainage	Town	0.6	O
64	TU	Gilbertville Road Slice	Town	0.3	C
			Total Acreage:	529.2	

** Note, the Assessor data does not match the deed for this parcel; which indicates the portion south of the Ware River is owned by the Mass Central RR.*



See key at bottom of next page.

Potential Use	Funding for Acquisition	Public Access	Level of Protection	Zoning	Assessor Parcel ID	Condition
parking for bike trail	unknown	Y	Permanent	Suburban Resid.	10-96-1	unknown
unknown	unknown	Y	Permanent	Suburban Resid.	6-0-20	unknown
expand passive rec	Town	Y	Permanent	Rural Resid.	23-0-15	good
passive rec	unknown	Y	Permanent	Rural Resid.	29-0-15	good
forestry	unknown	Y	Permanent	Rural Resid.	35-15-1	fair
forestry	unknown	Y	Permanent	Rural Resid.	29-0-46	good
n/a	unknown	Y	Permanent	Downtown Resid	60-0-72	good
n/a	unknown	Y	Permanent	Highway Commercial	52-0-91	poor
n/a	unknown	Y	Permanent	Rural Resid.	21-0-51	good
n/a	unknown	Y	Very High	Rural Resid.	30-44-1	good
active recreation field	unknown	N	Very High	Rural Resid.	23-0-13	good
n/a	unknown	X	Very High	Downtown Resid	62-0-44	fair
n/a	unknown	X	Very High	Downtown Resid	62-0-45	good
n/a	unknown	Y	Very High	Downtown Resid	60-0-177	good
expand active recreation	unknown	Y	Very High	Downtown Resid	60-0-70	good
n/a	unknown	Y	Very High	Downtown Resid	60-0-70	good
active recreation	unknown	Y	Very High	Downtown Resid	60-0-70	good
cemetery/ recreation	unknown	Y	Low	Downtown Resid	29-0-72	good
passive/active recreation	unknown	Y	Low	Downtown Resid	29-0-67	good
passive/active recreation	unknown	Y	Low	Downtown Resid	23-0-8	good
passive/active recreation	unknown	Y	Low	Downtown Resid	63-0-45	good
conservation/passive recreation	unknown	Y	Low	Rural Resid & Highway Commercial	24-0-14	good
access to Kubinski Field	unknown	Y	Low	Downtown Resid	60-0-228	good
active/passive recreation	unknown	Y	Low	Downtown Resid	60-232-1	good
n/a	unknown	Y	Low	Downtown Commercial	61-0-6	excellent
n/a	unknown	Y	Low	Downtown Commercial	57-0-91	excellent
sitting area	unknown	Y	Low	Downtown Commercial	57-0-98	good
active rec fields	unknown	Y	Low	Suburban Resid.	57-0-62	good
n/a	unknown	Y	Low	Residential Business & Rural Resid.	16-0-14	good
solar field/ active or passive rec	unknown	N	Low	Industrial	11-0-21	fair
rail trail	unknown	Y	Low	Suburban Resid.	10-0-136	good
rail trail	unknown	Y	Low	Commercial/Industrial	5-0-33	good
conservation	unknown	Y	Low	Commercial/Industrial	9-0-170	good
conservation	unknown	Y	Low	Commercial/Industrial	9-170-2	good
active or passive rec/ municipal uses	unknown	Y	Low	Rural Resid.	14-0-8	good
active or passive rec/ municipal uses	unknown	Y	Low	Rural Resid.	14-8-66	good
n/a	unknown	N	Low	Rural Resid.	29-69-1	good
n/a	unknown	N	Low	Residential Business	36-0-38	poor

Table 5.4: Other Public Lands

OS Id #	Type	Site Name	Owner
24	C	Quabbin Reservoir Cemetery	MASS- DCR WATER SUPPLY
25	WR	Quabbin Reservoir	MASS - DFW
26	FW	Ware River Access	MASS - DFW
27	FW	Coy Hill WMA	MASS - DFW
28	FW	Coy Hill WMA	MASS - DFW
29	FW	Ware River Access	MOULSON CHARLOTTE R & BERNARD V
30	FW	Herman Covey WMA	MASS - DFW
31	FW	Herman Covey WMA	MASS - DFW
32	FW	Herman Covey WMA	MASS - DFW
33	FW	Herman Covey WMA	MASS - DFW
34	FW	Herman Covey WMA	MASS - DFW
35	FW	Herman Covey WMA	MASS - DFW
189	TU	Palmer Consv Comm	PALMER TOWN OF
			Total Acreage:

Key:

Type:

APR - Agricultural Preservation Restriction
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FW - MA Fish & Wildlife
WR - Water Resources (MA DCR or Ware Water Dept.)
TP - Town of Ware, protected permanently
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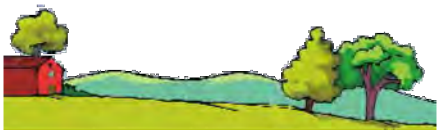
OTHER - other forms of protecton
C - Cemetery
61 - Chapter 61, Forest
61A - Chapter 61A, Agriculture
61B - Chapter 61B, Recreation

Primary Purpose:

A - Agriculture
B - Recreation & Conservation
C - Conservation
F - Flood Control
H - Historical / Cultural
O - Other
Q - Habitat
R - Recreation
S - Scenic
U - Underwater
W - Water Supply
X - Unknown



Acres	Primary Purpose	Public Access	Level of Protection	Assessor Parcel ID	Owner Type
116.2	W	L	Permanent	64-0-1	S
7,931.0	W	L	Permanent	64-0-1	S
21.4	B	Y	Permanent	41-0-22	S
17.7	C	Y	Permanent	24-0-25	S
198.1	C	Y	Permanent	18-0-4	S
26.7	C	Y	Permanent	10-0-3	S
51.7	C	Y	Permanent	8-1-1	S
1.5	C	Y	Permanent	7-0-4	S
221.9	C	Y	Permanent	3-0-10	S
28.9	C	Y	Permanent	3-13-3	S
22.7	C	Y	Permanent	19-0-1	S
3.8	C	Y	Permanent	25-0-23	S
2.5	C	X	Low	6-1-1	M
8,644.2					

Public Access:
Y - Full
N - None
L - Limited
X - Unknown

Owner Type:
S - State
M - Municipal
L - Land Trust
N - Private Non-profit
P - Private

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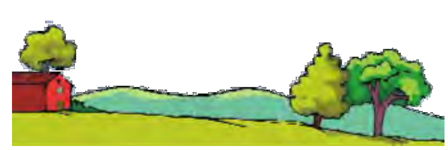

Community Vision Section 6

Description of Process

As described in Section 2, the Open Space and Recreation Committee solicited community input to determine what the citizens of Ware value. This process involved a community survey and public visioning session. The final draft OSRP was also issued for a 30-day public comment period in November. With the data collection and analysis completed, and public input compiled, the Open Space and Recreation Committee reviewed the goals and objectives outlined in the 2007 OSRP to determine if they remained relevant and served as guidance for the next seven years. All four goals from the 2007 plan were kept, and several changes to the objectives were made to reflect work that had been accomplished over the past five years and work that needed continuation and/or expansion. The goals and objectives for the 2013 OSRP are outlined in Section 8 of this plan.

Statement of Open Space and Recreation Goals

The Town of Ware seeks to provide a broad range of high quality recreational opportunities for people of all ages in a cohesive, well publicized, and effectively managed format that preserve's the town's rural characteristics.

Goal #1: Provide a broad range of high quality recreational programs.

Goal #2: Manage open space and recreation cohesively and effectively.

Goal #3: Preserve town's rural characteristics.

Goal #4: Increase public awareness of open space and recreation resources.

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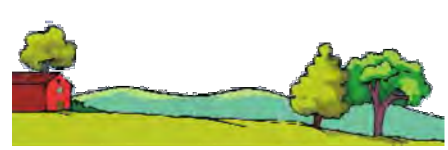


Summary of Resource Protection Needs

The results of the public outreach and participation process of the 2013 OSRP update remain similar to those identified in the 2007 Plan. Residents continue to value wildlife habitat, farmland, forests, the scenic rural character, and the local aquifer-based drinking water supplies. The quality of these resources is threatened indirectly through the ways humans use the landscape. New development, if poorly planned, could have a negative impact on both quality and quantity of all these resources. Residential sprawl has the potential to fragment wildlife corridors, diminishing the ecological integrity of these important critical natural lands. Coincidental to disrupting ecological value, residential sprawl can also interrupt scenic views and landscapes, degrade rural character, and impede the development of continuous trail development across large areas.

The ways in which lands are protected from development produce different values. For example, lands that are protected through the use of a conservation restriction can stay in private ownership. This results in having the decisions regarding the property's management in the hands of individuals, instead of a non-profit or a state or federal agency, which may not respond well to local concerns. In this example, the land also remains on the local property tax rolls. Although public access is sometimes required in conservation easements purchased by state conservation agencies and land trusts, it is not guaranteed. Lands that are purchased by state agencies and large land trusts are likely to provide access to the general public and sometimes offer payments in lieu of taxes.

Summary of Community Recreation Needs

Planning for a community's open space and recreation needs must strive to satisfy the present population's desires for new facilities, open spaces, and services as well as interpret and act upon the available data to prepare for the future needs of the residents. Although the OSRP will be updated in seven years, the types of actions that are identified in Section 9 take into account the needs of the next generation as well.

Responses to the community survey overwhelming stated that residents were not aware of the location of many of the town owned places for recreation, specifically the town forest properties on Walker Road, Upper North Street, Greenwich Road, and Snow's Pond. As a result, the trails at these locations are not fully utilized by residents. The top five recreational opportunities in need of expansion, enhancement or creation were prioritized: bike paths, nature trails, parks, arts and cultural events, and picnic areas. Broader outreach and promotion existing town-owned forest lands would address residents' desires for some of these opportunities. A public outreach campaign including maps and signage promoting awareness of both public and private lands for public recreation should be a top priority in the coming years.

Although ranking tenth in the list of desired recreational opportunities, trails for motorized use is also needed in Ware. Committee members could readily list numerous places in town where motorized vehicles are accessing land unauthorized. The conflict between motorized and non-motorized recreational use also needs to be addressed in order to recognize the inherent public safety issues associated with mixed use.

As required by the Massachusetts Division of Conservation Services, municipal Open Space and Recreation Plans must include information from the Statewide Comprehensive Outdoor Recreation Plan (SCORP)[1] and how it relates to the community. The 2012 SCORP discusses demand for outdoor recreation on a statewide basis, based on many public outreach efforts across the state. The plan has four goals: 1) increase the availability of all types of trails for recreation, 2) increase the availability of water-based recreation, 3) invest in recreation and conservation areas that are close to home for short visits, and 4) invest in racially, economically, and age diverse neighborhoods given their projected increase in participation in outdoor recreation. Ware's OSRP Action Plan includes goals and recommendations that address each of these goals with the exception of the second one regarding water-based recreation. That said, there has been discussion about improving water access to the Ware River at Grenville Park.

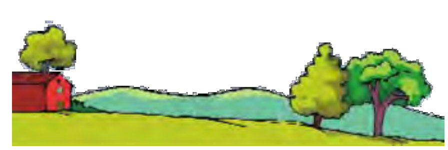
Summary of Management Needs and Potential Change of Use

There are several techniques that can be used by towns for directing new growth into well suited areas and protecting those areas that are recognized as the most important natural resources. Strategies for consideration include changes to the local zoning code, land conservation, education and outreach about land protection options for private land owners, and education about best practices for forest landowners.

Purchasing a landowner's development rights is a common technique used by state, federal, and non-profit conservation agencies. A landowner has many rights associated with owning land including the right to farm, harvest wood, drill for water, and mineral rights. The amount of money that a land trust might pay a landowner for their development rights is equal to the difference between the value of the land as building lots for residential or commercial structures and its value as open land in its undeveloped and protected state. An example is the Agricultural Preservation Restriction (APR) Program. The APR program pays the landowner/farmer/forester the value of their land's development rights (the difference between the land's market value and its agricultural value). In return, the landowner retains ownership of the land, continues to pay property taxes, and will be able to easily pass this land onto their next generation (i.e., the land could stay within the family).

Although conservation restrictions are a common practice, most landowners are not aware of them, how they work, potential land conservation partners, etc. Education and outreach to landowners can provide local landowners interested in protecting their land with resources and contacts for potential partners, and offer resources for proper land management practices.

1. Massachusetts Statewide Comprehensive Outdoor Recreation Plan 2012. MA Executive Office of Energy and Environmental Affairs.



A less common form of preservation is a scenic easement, which are usually less restrictive than a conservation or agricultural restriction and are designed to protect views from public roadways.

There are several zoning techniques useful for land preservation. The most common is cluster housing provisions, which require a portion of the parcel being developed to be preserved as open space. Ware's zoning bylaw does include such provisions, although they should be revised to encourage use of the tool. Less common in this part of the country is transfer of development rights, where one area of a community is designated as a "sending zone" and another a "receiving zone"; a property owner in the sending zone has the option to sell or transfer his development rights to a parcel in the receiving zone, thereby preserving one parcel while increasing the density on the other parcel. Typically, sending zones are located where the community wishes to preserve land, and receiving zones are located where municipal services are available to serve a denser population. Other zoning techniques include hillside or hilltop districts which are often related to scenic vistas but are also useful for protecting steep slopes; in both cases development is usually allowed but at much lower densities than are allowed elsewhere in the town.

Finally, aside from the desire to protect land, funding for fee-simple purchase of the land or a conservation restriction is critical to these efforts. The Community Protection Act (CPA) allows communities to create a local Community Preservation Fund for open space protection, historic preservation, affordable housing and outdoor recreation. Community preservation monies are raised locally through the imposition of a surcharge of not more than 3% of the tax levy against real property, and municipalities must adopt CPA by ballot referendum. Although previous efforts were unsuccessful, exploring the adoption of the CPA in Ware is an important step toward developing resources to implement many of the actions outlined in the Action Plan in Section 9.

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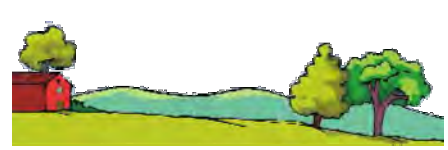

Goals and Objectives

Section 8

The goals and objectives identified below were carried forth from the 2007 Open Space and Recreation Plan with some modification to some of the objectives. Towards the later phase of the planning process, it was evident that the goals and many of the objectives remained relevant in 2013. Although much work had been accomplished since 2007, expansion and/or continuation of this work is needed to advance the Town of Ware's goals for open space and recreation over the next seven years.

Goal #1: Provide a broad range of high quality recreational programs.

Objectives:

1a. Develop passive and active recreation opportunities on town-owned lands and private property.

1b. Develop recreation programs for all residents including social, arts and cultural programming.

1c. Secure space for indoor recreation activities.

1d. Expand lighted regulation athletic fields.

Goal #2: Manage open space and recreation cohesively and effectively.

Objectives:

2a. Increase coordination of town recreation facilities' management and administration.

2b. Refurbish existing town recreation facilities.

2c. Identify funding for recreation and conservation land management.

Goal #3: Preserve town's rural characteristics.

Objectives:

3a. Develop Ware River Greenway.

3b. Work towards establishing a town-wide greenway system.

3c. Conduct public outreach about land protection options.

Goal #4: Increase public awareness of open space and recreation resources.

Objectives:

4a. Develop informational program.

4b. Create innovative fund-raising.

4c. Continue to offer town-wide special event programs.

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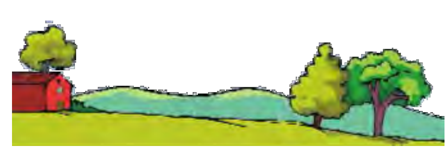
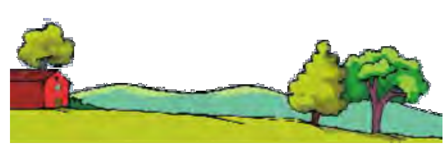
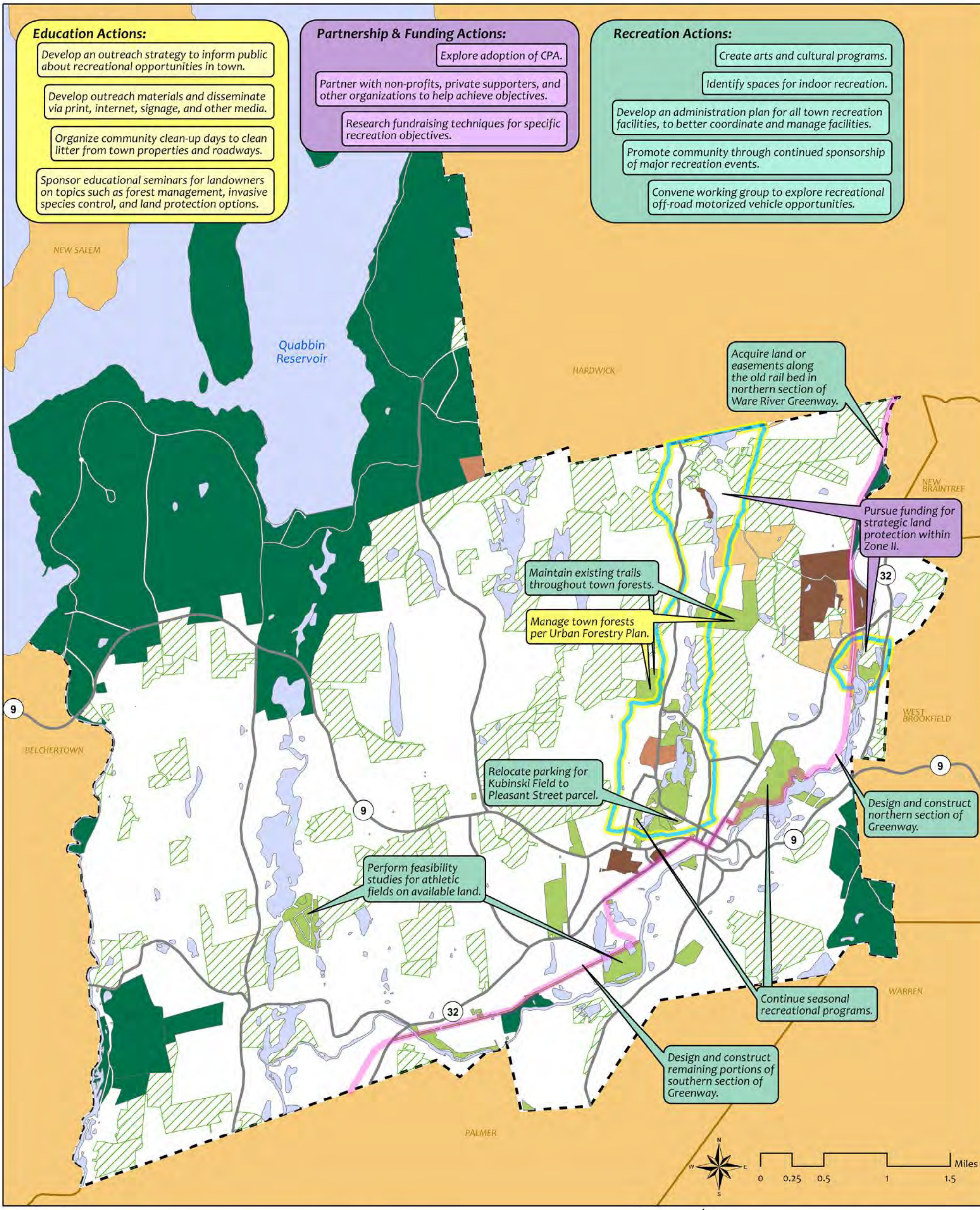


Objective / Action	Responsible Entities[1]	Proposed Timeframe	Possible Funding Sources	Priority
1a. Develop passive and active recreation opportunities on town owned and private lands				
Maintain existing trail network through town forests.	CC, PRC, OSRC	2016-2018	DCR Trails Grant Volunteer Corp	High
Develop signage and maps for trail network and make available to the public.	CC, PRC, OSRC	2016-2018	Private and Public Funds	Medium
Convene working group to explore need and potential location for motorized recreational use	OSRC	2017-2019	Not Needed	Low
Manage Town forests on Upper North Street, Walker Road and Muddy Brook as described in Urban Forestry Plan	CC	2016-2018	Town Funds	High
1b. Develop recreation programs for all residents including social, arts and cultural programming				
Support development of arts and cultural programming	CuC, HS	2016+ [2]	Town Funds Foundation Grants	Medium
Continue seasonal recreation programs for youth and adults	PRC, SD	2016+	User Fees Town Funds	High
1c. Secure space for indoor recreation				
Identify spaces for indoor recreation	OSRC	2018-2020	Not Needed	Medium
Work with private and non-profit entities to continue and to develop new night programming for teens and adults	OSRC, PRC	2016+	Town Funds	High
1d. Expand lighted and unlighted regulation athletic fields				
Perform feasibility study for athletic field development on available land	OSRC	2019	DCS PARC Grant	High
Solicit grants for athletic field improvement and development	OSRC, BOS	2017-2021	DCS PARC Grant	High
2a. Increase coordination of town recreation facilities administration and management				
Develop plan of administration for all town recreation facilities	PRC, OSRC, SD	2016+	Town Funds	High
Relocate Kubinski Field parking lot from Zone I Groundwater Protection District to town-owned land on Pleasant Street	OSRC, PRC, BOS	2017	DCS PARC Grant	High

1. *BOS = Board of Selectmen, CC = Conservation Commission, CuC = Cultural Commission, DPW = Department of Public Works, HC = Historical Commission, HS = Historical Society, OSRC = Open Space and Recreation Committee, PCDD = Planning & Community Development Department, PRC = Parks & Recreation Commission, SD = School Department, TC = Tax Collector, WD = Water Division of DPW*
2. *2016+ means this is an ongoing action item.*

Objective / Action	Responsible Entities	Proposed Timeframe	Possible Funding Sources	Priority
2b. Identify funding for recreation and land conservation				
Pursue funding for strategic land protection in Zone II Groundwater Protection District	WD, PCDD	2016+	Town Staff PVPC Local Technical Assistance	High
Seek corporate support	OSRC, BOS	2016+	Private/Corporate Funds	Medium
Explore adopting Community Preservation Act	BOS, CC, HC	2018-2022	Not Needed	Medium
3a. Develop Ware River Greenway				
Acquire land or easements along abandoned rail bed on northern section	OSRC	2016-2020	DCR Trails Grant	High
Design and construction for southern section	OSRC	2016-2018	DCR Trails Grant	High
Design and construction for northern section	OSRC	2018-2020	DCR Trails Grant	Medium
3b. Work towards establishing a town-wide greenway system				
Following the data presented in this plan, pursue opportunities for land preservation in critical areas	OSRC	2016+	Grants, Private/ Corporate Funds,	High
3c. Public outreach about land protection options				
Develop educational materials for community	CC, PCDD	2016-2018	Town Funds	High
Distribute information through Tax Collector with tax bills	TC	2016-2018	Town Funds	High
Host seminars on forest management, invasive species control, and land protection options (e.g. gifts, bargain sales, tax credits, and grant opportunities) for interested landowners	OSRC, CC	2016-2018	Foundation Grants Town Funds	High
4a. Develop informational program				
Develop outreach materials (signage, maps, brochures, etc.)	PCDD, CC, DPW	2016-2017	Town Funds	High
Develop and implement an outreach strategy	PCDD, CC, DPW	2016	Town Funds	High
Create a plan locating optimum sites for signs and kiosks.	PCDD, CC, DPW	2016	Town Funds	High
Develop design standards for signs and kiosks	PCDD, CC, DPW	2016	Town Funds	High
Utilize town website and cable access station about facilities, signage awareness, and rules and regulations.	PCDD, CC, DPW	2017-2022	Town Funds	High
4b. Create innovative fund-raising				
Research fundraising techniques for specific recreation objectives.	OSRP, PRC	2016+	Not Needed	Medium
Partner with non-profits, other organizations and private supporters	OSRP, PRC	2016+	Not Needed	Medium
4c. Continue to offer town-wide special events				
Continue to hold large-scale recreation events such as road races or derbies to promote the community	OSRP, PRC	2016+	Town Funds User Fees	High





Legend

Ware River Greenway

Aquifer - Zone II

Open Space

- Town
- State
- Land Trust
- Non-Profit
- Private
- 61, 61A, 61B

Actions

Education

Partnership & funding

Recreation

Open Space & Recreation Plan

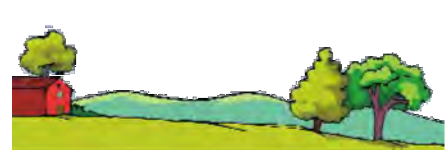
Map 21: Action Plan

October 7, 2013; updated March 3, 2016

Sources:
MassGIS: Open Space*, Waterbodies, Rivers, Roads, Towns
Ware: Open Space*

* Open Space database is a combination of data obtained from MassGIS, the Town of Ware Assessor's and Conservation Commission offices, the UMass LARP Fall 2012 "Prelude to a Master Plan," and research by Karen Cullen, Director of Planning & Community Development.

Town of Ware
126 Main Street
Ware, MA 01082
www.townofware.com



Public Comments Section 10

The Open Space & Recreation Plan Committee met to review the final draft of the plan on March 2, 2016. After agreeing on some edits to the Action Plan, the Committee voted 7-0 in favor that the plan as reviewed this evening with edits to be made be accepted by the committee and forwarded to the appropriate boards for letter of support.

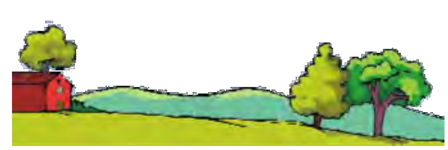
On March 16, 2016, the Planning Board reviewed the plan and voted ______ to support/endorse the plan. See letter attached.

On March ___, 2016, the Board of Selectmen reviewed the plan and voted ____ to support/endorse the plan. See letter attached.

Letter from Planning Board

Letter from Board of Selectmen

Letter from Conservation Commission



Letter from PVPC

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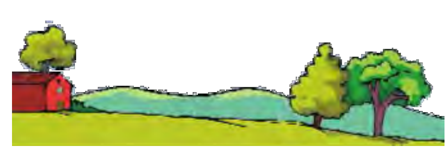

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ATTACHMENT A
Forms

Attachment A

Form 1

Certificate of Tax Compliance

Pursuant to Chapter 62C, §49A(b) of the Massachusetts General Laws, I,

____authorized signatory for
(Name)

____, do hereby certify under the pains and
(Name of Proposer)

penalties of perjury that said proposer has complied with all laws of the Commonwealth of Massachusetts relating to taxes.

Signature: ____

Printed name: ____

Title: ____

Name of Business: ____

Date: ____

Form 2

Town of Ware
Request for Qualifications
CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean natural person, business, firm, corporation, union, committee, club, or other organization, entity, or group of individuals.

Signature **Typed Name/Title**

Name of Firm/Business

Form 3

CERTIFICATE OF AUTHORITY

Give full names and residences of all persons and parties interested in the foregoing proposal:

> (Notice: Give first and last name in full; in case of a corporation, give names of President and Treasurer; in case of a limited liability company, give names of the individual members, and, if applicable, the names of all managers; in case of a partnership or a limited partnership, all partners, general and limited and; in case of a trust, all the trustees)

NAME	ADDRESS	ZIP CODE
______________________	______________________________________	_____________
______________________	______________________________________	_____________
______________________	______________________________________	_____________

Kindly furnish the following information regarding the Respondent:

1) IF A PROPRIETORSHIP

Name of Owner: ____

Address: ____

Name of Business: ____

Home: ____

2) IF A PARTNERSHIP

Business Name: ____

Business Address: ____

Names and Addresses of Partners:

PARTNER NAME	ADDRESS	ZIP CODE
______________________	________________________________	_____________
______________________	________________________________	_____________
______________________	________________________________	_____________

3) IF A CORPORATION OR A LIMITED LIABILITY COMPANY

Full Legal Name: ____

State of Incorporation: ____

Principal Place of Business: ____

Qualified in Massachusetts: Yes___________ No___________

Place of Business in Massachusetts:

____

4) IF A TRUST

Full Legal Name: ____

Recording Information:____

Full names and address of all trustees:

NAME	ADDRESS	ZIP CODE
______________________	________________________________	_____________
______________________	________________________________	_____________
______________________	________________________________	_____________
______________________	________________________________	_____________

Signature: ____

Printed name: ____

Title: ____

Name of Business: ____

Date: ____

Form 4

DISCLOSURE STATEMENT FOR
TRANSACTION WITH A PUBLIC AGENCY CONCERNING REAL PROPERTY
M.G.L. c. 7C, s. 38 (formerly M.G.L. c. 7, s. 40J)

The undersigned party to a real property transaction with a public agency hereby discloses and certifies, under pains and penalties of perjury, the following information as required by law:

(1) Real Property: The parcels of land described in Exhibits A, B, and C to this Agreement.

(2) Type of Transaction, Agreement, or Document: Sale of Property by Town

(3) Public Agency Participating in Transaction: Town of Ware

(4) Disclosing Party's Name and Type of Entity (if not an individual): ______________________

(5) Role of Disclosing Party (Check appropriate role):

_____Lessor/Landlord _____Lessee/Tenant

_____Seller/Grantor ___**X**___Buyer/Grantee

_____Other (Please describe): ____

DISCLOSURE STATEMENT FOR
TRANSACTION WITH A PUBLIC AGENCY CONCERNING REAL PROPERTY
M.G.L. c. 7C, s. 38 (formerly M.G.L. c. 7, s. 40J)

(6) The names and addresses of all persons and individuals who have or will have a direct or indirect beneficial interest in the real property excluding only 1) a stockholder of a corporation the stock of which is listed for sale to the general public with the securities and exchange commission, if such stockholder holds less than ten per cent of the outstanding stock entitled to vote at the annual meeting of such corporation or 2) an owner of a time share that has an interest in a leasehold condominium meeting all of the conditions specified in M.G.L. c. 7C, s. 38, are hereby disclosed as follows (attach additional pages if necessary):

NAME	RESIDENCE
________________________	___________________________
________________________	___________________________
________________________	___________________________

(7) None of the above- named persons is an employee of the Division of Capital Asset Management and Maintenance or an official elected to public office in the Commonwealth of Massachusetts, except as listed below (insert "none" if none):

(8) The individual signing this statement on behalf of the above-named party acknowledges that he/she has read the following provisions of Chapter 7C, Section 38 (formerly Chapter 7, Section 40J) of the General Laws of Massachusetts:

> *No agreement to rent or to sell real property to or to rent or purchase real property from a public agency, and no renewal or extension of such agreement, shall be valid and no payment shall be made to the lessor or seller of such property unless a statement, signed, under the penalties of perjury, has been filed by the lessor, lessee, seller or purchaser, and in the case of a corporation by a duly authorized officer thereof giving the true names and addresses of all persons who have or will have a direct or indirect beneficial interest in said property with the commissioner of capital asset management and maintenance. The provisions of this section shall not apply to any stockholder of a corporation the stock of which is listed for sale to the general public with the securities and exchange commission, if such stockholder holds less than ten per cent of the outstanding stock entitled to vote at the annual meeting of such corporation. In the case of an agreement to rent property from a public agency where the lessee's interest is held by the organization of unit owners of a leasehold condominium created under chapter one hundred and eighty-three A, and time-shares are created in the leasehold condominium under chapter one hundred and eighty-three B, the provisions of this section shall not apply to an owner of a time-share in the leasehold condominium who (i) acquires the time-share on or after a bona fide arm's length transfer of such time-share made after the rental agreement with the public agency is executed and (ii) who holds less than three percent of the votes entitled to vote at the annual meeting of such organization of unit owners. A disclosure statement shall also be made in writing, under penalty of perjury, during the term of a rental agreement in case of any change of interest in such property, as provided for above, within thirty days of such change.*

Any official elected to public office in the commonwealth, or any employee of the division of capital asset management and maintenance disclosing beneficial interest in real property pursuant to this section, shall identify his position as part of the disclosure statement. The commissioner shall notify the state ethics commission of such names, and shall make copies of any and all disclosure statements received available to the state ethics commission upon request.

The commissioner shall keep a copy of each disclosure statement received available for public inspection during regular business hours.

(9) This Disclosure Statement is hereby signed under penalties of perjury.

____

Print Name of Disclosing Party (from Section 4, above)

____

Authorized Signature of Disclosing Party Date (mm / dd / yyyy)

____

Print Name & Title of Authorized Signer

ATTACHMENT B
Purchase and Sales Agreement

Attachment B

PURCHASE AND SALE AGREEMENT

1. **INTRODUCTION**.

(a) EFFECTIVE DATE: ___________________________, 2023.

(b) PROPERTY: The parcels of land described in Exhibits A, B, and C to this Agreement.

(c) SELLER: Town of Ware

Address: Ware Town Hall, 126 Main Street, Ware, MA 01082

Seller's Attorney: Jeffrey T. Blake, Esq., K.P. Law, P.C., 101 Arch Street, Boston, MA 02110

Phone: (617) 556-0007 Fax: (617) 654-1735

Email: jblake@k-plaw.com

(d) BUYER:

Address:

Buyer's Attorney:

Phone: Fax:

Email:

2. **COVENANT**. Seller agrees to sell, and Buyer agrees to buy the Property upon the terms hereinafter set forth.

3. **PURCHASE PRICE**.

(a) Purchase Price. The purchase price for the Property shall be ______________________ and 00100 Dollars ($__________________.00) (the "Purchase Price"), of which ___________________ and no/100 Dollars shall be paid within two (2) Business Days of the Effective Date (the "Deposit"). The balance of the Purchase Price, as adjusted by all prorations as provided for herein, shall be paid to Seller by Purchaser at Closing, by wire transfer of immediately available federal funds.

(b) Deposit. (a) Within two (2) Business Days after the Effective Date, Buyer will deposit the Deposit with the Town Treasurer as escrow agent in a non-interest-bearing account. The Deposit shall be applied to the Purchase Price at Closing or shall be disbursed as otherwise provided herein. The escrow agent's obligation to return the Deposit to the party entitled thereto under the terms of this Agreement, as and when provided herein, shall survive the termination of this Agreement. In the event that this Agreement is terminated solely because of Seller's default, the Deposit shall be returned to Buyer within fourteen (14) of said termination, regardless of whether the return of said Deposit is stated elsewhere in this Agreement. The foregoing obligation shall survive the termination of this Agreement.

4. **TITLE**.

(a) Title Report. Buyer shall obtain title commitments (the "Title Commitments") issued by a nationally recognized title insurance company, together with a copy of all instruments creating title exceptions described in the Title Commitment (the "Exception Documents"), all at its sole cost and expense;

(b) Title Objection Notice. Buyer shall have until 5:00 p.m. on ________________, 2023 (the "Inspection Termination Date") and the period from the Effective Date to the Inspection Termination Date, the "Inspection Period") to send Seller a letter (the "Title Objection Letter") setting forth all of Buyer's objections to the Title Reports and Exception Documents, with copies thereof (collectively, the "Title Objections"), and (b) Seller shall have until 5:00 p.m.______________, 2023 (the "Seller Response Period"), which date is fifteen (15) days after Seller receives the Title Objection Letter, to notify Buyer in writing ("Seller's Title Response Notice") of Seller's election, in its sole and absolute discretion, to either: (i) cure, on or prior to Closing, any of the Title Objections, or (ii) not cure any or all of the Title Objections (and Seller's failure to respond by the expiration of the Seller Response Period shall be deemed an election by Seller not to cure any of the Title Objections). If Seller elects to cure any Title Objections, Seller shall use good faith efforts to cure such Title Objections at or prior to Closing, provided, however, that good faith efforts shall not require Seller to expend more than $2,000.00 to effectuate said cure, including attorneys' fees, but excluding monetary liens voluntarily granted by Seller.

(c) Title Termination Date. If Seller is unwilling to cure (or is deemed to have elected not to cure) any of the Title Objections, Buyer will have the option to either: (a) waive any Title Objections that Seller is unwilling to cure or is deemed to have elected not to cure; or (b) terminate this Agreement by written notice to Seller sent by 5:00 p.m. on _________________, 2023 (the "Termination Day"), which date is fifteen (15) days after the Seller Response Period expires. Upon a timely termination by Buyer, this Agreement shall automatically terminate, the parties shall be released from all further obligations under the Agreement (except for those provisions that, by their terms, survive a termination of this Agreement).

(d) Waiver. Buyer's failure to take either one of the actions described in (b) and (c) above shall be deemed to be Buyer's election to acquire the Property notwithstanding the Title Objections under this subsection (d), if any, and Buyer shall have waived its right to terminate this Agreement under this Section. Buyer shall have been deemed to have approved any title matter that exists as of the date of the Title Commitment and that Seller is not obligated to remove or as to which either Buyer did not object to as provided above or to which Buyer did object, but with respect to which Buyer did not terminate this Agreement. Nothing herein shall affect Buyer's right to object to title matters occurring after the Inspection Period.

(e) Permitted Exceptions. Notwithstanding anything herein to the contrary, Buyer acknowledges and agrees that the Property shall be conveyed subject to the following matters: (i); (ii) any lien to secure payment of special assessments, not delinquent, (iii) any and all applicable laws, ordinances, rules and governmental regulations (including, without limitation, those relating to building, zoning and land use) affecting the development, use, occupancy and/or enjoyment of the Property, (iv) matters set forth in the Title Report and not included in the Title Objections, (v) Title Objections subsequently waived or deemed waived by Buyer in accordance with this Section 4, (iv) such other Title Objections as Buyer's title company shall commit to insure over or omit as exception, without any additional cost to Buyer, (vii) any lien, encumbrance, title exception or defect that are approved or deemed approved by Buyer after the date hereof, and (viii) a trail easement or easements that may be reserved by Seller on portion or portions of the Property at locations reasonably acceptable to Buyer for benefit of the public, to be shown on a plan prepared by Buyer and acceptable to Seller. The foregoing matters are referred to herein, collectively, as the "Permitted Exceptions." Notwithstanding anything stated to the contrary herein, Seller covenants and agrees to remove from the Property any lien or encumbrance which is a mortgage, deed of trust and/or other debt instruments to the extent voluntarily executed by Seller or expressly assumed by Seller in writing.

(f) Title and Practice Standards. Any matter or practice arising under or relating to this Agreement which is the subject of a title standard or a practice standard of the Massachusetts Real Estate Bar Association at the time for delivery of the deed shall be covered by said title standard or practice standard to the extent applicable.

5. **PLANS**. If said deed refers to a plan necessary to be recorded therewith, Buyer shall prepare and deliver such plan in form adequate for recording or registration to Seller for Seller's approval, not to be unreasonably withheld, at least thirty (30) days prior to the closing date. Buyer shall prepare a survey plan of the easements to be reserved by Seller, if any.

6. **PROPERTY INSPECTIONS.**

(a) Inspections. During the Inspection Period, Buyer shall have a limited license to enter upon the Property for the purpose of conducting such other inspections, surveys, tests and investigations as Buyer deems reasonably necessary to ascertain the suitability of the Property for the permitted uses (including use thereof residential purposes and ability to construct the Project improvements), including, without limitation, ALTA boundary/topographical and/or "as-built" surveys, utility inspections, zoning verifications, examination of flood plain status, to determine the acceptability of soil compaction, examination of water and drainage delineations, and other non-invasive inspections (the "Inspections"), all at Buyer's sole risk and expense. Buyer shall not conduct any subsurface or invasive inspections unless: Buyer's Phase 1 Site Assessment report recommends a Phase 2 Site Assessment and Buyer has notified Seller of the same in writing at least thirty (30) days prior thereto and obtained Seller's prior written approval, including, without limitation, Seller's prior written approval of the location of such invasive inspections, which may not be unreasonably withheld. Buyer shall use commercially diligent efforts to complete the Inspections as soon as practicable and to minimize any interference with the use of the Property by Seller and others entitled thereto. All of such other entries upon the Property shall be at reasonable times during normal business hours and after at least forty-eight (48) hours prior written notice to Seller or Seller's agent (which notice may be sent by e-mail to __________ at _____________), and Seller or Seller's agent shall have the right to accompany Buyer during any activities performed by or on behalf of Buyer on the Property. Buyer will promptly provide Seller with a copy of any reports in Seller's possession or control ("Reports") which assesses the presence of any Hazardous Materials (as such term is defined herein) on the Property or any violation of any applicable law. Buyer agrees to keep confidential and not disclose the contents or result of any Reports, except to the extent required by applicable law.

(b) Repair, Restoration. Except as provided below, if Buyer and/or its agents, employees, representatives, contractors, consultants and/or invitees (with Buyer, the "Buyer Parties") disturb or damage the Property or any other improvements or property of Seller or of others during the Inspection Period or at any other time that Buyer and/or the other Buyer Parties enter the Property, Buyer shall promptly restore or repair the Property and/or the improvements thereon to the same condition as existed prior to such disturbance or damage, it being acknowledged that the failure to repair/restore the Property and/or the other property promptly shall be a material default under this Agreement. The foregoing obligation shall survive the termination of this Agreement.

(c) Property Objection Notice. If Buyer determines that the condition of any of the Property are not acceptable under this Section, Buyer shall have the right to terminate this Agreement by notifying Seller of such termination no later than the Inspection Termination Date, setting forth therein the reasons for said termination (the "Property Objection Letter"). Upon such timely termination, neither party shall have any further rights or obligations under this Agreement except for such obligations expressly intended to survive termination. If Buyer fails to so notify Seller of Buyer's termination of this Agreement by the Inspection Termination Date, then Buyer shall have waived its right to terminate this Agreement pursuant to this Section 6, and be deemed to have approved the condition of the Property as of said Inspection Termination Date. Nothing herein shall affect Buyer's right to object to Hazardous Materials released on the Property after the Inspection Termination Date.

7. **INSURANCE**.

(a) Insurance. Buyer shall procure and maintain, effective as of the date of this Agreement through and until the Closing: (a) Workers' Compensation Insurance in statutory limits, and Employer's Liability Insurance in a minimum amount of One Million ($1,000,000.00) Dollars, and (b) the following insurance coverages with insurance companies reasonably acceptable to Seller: (i) Commercial General Liability Insurance including Personal Injury, Death, Contractual, Products/Completed Operations, Independent Contractors, and Property Damage and Commercial Automobile Liability Insurance covering all automobiles, trucks, and other vehicles utilized at the Property, all in a minimum amount of One Million ($1,000,000.00) Dollars combined single limit coverage arising out of any one occurrence, and Two Million ($2,000,000.00) Dollars in the aggregate; and (iii) umbrella insurance in the amount of Five Million Dollars ($5,000,000).

(b) General Requirements. Each of the foregoing policies (except workers' compensation insurance) must include "Town of Ware, Massachusetts" as an additional insured. Upon or prior to execution of this Agreement, Buyer shall deliver to Seller one or more certificates of insurance evidencing that Buyer has in fact procured the insured required hereunder. Buyer will not be permitted to access the Property until Seller receives such certificates of insurance. Such policies shall contain a provision whereby the insurer shall give Seller not less than thirty (30) days' written notice prior to the cancellation or material modification of such policies. If such insurance is available only on a claims-made basis, then the dates of coverage, including the retroactive date and the time period within which any claim can be filed, shall be stated in the certificate(s) of insurance, and Buyer shall be obligated to ensure that no gaps in coverage occur. Such insurance shall not relieve or release Buyer from, or limit its respective liability as to, any and all obligations arising under this Section. Buyer shall immediately notify Seller, initially by telephone, and thereafter in writing, of any and all accidents arising out of Buyer's activities on the Property.

(c) INDEMNIFICATION; RELEASE. Buyer shall release, discharge, indemnify, defend and hold harmless Seller and/or its agents, employees, representatives, board of commission members, and others acting by and through Seller (collectively, with Seller, the "Seller Parties") from and against any and all damages, claims, losses, liabilities, costs and expenses (including reasonable attorneys' fees), which may be brought against, imposed upon and/or incurred by any of the Seller Parties arising out of or related to the Inspections of the Property and/or the entry upon and/or activities undertaken by Buyer and/or any of the other Buyer Parties, except to the extent that the same is directly caused by the gross negligence of any of the Seller Parties. The obligations of Buyer pursuant to this Section shall survive the Closing and/or the termination of this Agreement.

(d) HAZARDOUS MATERIALS. Buyer acknowledges that Buyer has not been influenced to enter into this transaction and that she has not relied upon any warranties or representations not set forth in this Agreement. Buyer represents and warrants that it or its agents have conducted a full inspection of the Property, and based upon Buyer's investigation, Buyer is aware of the condition of the Property and will accept the Property "AS IS", subject to Buyer's right to terminate this Agreement under Section 5. Buyer acknowledges that Seller has no responsibility for hazardous waste, oil, hazardous material or hazardous substances, as those terms are defined by any applicable federal, state and/or local law, rule or regulation, including, without limitation, the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, M.G. L. c. 21E, the Massachusetts Hazardous Waste Management Act, M.G.L. c. 21C, the Comprehensive Environmental Response, Compensation and Liability Act, as amended, 42 U.S.C. §§ 9601 et seq. and the Resource Conservation and Recovery Act, as amended, 42 U.S.C. §§ 6901 et seq. (herein collectively referred to as "Hazardous Materials") on, in, under or emitting from the Property or for any other condition or defect on the Property, and shall defend, indemnify the hold harmless Seller form any and all losses, damages, costs, claims, fines, expenses and liabilities relating to said Hazardous Materials. The provisions of this Section shall survive delivery of the deed.

(e) BUYER'S ACKNOWLEDGEMENT. Buyer acknowledges and agrees that Seller has not made, does not make and specifically disclaims any representations, warranties, promises, covenants, agreements or guaranties of any kind or character whatsoever, whether express or implied, oral or written, past, present or future, of, as to, concerning or with respect to (a) the nature, quality or condition of the Property, including, without limitation, the water, soil and geology, (b) the income to be derived from the Property, (c) the suitability of the Property for any and all activities and uses which Buyer may conduct thereon, (d) the compliance of or by the Property or its operation with any laws, rules, ordinances or regulations of any applicable governmental authority or body, including, without limitation, the Americans with Disabilities Act and any rules and regulations promulgated thereunder or in connection therewith, I the habitability, merchantability or fitness for a particular purpose of the Property, or (f) any other matter with respect to the Property, and specifically that Seller has not made, does not make and specifically disclaims any representations regarding the presence, existence or absence of Hazardous Materials, toxic substance or other environmental matters. Buyer further acknowledges and agrees that, having been given the opportunity to inspect the Property, Buyer is relying solely on its own investigation of the Property and not on any information provided or to be provided by Seller. Buyer further acknowledges and agrees that any information provided or to be provided with respect to the Property was obtained from a variety of sources and that Seller has not made any independent investigation or verification of such information. **Buyer further acknowledges and agrees that, and as a material inducement to the execution and delivery of this Agreement by Seller, the sale of the** Property **as provided for herein is made on an "AS IS, WHERE IS" CONDITION AND BASIS "WITH ALL FAULTS."** Buyer acknowledges, represents and warrants that Buyer is not in a significantly disparate bargaining position with respect to Seller in connection with the transaction contemplated by this Agreement; that Buyer freely and fairly agreed to this acknowledgment as part of the negotiations for the transaction contemplated by this Agreement.

(f) POSSESSION AND DELIVERY OF PREMISES. Full possession of said Property free of all tenants and occupants are to be delivered at the time of the delivery of the deed.

8. **EXTENSION TO PERFECT TITLE OR MAKE PREMISES CONFORM**. If Seller shall be unable to give title or to make conveyance, or to deliver possession of the Property, all as herein stipulated, or if at the time of the delivery of the deed to the Property does not conform with the provisions hereof, then any payments made under this Agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this Agreement shall be void without recourse to the parties hereto, unless Seller elects, in its sole discretion, to use reasonable efforts to remove any defects in title, or to deliver possession as provided herein, or to make the said Property conform to the provisions hereof, as the case may be, in which event Seller shall give written notice thereof to Buyer at or before the time for performance hereunder. In no event, however, shall reasonable efforts require Seller to expend more than $2,500.00, including attorneys' fees. Seller's obligations hereunder are subject to the availability and/or appropriation of funds to fulfill Seller's obligations.

9. **FAILURE TO PERFECT TITLE OR MAKE PREMISES CONFORM**. If at the expiration of the extended time Seller shall have failed so to remove any defects in title, deliver possession, or make the Property conform, as the case may be, all as herein agreed, then any payments made under this Agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this Agreement shall be void without recourse to the parties hereto.

(a) BUYER'S ELECTION TO ACCEPT TITLE. Buyer shall have the election, at either the original or any extended time for performance, to accept such title as Seller can deliver to the said Property in its then condition and to pay therefore the purchase price, without deduction, in which case Seller shall convey such title.

10. **USE OF MONETY TO CLEAR TITLE**. To enable Seller to make conveyance as herein provided, Seller may, at the time of delivery of the deed, use the purchase money or any portion thereof to clear the title of any or all encumbrances or interests, provided that all instruments so procured are recorded in accordance with customary Massachusetts conveyancing practices.

11. **ACCEPTANCE OF DEED**. The acceptance of the deed by Buyer shall be deemed to be a full performance and discharge of every Agreement and obligation herein contained or expressed, except such as are, by the terms hereof, to be performed after the delivery of said deed.

12. **ADJUSTMENTS**. Buyer shall make payment in lieu of taxes in accordance with G.L.c.44, §63A as of the day of performance of this Agreement and the net amount thereof shall be added to the purchase price payable by Buyer at the time of delivery of the deed. Charges for water, sewer, and fuel shall be adjusted as of the day of closing.

13. **BUYER'S DEFAULT; DAMAGES**. If Buyer shall fail to fulfill Buyer's Agreements herein, the Deposit made hereunder by Buyer shall be retained by Seller as Seller's sole and exclusive remedy at law and equity for Buyer's breach of this Agreement. The parties acknowledge and agree that Seller has no adequate remedy in the event of Buyer's default under this Agreement because it is impossible to exactly calculate the damages which would accrue to Seller in such event. Therefore, acknowledging this fact, the parties agree that: (i) the Deposit hereunder is the best estimate of such damages which would accrue to Seller in the event of Buyer's default, (ii) said Deposit represents damages and not a penalty against Buyer, and (iii) the parties have been afforded the opportunity to consult an attorney with regard to the provisions of this Section.

14. **LIABILITY OF SHAREHOLDER, TRUSTEE, FIDUCIARY**. If Seller or Buyer executes this Agreement in a representative or fiduciary capacity, only the principal or the estate represented shall be bound, and neither Seller or Buyer so executing, nor any shareholder or beneficiary of any trust, shall be personally liable for any obligation, express or implied, hereunder.

15. **PERMITS AND FINANCING**.

(a) Permits. Buyer shall obtain any and all necessary permits, approvals, and licenses from federal, state and local authorities that are necessary or convenient to enable Buyer to undertake, construct and operate the Project for the Permitted Use (collectively, the "Permits"), with appeal periods having expired without any appeal being filed, or if filed, the final adjudication of such appeal pursuant to a final court order without further appeal. All such Permits shall be obtained at the sole risk and expense of the Buyer, and no work shall be done upon the Property in connection therewith unless and until Buyer has provided Seller with written notice and copies of all applicable Permits. Seller agrees to cooperate in any reasonable manner in connection with the making of applications for any such Permits, all at Buyer's cost, but Buyer acknowledges that Seller has no control over and cannot guarantee that Permits required from municipal boards or officers within their statutory or regulatory authority will be granted or fees waived.

(b) Financing. Buyer shall obtain financing, in an amount sufficient in the reasonable judgment of Buyer and Seller for Buyer to pay the purchase price for the Property and design, construct, operate and maintain the Project as required under the LDA (the "Financing"), and Buyer shall provide Seller with firm project financing commitments, including, but not limited to public funding commitments, construction loan commitments, and/or permanent loan commitment from institutional lenders and/or public or quasi-public entities, on terms and amounts reasonably satisfactory to Buyer and Seller (the "Financing Commitments"), and Buyer shall, prior to or simultaneously with the execution and delivery of the Deed, close on the Financing, including closing on all financing transactions and admission of the tax credit equity investor(s) to Buyer, whereby Buyer shall have the contractual right to receive funds from institutional lenders, tax credit equity investors and/or public or quasi-public entities (the "Financial Closing").

(c) Due Diligence. Buyer shall use commercially diligent and good faith efforts to obtain the Permits and Financing Commitments no later than ____________________, 2023 (as Seller may extend in writing, in its sole and absolute discretion, the "Initial Permit Period"). If, at the expiration of the Initial Permit Period, the Financing Commitments have not been obtained despite Buyer's good faith and diligent efforts, Buyer may, with Seller's consent, which shall not be unreasonably withheld, extend the Initial Permit Period by no more than _________ (____) days (the "Extended Permit Period" and, with the Initial Permit Period, the "Permit Period"), provided that Buyer gives written notice to Seller requesting the extension at least thirty (30) days prior to the expiration of the Initial Permit Period. In the event that the Financing Commitments cannot be satisfied within the Permit Period, Buyer or Seller shall have the right to terminate this Agreement, whereupon this Agreement shall be null and void, without recourse to the parties, except those provisions that are expressly stated herein to survive said termination. Buyer shall not be liable to Seller for failing to obtain the Permits and/or the Financing unless Buyer failed to use good faith and diligent efforts to satisfy said contingencies.

(d) Buyer shall provide Seller with written status once every ____ weeks/months from the Effective Date until the Closing, and shall meet with Buyer at such times as Seller may reasonably request, to update Seller of the specific steps taken by Buyer to obtain the Permits and Financing and shall provide such other information as Seller may reasonably request.

16. **CONDITIONS TO CLOSING.** The parties acknowledge and agree that Buyer's and Seller's obligations hereunder are contingent on the satisfaction of following conditions (the "Contingencies") on or before the Closing Date or such earlier or later date set forth in this Agreement:

(a) Permits. Buyer shall have obtained the necessary Permits to construct and operate the Property for its permitted uses (the "Project") by the expiration of the Diligence Period;

(b) Financing. Buyer shall obtained the Financing Commitments by the expiration of the Diligence Period, and shall conduct the Financial Closing prior to or simultaneously with the execution and delivery of the Deed to the Property, whereby Buyer shall receive access to funds to undertake and complete the Project;

(c) Compliance. Compliance by Buyer and Seller with any other requirements of Massachusetts General or Special laws relative to the disposition of real property by Seller, including G.L. c. 30B, and Buyer and Seller agree to diligently pursue full compliance with said laws; and

(d) Termination. In the event that the Closing does not occur within the time set forth in Section ____ because of Buyer's failure to satisfy the Contingencies, despite its good faith and diligent efforts, Buyer or Seller shall have the right to terminate this Agreement, whereupon neither party shall have any further rights or obligations under this Agreement except for such obligations expressly intended to survive termination. In the event that the Closing does not occur within the time set forth in Section____ because of Seller's failure to satisfy the condition set forth in Section 22(a) on the date of the Closing, despite its good faith and diligent efforts, Buyer shall have the right to terminate this Agreement, whereupon the Deposit shall be returned to Buyer and neither party shall have any further rights or obligations under this Agreement except for such obligations expressly intended to survive termination.

17. **DELIVERABLES AT CLOSING**.

(a) Items to be Delivered by Seller. Seller shall execute, acknowledge and deliver, as applicable, to Buyer's attorney on or prior to the date of Closing, the following: (a) original, recordable release deed (the "Deed") conveying all of Seller's right, title and interest in and to the Property, subject only to Permitted Exceptions and the other restrictions set forth herein, (b) a settlement statement showing all of the payments, adjustments and prorations provided for in in this Agreement and otherwise agreed upon by Seller and Buyer ("Closing Statement"), and (c) such customary and usual certificates and affidavits as Buyer's title insurance company may reasonably require in order to issue the Title Policy without exception for mechanic's and materialmen's liens, broker's liens, rights of parties in possession, without cost or expense to Seller.

(b) Items to be Delivered by Buyer. Buyer shall execute and deliver, as applicable, to the Seller's attorney the following: (a) the Purchase Price, adjusted as provided in this Agreement, which funds shall remain in escrow until the Deed has been recorded; (b) a signed counterpart of the Closing Statement; (c) evidence, reasonably satisfactory to Seller's attorney, of authority of any person or persons executing instruments for or on behalf of Buyer, (d) a signed Disclosure of Beneficial Interest form, as required under G.L. c.7C, §38, and I such other documents, instruments and items as may be reasonably required by the Seller's title insurance company and/or Seller to consummate the transaction contemplated by this Agreement.

18. **CLOSING AND CLOSING COSTS**.

(a) Closing. The consummation of the purchase and sale of the Property which is the subject of this Agreement (the "Closing") shall be at 11:00 a.m. EST on ___________________________, 2023 (or such later date agreed to by Seller, in its sole and absolute discretion, the "Closing Date"), and shall take place at Ware Town Hall or a closing by mail, at Seller's option. All documents and funds are to be delivered in escrow subject to prompt rundown of title and recording, and such recording shall take place by 3:45 p.m. on the Closing Date, which recording shall not be unreasonably delayed beyond customary conveyancing practices. All funds shall be held in escrow by Seller's Attorney who shall release the funds to Seller only upon the recording of the Deed. It is agreed that time is of the essence of this Agreement.

(b) Closing Costs. At the Closing, (a) Seller will pay and be responsible for (i) the recording charges for any instrument which releases or discharges any monetary encumbrances or liens for which the Seller is responsible as required under this Agreement, (ii) any transfer or Deed stamp taxes, (iii) Seller's counsel's fees and expenses, and (b) Buyer will pay and be responsible for (i) all recording charges other than as are the express responsibility of Seller pursuant to the terms of this Section, (ii) all costs and fees for title examination, title insurance (if obtained) and other title company charges (if applicable), the ALTA survey of the Property (if performed) and all of Buyer's due diligence studies and investigations, and (iii) Buyer's counsel's fees and expenses. Seller and Buyer will each pay all other expenses, charges or costs for which sellers and purchasers, respectively, are customarily responsible in commercial real estate transactions in Massachusetts.

19. **EMINENT DOMAIN.** Notwithstanding anything herein to the contrary, in the event that all or a substantial part of the Property is taken by eminent domain by an entity other than Seller, Seller or Buyer may each, at its option, terminate this Agreement. "Substantial Part" is defined herein as that portion of the Property that would materially and adversely prevent Buyer from undertaking the Project and/or using the Property for the Permitted Use.

20. **EXTENSIONS**. Buyer and Seller hereby authorize their respective attorneys (as the case may be) to execute on their behalf any extensions to the time for performance and any change of location and/or time for delivery of the Deed. Buyer and Seller shall be able to rely upon the signature of said attorneys as binding unless they have actual knowledge before the execution or other consent to such extensions, that either party has disclaimed the authority granted herein to bind them. For purposes of this Agreement, facsimile signatures shall be construed as original.

21. **MISCELLANEOUS**.

(a) Assignment. Buyer shall not assign this Agreement or any of its rights hereunder without prior written consent of Seller, which may be withheld in Seller's sole and absolute discretion.

(b) Brokers' Commissions. Seller and Buyer each hereby represent and warrant to each other that it has not dealt with or engaged any broker or finder in respect to the transaction contemplated hereby. Seller and Buyer each hereby indemnify, protect and defend and hold the other harmless from and against all losses, claims, damages, awards, costs and expenses resulting from the claims of any broker, finder, or other such party claiming by, through or under the acts or agreements of the indemnifying party. The provisions of this paragraph shall survive the Closing.

(c) Waiver; Consent. Either party may specifically and expressly waive in writing any portion of this Agreement or any breach thereof, but no such waiver shall constitute a further or continuing waiver of any preceding or succeeding breach of the same or any other provision. The consent by one party to any act by the other party for which consent was required shall not be deemed to imply consent or waiver of the necessity of obtaining such consent for the same or any similar acts in the future. No waiver or consent shall be implied from silence or any failure of a party to act, except as otherwise specified in this Agreement.

(d) Notices. Any notice required or permitted to be given under this Agreement shall be in writing and signed by the party or the party's attorney or agent and shall be deemed properly given upon the earlier of: (1) two (2) business days after deposit with the United States Postal Service, if sent by registered or certified mail, return receipt requested, postage prepaid; (ii) one (1) business day after deposit with an express courier service such as Federal Express; (iii) actual receipt, or (iv) electronic transmission, addressed to the parties as set forth in Section 1, with a copy to the party's attorney. A party may change its address for receipt of notices by service of a notice of such change in accordance herewith.

(e) Entire Agreement. This Agreement and its exhibits constitute the entire agreement between the parties hereto pertaining to the subject matter hereof, and the final, complete and exclusive expression of the terms and conditions thereof. All prior agreements, representations, negotiations and understandings of the parties hereto, oral or written express or implied, are hereby superseded and merged herein.

(f) Captions. The captions used herein are for convenience only and are not a part of this Agreement and do not in any way limit or amplify the terms and provisions hereof.

(g) Governing Law. This Agreement shall be governed by and construed under the laws of the Commonwealth of Massachusetts, and any and all disputes, issues and claims of any kind or nature relating to this Agreement and/or the Property shall be brought in the courts of the Commonwealth of Massachusetts.

(h) Invalidity of Provision. If any provision of this Agreement as applied to either party or to any circumstances shall be adjudged by a court of competent jurisdiction to be void or unenforceable for any reason, the same shall in no way affect (to the maximum extent permissible by law) any other provision of this Agreement, the application of any such provision under circumstances different from those adjudicated by the court, or the validity or enforceability of the Agreement as a whole.

(i) Amendments. No addition to or modification of any provision contained in this Agreement shall be effective unless fully set forth in writing executed by both Buyer and Seller.

(j) Date of Performance. All references to "days" in this Agreement shall be construed to mean calendar days unless otherwise expressly provided. If the date on which any performance required hereunder is other than a Business Day, then such performance shall be required as of the next following Business Day. The term "Business Day" shall mean a day that is other than a Saturday, Sunday or holiday in which the banks in Massachusetts are authorized to close. Unless otherwise expressly provided herein, the last day of any period of time described herein shall be deemed to end at 5:00 p.m., Eastern Standard Time.

(k) Time of Essence. Time is of the essence of every provision of this Agreement of which time is an element.

(l) Effective Date of this Agreement. The Effective Date of this Agreement shall be the last date on which fully executed Agreements or counterpart signature pages have been delivered.

(m) Counterparts; PDF Execution; Drafts not an Offer to Enter into a Legally Binding Agreement. This Agreement may be executed in multiple counterparts (which counterparts may be executed by facsimile) which shall together constitute a single document. However, this Agreement shall not be effective unless and until all counterpart signatures have been obtained. Delivery of an executed counterpart of this Agreement via electronic mail shall be equally as effective as delivery of an original executed counterpart. Any party delivering an executed counterpart of this Agreement by electronic mail also shall deliver an original executed counterpart of this Agreement, but the failure to deliver an original executed counterpart shall not affect the validity, enforceability and binding effect of this Agreement. Signature and acknowledgement pages may be detached from the counterparts and attached to a single copy of this Agreement to physically form one document.

(n) No Third-Party Beneficiaries. This Agreement is for the sole and exclusive benefit of the parties hereto and their respective permitted successors and assigns, and no third party is intended to, or shall have, any rights hereunder.

[signatures on the following page]

Signed by the parties under seal as of this _______ day of ___________________, 2023.

SELLER:

TOWN OF WARE,
By its Selectboard

____
John J. Morin, Chair

____
Caitlin M. McCarthy, Vice-Chair

____
Thomas H. Barnes, Clerk

____
Keith J. Kruckas, Member

____
Joshua A. Kusnierz, Member

BUYER:

By: ___________________________________

Name: ________________________________

Title: _________________________________

850218/WARE/0001