Town of Uxbridge, MA

DRAFT - Needs Assessment

Comprehensive Wastewater Management Planning (CWMP) Project

December 2014

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Glossary of Common Acronyms

ACEC	Areas of Critical Environmental Concern
BOD	Biological Oxygen Demand
BOH	Board of Health
BOS	Board of Selectmen
CECs	Contaminants of Emerging Concern
CEDS	Comprehensive Economic Development Strategy
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CMRPC	Central Massachusetts Regional Planning Commission
COD	Chemical Oxygen Demand
CWA	Clean Water Act
DO	Dissolved Oxygen
DPW	Department of Public Works
EEA	Executive Office of Energy and Environmental Affairs
EIR	Environmental Impact Report
ENF	Environmental Notification Form
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
gpd	Gallons Per Day
I/I	Infiltration and Inflow
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Office of Geographic Information
MCL	Maximum contaminant level
MEPA	Massachusetts Environmental Policy Act
mgd	Million gallons per day
mg/L	Milligrams per liter
MGL	Massachusetts General Law
MS4	Municipal Separate Storm Sewer Systems
NEPA	National Environmental Policy Act of 1970
NHESP	Natural Heritage and Endangered Species Program
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTNC	Non Transient Non-Community Public Water System
POTW	Publicly Owned Treatment Facility
ppm	Parts per Million
PSTF	Privately Owned Treatment Facility

TMDLs	Total maximum daily loads
TNC	Non-Community Public Water System
SDWA	Safe Drinking Water Act
SRF	State Revolving Fund
SWAP	Source Water Assessment Program
SWAP	State Wildlife Action Plan
TDS	Total dissolved solids
TMDL	Total Maximum Daily Load
TSS	Total suspended solids
UMDI	University of Massachusetts Donahue Institute
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WEF	Water Environment Federation
WPA	Wetland Protection Act
WWTF	Wastewater Treatment Facility

1. Introduction

1.1 Project Identification and Purpose

The purpose of the Comprehensive Wastewater Management Planning Project (Project) is to provide an environmentally and economically sound plan for wastewater treatment and disposal in the Town of Uxbridge, MA for the 20-year planning period from 2015 to 2035.

This Needs Assessment Report completes the first of three phases of the Project. It provides the framework and necessary background information to complete the second phase of the Project where alternatives to remedy wastewater problems will be developed and evaluated (screened) for overall feasibility. The final phase of the Project will consist of a detailed cost evaluation and environmental impact analysis of feasible alternatives, and a recommended plan of action.

This Needs Assessment Report utilizes existing information and estimations of future land use, populations, and water usage to project future wastewater flows and loadings for the year 2035. Wastewater issues and specific problem areas of the Town are identified and evaluated. Regulatory requirements and the Town's goals relating to wastewater management and growth management are incorporated into the Project.

1.2 Project Background and Issues

The Town of Uxbridge operates a wastewater treatment facility (WWTF) which was constructed in 1979. The only upgrade to the facility since its original construction has been the installation of a lime tower in 2007.

The facility was previously operated under National Pollutant Discharge Elimination System (NPDES) Permit No. MA0102440 dated September 1999. The Town was issued a new, more stringent permit in 2013 (Permit No. MA0102440). Because certain conditions within the permit cannot be met with the WWTF's existing infrastructure, the U.S. Environmental Protection Agency (USEPA) issued an Order for Compliance on Consent – Docket No. 14-003 (Consent Order) in June 2014. The Consent Order provides a schedule by which the Town is to come into compliance with the new permit and provides interim limits that must be met while the planning, design, and construction of upgraded facilities at the WWTF are underway. The recently issued permit also requires that the Town complete a CWMP and submit the final draft to USEPA in December 2015.

1.3 Project Scope

The Uxbridge CWMP Project has been divided into six phases. Given the time constraints of the Consent Order, many of the phases outlined below are being conducted concurrently. A brief listing of the tasks associated with these phases follows.

1. **Phase 1** – Develop the following Needs Assessment items:
    - Description of purpose and scope
    - Background
    - Existing conditions
    - Summary of needs

2. **Phase 2** – Develop a revised Needs Assessment Report based on comments from the Town.
3. **Phase 3** – Develop the following alternatives screening and recommended plan items:
    - Documentation of planning and evaluation criteria to be used in the CWMP
    - Flows and loads
    - Sewer service area evaluation
    - "Away from WWTF" detailed evaluation
    - Wastewater infrastructure screening and detailed evaluation
    - Recommended plan
4. **Phase 4** – Develop a revised Recommended Plan in accordance with Town comments.
5. **Phase 5** – Initiate public participation through the public review process.
6. **Phase 6** – Initiate a Massachusetts Environmental Policy Act (MEPA) review (if required).

1.4 Review Process

If the project exceeds one of the review thresholds outlined in the 301 CMR 11.00, it must enter into the MEPA process by filing an Environmental Notification Form (ENF) with the Secretary of Environmental Affairs (Secretary). At the close of the ENF review period, the Secretary determines whether an Environmental Impact Report (EIR) is necessary and issues a MEPA certificate.

1.5 Planning Period

The planning period for this Project, which is the time span over which wastewater facility needs are forecasted, is 20 years -- from 2015 through 2035. The Massachusetts Department of Environmental Protection's (MassDEP) *Guide to Comprehensive Wastewater Management Planning* (January 1996) requires a minimum planning period of 20 years.

1.6 Purpose and Organization of the Needs Assessment

The Needs Assessment Report is divided into six chapters:

Chapter 1 presents general introductory information about the Project.

Chapter 2 describes the technical documents reviewed as well as Town and regional data used in the Project.

Chapter 3 identifies the regulatory issues (local, regional, state, and federal) that must be considered during the project.

Chapter 4 describes existing environmental resources and demographics.

Chapter 5 discusses the Town's existing water and wastewater infrastructure.

Chapter 6 provides a summary of the Needs Assessment.

2. Background

2.1 Introduction

This chapter provides an overview of information used in preparing the Needs Assessment for the Town of Uxbridge. Section 2.2 provides a brief summary of previous facilities plans, Town planning documents, and regional planning documents used in preparing the Needs Assessment. A list of maps related to this project is included in Section 2.3. Section 2.4 describes how these documents are used in this Project.

2.2 Technical Reports and Data

Available wastewater planning documents, sewer and collection system studies, and regional planning documents were reviewed for the Needs Assessment. Each is summarized below.

2.2.1 Uxbridge Town Planning Documents

Master Plan

While the Town does not have a formal Master Planning document, it has engaged in several planning studies which are described in further detail in subsequent sections.

Uxbridge Wastewater Planning Documents

In 1938, a report was compiled for the collection and treatment of domestic sewage in the Town of Uxbridge. The report was reviewed and updated as part of the *"General Sewage System and Waste Treatment Plant"* report which was completed by Haley and Ward Inc. in March 1969 and revised in June 1972. A 1975 Supplement was appended to incorporate regulations established by the USEPA after 1972. The 1969 report and 1975 supplement outline a basis of design for the Uxbridge WWTF and the original collection system.

Following construction, Haley and Ward Inc. issued the following record drawings:

- Contract No. 1 for constructing the Uxbridge WWTF and pumping stations dated 1976
- Sewer record drawings dated January 1979.

An operations and maintenance manual for the facility was compiled by York Wastewater Consultants Inc. in 1982.

New Connections, Better Connected – A Vision For Downtown Uxbridge

"New Connections, Better Connected – A Vision for Downtown Uxbridge" is a report that was prepared for the Town of Uxbridge by the Cecil Group through a partnership with MassDevelopment in April 2008. The report outlined an economic strategy to link a redeveloped Bernat Mill area and the redefined boundaries of downtown Uxbridge by a shared geography to increase the economic potential of both areas.

The Bernat Mill is a former manufacturing facility that was redeveloped as a commercial site for over 60 businesses. The site was destroyed by a fire in 2007. Recommendations from the report include improved street-scaping, improvements to several bridges linking the two sites, trail markers, a new road, and facade improvements.

2.2.2 Uxbridge Sewer and Collection System Studies

2005 infiltration and Inflow Study

An infiltration/inflow (I/I) analysis of the collection system was completed by Beta Group Inc. in 2005. Beta Group used a combination of flow metering, rainfall gauging, and groundwater measurement to estimate the rates of I/I entering the WWTF. Results of the study will be discussed further in Chapter 5.

2.2.3 Regional Planning Documents

Greater Worcester Area Comprehensive Economic Development Strategy

The 2012 Greater Worcester Area Comprehensive Economic Development Strategy (CEDS) was produced by the Central Massachusetts Regional Planning Commission (CMRPC) to address economic opportunities and constraints within the Greater Worcester Region. The Greater Worcester Region is made up of the City of Worcester and 39 surrounding communities in Southern Worcester County, including Uxbridge. The report identified priority projects for each of the 40 towns. The following active or proposed economic development projects were identified in the Town of Uxbridge:

1. **Route 16/Route 146 Site** – This site consists of approximately 500,000 square feet of land zoned for retail for which the Town has received funding under Massachusetts General Law (MGL) Chapter 43D. At the writing of the CEDS, the property was being marketed to mid-range retailers.
2. **Bernat Mill/Downtown Uxbridge** – A property that formerly housed more than 60 small commercial businesses and was destroyed by fire in 2007.
3. **Stanley Woolen Mill redevelopment** – A 100,000 square foot space planned to be used for visitor-oriented retail.
4. **The Mill at West River Pond (Waucantuck Mill)** – A brownfield site for which a developer has received a special permit to construct 140 residential units.

Blackstone Prioritization Project

The 2012 Blackstone Prioritization Project Report (Report) was developed by the CMRPC to establish community-based priorities for the 11 communities within the Blackstone Valley Region, including Uxbridge. The project focused on developing priorities for regional development and preservation strategies. In the Blackstone Project, the Town of Uxbridge is classified as a "developing suburb." The Report describes developing suburbs as "…communities that have experienced high rates of growth over the past decade, primarily through large lot single-family homes. They also tend to have large amounts of undeveloped and unprotected land that could be used for development. Some of these suburbs have strong mixed-use town centers, while others have town centers with historical and civic significance but little commercial or neighborhood value. However, overall they have fairly low density development and the extent of economic development varies but is generally quite limited."

The Report also lists Uxbridge in the sub-category of "country suburbs," described as "...very low density, country/rural character, and has room to grow. These communities typically do not have a significant town center and no compact neighborhoods. There is typically a large amount of vacant

developable land. New growth is mostly made up of conventional sub-division development on vacant land and population and household growth is rapid."

Two different growth approaches for a community are described in the report: a distributed growth approach and a regional priorities growth approach.

The **distributed growth approach** is described as a "business as usual" scenario in which new growth is scattered throughout developed and undeveloped areas without focus on specific priority areas. The report concludes that the distributed growth approach is unsustainable for the Blackstone Valley, largely because requests for infrastructure funding, roadway expansions to serve these areas, new wastewater infrastructure, and other necessary upgrades will outpace available resources. It was also noted that scattered growth will result in increased traffic volumes as residential properties are dispersed farther from Town centers.

The **regional priorities growth approach** looks at developing a strategy that focuses on the "compact nature and heritage of the valley" and promotes growth in focused and strategic areas. The following benefits of this approach are listed in the report:

- "Supports existing employment centers by prioritizing growth where jobs already exist.
- Leverages and protects previous infrastructure investments by utilizing systems and focusing limited resources on their integrity.
- Reduces the need for new infrastructure extensions through the reduction of sprawl policies.
- Increases potential for transit through higher employment and housing densities in these defined areas.
- Capitalizes on multi-municipal areas by providing opportunity where otherwise fragmented approaches would make development more challenging.
- Ensures an efficient use of resources on redevelopment and infill, thereby preserving the natural, historical, cultural and heritage landscapes that embody the identity of the Blackstone Valley."

Since the distributed growth approach was determined to be unsustainable, the regional priorities growth approach was assumed to apply to future growth in Uxbridge. This will be reviewed in further detail in Phase 2 of the Project.

2.3 Mapping

Many of the maps reviewed as part of this Project were developed by the Office of Geographic Information (MassGIS). MassGIS is an official state agency assigned to collect, store, and disseminate geographic data. Maps reviewed include:

- Sustainable Water Management Initiative interactive GIS map
- MassGIS Soil Map
- MassGIS Geology Map
- MassGIS Title 5 Buffer Map
- MassGIS Water Resources Map
- MassGIS Habitat Map

- United States Department of Agriculture (USDA) General Soil Map dated 1994

2.4 Discussion of How Documents Are Used in the Project

Wastewater planning documents were reviewed to determine the design intent of the Town's existing infrastructure. Sewer and collection system documents were reviewed to assess existing infrastructure. Regional planning documents were reviewed to ensure that water and wastewater projections for the Town of Uxbridge were consistent with regional water resource management projects.

3. Regulatory Issues

3.1 Introduction

This chapter presents the environmental regulations affecting wastewater treatment facilities in the Town of Uxbridge. Federal, state, regional and town governments have enacted environmental regulations and guidance documents which relate to the collection, treatment and discharge of wastewater. The federal regulations are contained in the Code of Federal Regulations (CFR) and are enforced by the USEPA. The Massachusetts regulations are contained in the Code of Massachusetts Regulations (CMR) and are enforced by MassDEP. The Town of Uxbridge has adopted Town Bylaws to protect the citizens of Uxbridge. These regulations, bylaws, and guidance documents are intended to protect public health and the natural environment, and are briefly reviewed in this chapter.

The following is a brief summary of some of the regulations and guidance documents that are most applicable for this project. This is not intended to be a comprehensive list of all laws involved in the various regulations. For details on any of the requirements, refer to the actual law or regulation.

3.2 Federal Regulatory Issues

3.2.1 National Environmental Policy Act of 1970

The National Environmental Policy Act of 1970 (NEPA) provides the basis for the protection of the environment in the United States. This act ensures that environmental information is provided to the public for use in the decision making process for projects which might affect the environment. According to the regulations, the "…NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences and take actions that protect, restore and enhance the environment". This policy has been established to eliminate redundancy and combine NEPA requirements with other concerned agencies' requirements. The NEPA process is the forerunner of similar environmental review processes adopted by state and regional agencies; it allows for the assessment and identification of alternatives for projects concerning the environment. The Town of Uxbridge is not expected to enter into the NEPA process as the CWMP Project is regulated by MEPA.

3.2.2 Stormwater Discharges

Stormwater discharges within the Town of Uxbridge are regulated by the USEPA under the NPDES Phase II Stormwater Permit Program. The Town was issued a General Permit for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) by USEPA in May 2003. This permit regulates stormwater management activities for Phase II MS4s in Massachusetts and New Hampshire.

3.3 State Regulatory Issues

3.3.1 On-Site Treatment and Discharge

Title 5 of the Massachusetts State Environmental Code provides minimum standards for the "….protection of public health, safety, welfare and the environment by requiring the proper siting, construction, upgrade, and maintenance of on-site sewage disposal systems and appropriate

means for the transport and disposal of septage". The regulations contained in 310 CMR 15.00 come under the jurisdiction of MassDEP and are enforced in conjunction with the local health department through permits, inspections, and financial penalties.

As defined by the regulations, an individual sewage disposal system is "…a system or series of systems for the treatment and disposal of sanitary sewage below the ground surface." Systems typically consist of a septic tank, distribution box, and a soil absorption system. These systems may also contain a tight tank, shared system, or alternative system. The design considerations for Title 5 systems include minimum setbacks, minimum separation from groundwater, sizing guidance, and soil requirements.

The following is a list of design considerations for Title 5 systems as described by 310 CMR 15.000:

- No new system shall be constructed, upgraded, or expanded if access to a local sewer system is available and feasible, except in the case of alternative systems which can demonstrate the ability to provide the same or greater treatment level of the sewer or by variance [15.004(3)].
- System design flows shall be based upon design flow criteria listed in 310 CMR 15.203. Actual water meter data shall not be substituted for the design flow criteria except in the case of school or university systems (15.203).
- Setbacks for septic tanks and soil absorption systems are laid out in 310 CMR 15.211.
- Four feet of vertical separation is required between the bottom of the soil absorption system and the groundwater for percolation rates more than 2 minutes per inch, and 5 feet of separation for percolation rates of 2 minutes per inch or less (15.212).
- Soil absorption systems must be located in areas where there is 4 feet of naturally occurring materials above the groundwater, and which contain no impervious layer occurring within the 4 feet unless a variance is obtained (15.240).
- Use of garbage grinders requires an additional 50 percent in leaching area [15.240(4)].
- Effluent loading rates are dependent on soil class and percolation rates (15.242).
- Absorption trenches are the preferred method of effluent disposal and should be used whenever possible (15.240(6)).
- Title V does not allow for any variances to the requirement of 4 feet of naturally occurring material for new construction. For repairs and upgrades to existing systems, a variance may be allowed providing the owner demonstrates that re-siting the system or connecting to a sewer are not feasible alternatives (15.415(1)).

The regulations are generally enforced by local health departments. The local Board of Health, due to specific problems or concerns, can and may impose more stringent requirements. Individuals and/or communities can receive a variance from the regulations; however, it must be in accordance with 310 CMR 15.00.

3.3.2 Privately-Owned Sewage Treatment Facilities and Publicly-Owned Treatment Works

Privately-owned sewage treatment facilities (PSTFs) are the private version of publically-owned treatment works (POTWs). POTWs are defined in 314 CMR 12.02 as "….any device or system used

in treatment (including recycling and reclamation) of municipal sewage or industrial waste of a liquid nature which is owned by a public entity. A POTW can include any sewers, pipes, or other conveyances if they convey wastewater to a POTW providing treatment." In Massachusetts, there are detailed requirements at the state level on the siting and operation of PSTFs.

Current MassDEP regulations require the use of a PSTF or POTW for any residential or commercial discharge greater than 10,000 gallons per day (gpd). MassDEP reviews the performance of these facilities under its Groundwater Discharge Permit Program (314 CMR 5.00). The Town of Uxbridge's WWTF is a POTW.

3.3.3 Groundwater Discharge Permitting

The Massachusetts Groundwater Discharge Permit Program is contained in 314 CMR 5.00 and governs wastewater discharges of 10,000 gpd (design flow) or greater. The groundwater discharge regulations cover several types of discharges to groundwater, including through infiltration beds, percolation fields, lagoons, or injection wells. Application for a discharge permit requires a hydrogeologic evaluation as well as an engineered design for the treatment and discharge facility.

3.3.4 Surface Water Discharge Permitting

The Massachusetts Surface Water Discharge Permit Program, described in 314 CMR 3.00, regulates all discharges of pollutants to surface waters located in Massachusetts. These include point sources for public and privately owned treatment works and stormwater discharges.

The Town of Uxbridge was previously governed by NPDES Permit No. MA0102440 dated September 1999, which expired in 2004. The Town was issued a new NPDES permit in June 2013 (Permit No. MA01202440). Because the Town would not be able to meet certain conditions of the permit with its existing infrastructure, the USEPA issued an Order for Compliance on Consent (Consent Order) in June 2014 which provides a schedule by which the Town is to come into compliance with the new permit, and provides interim limits that must be met while the planning, design, and construction of upgraded facilities at the WWTF are underway. The recently issued permit also requires that the Town complete a CWMP and submit the final draft to USEPA in December 2015.

3.3.5 Surface Water Quality Standards

The Massachusetts Surface Water Quality Standards define activities that are prohibited in various class-designated surface water bodies. An additional summary of water quality is provided in the Integrated List of Waters, also known as the 303(d) List. The classification of waters within the planning area is discussed in Chapter 4.

3.3.6 Wetlands Protection

The Wetland Protection Act (WPA) (MGL Ch. 131, S. 40) and parallel state regulations (310 CMR 10.00) were enacted to safeguard wetlands, associated resource areas, and floodplains from overdevelopment. The WPA covers any wet area where the groundwater level is at or near the surface of the ground for a long enough period during the year to support a community of wetland-type vegetation. Wet areas may include salt or freshwater marshes, meadow, swamp, or bog. Areas subject to protection under the WPA include banks, dunes, beaches and flats. All of these protected areas are referred to as resource areas. Resource areas are protected by a surrounding 100-foot buffer zone in which landscape alterations are regulated.

The WPA also covers construction on land subject to flooding and coastal storm flowage. Generally, the regulations apply to two types of floodplain: those lands bordering directly on bodies of water, and those lands subject to flooding (called “Isolated Land Subject to Flooding”) which do not border bodies of water.

The state regulates activities that involve filling, dredging, or excavating in or near a wetland or water body. The regulations govern additional construction activities, including site preparation, removal of trees or bushes, vista pruning, and changing of land contours.

A Notice of Intent must be filed for work in any resource area. This Notice requires a detailed description of the planned activity, and the applicant must show that if the resource area will be altered, the benefits will outweigh the damage. For work outside the resource areas but within a 100-foot buffer zone around a bordering vegetated wetland, bank, dune, or beach, the owner has the option of filing a “Request for Determination” to show the work will not alter a resource area. If the Conservation Commission agrees, it will issue a Negative Determination, permitting the work as presented. If the Conservation Commission decides that the work will alter a resource area, it will issue a Positive Determination and require a full hearing and the filing of a Notice of Intent.

3.3.7 Massachusetts Rivers Protection Act

This law is an amendment to the WPA and establishes a Riverfront Area, which is included in the resource areas protected by the WPA. The law authorizes conservation commissioners to regulate activities that occur within a Riverfront Area and establishes protection of the natural integrity of rivers as a state priority.

Permits for work in Riverfront Areas will be denied if a significant adverse impact would result or if there is a “practicable and substantially equivalent economic alternative” that will have less impact on the resource area. Certain activities are exempt from the Rivers Protection Act, including renovation of abandoned cranberry bogs and activities associated with wastewater treatment plants and their related structures, conveyance systems, and facilities.

3.3.8 Toxic/Incompatible Discharges to Wastewater Collection Systems

In the early 1980s, USEPA established nationwide industrial pretreatment standards contained in 40 CFR 403, General Pretreatment Regulations, to regulate the discharge of industrial pollutants to POTWs. The general goals of this program are to limit those toxic/incompatible discharges, which could:

- pass through a plant inadequately treated
- harm a plant’s treatment processes, thereby preventing the plant from complying with its permit
- accumulate in the plant’s sludge in concentrations which would limit sludge disposal options
- cause a risk to the health and safety of treatment plant works or the general public

When these regulations were established, all communities with POTW flows greater than 5 million gallons per day (mgd) were required to establish local industrial pretreatment programs. Because flow at the Town of Uxbridge’s WWTF is less than 5 mgd, no pretreatment program was required at the time.

Massachusetts pretreatment regulations (314 CMR 12.00) parallel the federal regulations. Paragraph 12.09.2 of the Massachusetts regulation states that a POTW with a design flow of 5 mgd or less may be required to establish a pretreatment program in order to meet the goals listed above.

3.3.9 Regulations for the Land Application of Sludge and Septage

The land application of sludge and septage is regulated by MassDEP in 310 CMR 32 and by USEPA in 40 CFR Part 503. The state regulations are more stringent.

Under the MassDEP regulations, sludge and septage are classified as Type I, II, or III depending on chemical, pathogen, organic content, and sludge stabilization processes used. The classification determines how the material can ultimately be used or disposed of. Type I material can be used on any site and requires no further MassDEP regulations, while Type II and III materials require additional regulation on their ultimate use, the application site, and allowable application rates.

3.3.10 Water Resources, Treatment, and Supply of Potable Water

The Safe Drinking Water Act (SDWA) of 1974 is federal legislation which dictates the regulation of potable water in the United States. The law was amended in 1986 and 1996. States can apply to USEPA for "primacy" which gives the state the authority to implement the SDWA within its jurisdiction. The state needs to show they will adopt standards at least as stringent as the federal standards and ascertain that water systems within the state meet these standards. Massachusetts is a primacy state. Regulations contained in 310 CMR 21.00 closely parallel the federal regulations and establish the maximum contaminant level (MCL) of the regulated contaminants in drinking water.

The SDWA provides guidelines on the establishment of wellhead protection programs, which Massachusetts has established in Section 310 CMR 22.21. The program delineates three zones around each public water supply. The Zone I delineation is the area immediately around the well or wellfield which must be owned by, or in control of, the water purveyor. The Zone II delineation is the area of an aquifer which contributes water to a well under the "…most severe pumping and recharge conditions that can be realistically anticipated." The regulations define these conditions as 180 days of pumping at safe yield with no recharge from precipitation. Zone II is bounded by the groundwater divide and by the contact of the aquifer with less permeable material. The Zone III delineation is the area beyond Zone II from which surface water and groundwater drain into a Zone II.

The allowed land use within each zone is regulated by the wellhead protection program. Land use activities within Zone I areas must be related to the water supply or have no significant adverse impact on water quality. The following land uses are prohibited from being sited in a Zone II area:

- landfills or open dumps
- landfilling of sludge or septage
- automobile graveyards and junkyards
- stockpiling of contaminated snow or ice
- individual sewage disposal systems designed to receive more than 110 gallons of sewage per quarter acre under ownership every day
- wastewater treatment plants that are required to obtain groundwater discharge permits

- facilities that generate, treat, store, or dispose of hazardous materials

There are exceptions to the prohibition of wastewater treatment plants listed above. These exceptions are reviewed by MassDEP on a case-by-case basis.

The Town of Uxbridge has a Groundwater Protection Overlay District in its zoning bylaws, in order to protect the Town's groundwater resources from contamination.

3.3.11 MEPA Environmental Review

The MEPA environmental review process is governed by MEPA. In general, the MEPA process, as described in 301 CMR 11.00, establishes thresholds, procedures, and timetables for a multi-level review process. If a project exceeds review thresholds, the project proponent begins the review process by preparing and filing an ENF with the Secretary of Environmental Affairs. A 30-day review period follows, during which the Secretary receives agency and public comments and holds a site visit and consultation session. At the close of the ENF review period, the Secretary determines whether an EIR is necessary and issues a MEPA certificate. If an EIR is required, it is prepared by the proponent and submitted to the Secretary. The EIR is reviewed at both draft and final stages by agencies and the public. After completion of the Secretary's review, state agencies may act on the project.

3.4 Regional Regulatory Design Guidance for Wastewater Facilities

3.4.1 TR-16 Guides for the Design of Wastewater Treatment Works; New England Interstate Water Pollution Control Commission, 2011 Edition

TR-16 is a New England design standard comprised of industry standard documents such as NFPA 820 and Water Environment Federation (WEF) Manual of Practice textbooks. The document provides guidance on collection system and treatment plant design and is used by MassDEP in its approval process for new and modified wastewater infrastructure.

3.5 Town of Uxbridge Regulations and Bylaws

3.5.1 Town of Uxbridge General Bylaws (Chapter 289)

These regulations identify the use requirements and restrictions of the Town's sewers, construction requirements, discharge controls, and other miscellaneous provisions. The bylaw includes building sewers and connections, use of public sewers, right of entry, violations and penalties, and prohibited discharges.

3.6 Joint Federal/State Regulatory Efforts

3.6.1 Total Maximum Daily Loads (TMDLs)

The Federal Clean Water Act (CWA) requires states to develop a list of impaired waters, which are waters that are unable to meet state-established water quality standards for their intended use (i.e., drinking water supply, fishing, recreational swimming and boating, or healthy ecosystems for plants and animals). States are then required to develop TMDLs for the impaired waters affected by the pollutants. A TMDL is a determination of the maximum amount of pollutants a body of water can withstand.

In 1998, the USEPA required all states to submit strategies for completing TMDLs within 8 to 13 years. Massachusetts submitted a two-stage strategy. The first stage would make use of existing studies and information by working to implement corrective actions where feasible; develop a pilot program to define data collection needs and procedures to be used for TMDL development; and develop and standardize TMDL determination methods for pollutants that did not have well-established protocols. The second stage will focus on developing the TMDLs, beginning with those pollutants with well-established determination methods.

Once TMDLs are determined, MassDEP develops a draft TMDL report, followed by a public review and comment period. After addressing public comments, MassDEP submits the TMDL report to USEPA for formal approval. The TMDL development process requires that communities develop plans to restore the health of water bodies and then make progress towards implementation of the plans. MassDEP monitors the progress of communities in achieving TMDLs. Restoration of water bodies is an extended process, so MassDEP looks for reasonable progress; if no reasonable progress is being made, enforcement actions may be taken.

The CWA requires states to monitor the quality of their water resources to determine if the water meets the standards for intended uses. This information is reported to the USEPA in the Integrated List of Waters. Category 5 of the Integrated List itemizes water bodies that are “impaired or threatened for one of more uses and requiring a TMDL.” Therefore, this list becomes the basis for determining the water bodies for which TMDLs will be established.

The water bodies within the planning area that are listed in the Integrated List as Category 5 waters include the Blackstone River, Cedar Swamp Brook, Mumford River, and West River. Water bodies within the Town of Uxbridge will be discussed in further detail in Chapter 4.

4. Existing Environmental Resources and Demographics

4.1 Introduction

This chapter provides a summary of the Town of Uxbridge's existing conditions, environmental resources, land use, zoning, and demographics. The Town's environmental resources are defined by the Town's topography, geology and soils, groundwater, surface waters, coastal embayments, wetlands, floodplains, forests, and protected natural areas. Each of these existing conditions has been identified through review of existing documents and records, interviews, and site evaluations by the project team.

4.2 Location

4.2.1 Location and Neighboring Towns

The Town of Uxbridge is located in the Blackstone River Valley and has a total land area of 30 square miles. Route 146 bisects the Town and links the community to two major population centers: Worcester, Massachusetts and Providence, Rhode Island. The Town is 16 miles south of Worcester and 20 miles northwest of Providence. Located in Worcester County, Uxbridge is bordered by the Massachusetts towns of Douglas, Mendon, Millville, Northbridge, and Sutton; and the Rhode Island towns of Burrillville and North Smithfield.

4.2.2 Climate

The Town of Uxbridge has a continental climate characterized by an annual variation in temperature. The Town receives approximately 47 inches of precipitation annually which is typically well distributed throughout the year. The highest recorded temperature in Uxbridge was 104°F in July 1975 and the lowest was -25°F in January 1957.

4.2.3 History of the Area

Uxbridge, MA was incorporated in 1727. After the first successful water-powered textile mill in America was constructed on the Blackstone River in Pawtucket, Rhode Island, industrial mills were soon built in Uxbridge. At its peak, the Town was home to 20 working mills. Textile mills in Uxbridge produced the first U.S. Air Force dress uniform, which was nicknamed "Uxbridge Blues."

The Blackstone River, which runs through Uxbridge, has been called the "Birthplace of America's Industrial Revolution" due to the prevalence of water-powered mills along its banks. The river was also referred to as "America's hardest working river" and was severely impacted by untreated sewage, industrial wastes, and numerous dams and canals which impeded the flow of its water. A 1990 USEPA report described the Blackstone as the "most polluted river in the country with respect to toxic sediments."

4.2.4 Applicable Survey Datum

The survey datum listed on the 1976 Uxbridge WWTF record drawings is listed only as USGS base. The datum used in the drawings is likely the National Geodetic Vertical Datum of 1929 (NGVD of 1929); however, this will need to be verified during design.

4.3 Natural Resources

4.3.1 Topography

The State of Massachusetts is divided by the United States Geological Survey (USGS) into six federally designated drainage basins. Uxbridge is part of the coastal Blackstone River Basin which drains into the Atlantic Ocean. The basins are further subdivided into 27 river basins which are used for water resources planning. The topography in the Town is hilly with elevations ranging from 200 to 577 feet above sea level.

4.3.2 Geology/Soils

The Town of Uxbridge is located in the New England Uplands Region of the New England Physiographic Provence. Figure 4-1 shows the distribution of soils within the Town. The 1999 Worcester County, Southern Part soil survey, issued by the USDA classifies soils into map units according to the taxonomic classification of the dominant soil or soils. The USDA survey lists the following four major soil types in Uxbridge:

1. **Paxton-Woodbridge-Ridgebury.** Typically 45% Paxton soils, 15% Woodbridge soils, 7% Ridgebury soils, and 33% soils of minor extent. The soil unit consists of nearly level to steep, very deep, well-drained to poorly drained soils on glaciated uplands. These soils are located primarily in the northwestern corner of Uxbridge. Paxton soils are considered very deep to bedrock, typically more than 1.5 meters. The seasonal high water table of Paxton soils is typically 1.5 to 2.5 feet below the surface.
2. **Canton-Montauk-Scituate.** Typically 42% Canton soils, 15% Montauk soils, 14% Scituate soils, and 29% soils of minor extent. The soil unit consists of nearly level to steep, very deep, well-drained soils on glaciated uplands. Canton-Montauk-Scituate soils are found throughout the Town of Uxbridge.
3. **Merrimac-Hinckley-Windsor.** Typically 32% Merrimac soils, 25% Hinckley soils, 7% Windsor soils, and 36% soils of minor extent. The soil unit consists of nearly level to steep, very deep, excessively drained and somewhat excessively drained soils on outwash plains. Merrimac-Hinckley-Windsor soils are found throughout the Town of Uxbridge.
4. **Freetown-Swansea-Saco.** Typically 55% Freetown soils, 25% Swansea soils, 4% Saco soils, and 16% soils of minor extent. The soil group consists of nearly level, very deep, very poorly drained soils on uplands, outwash plains, and floodplains. These soils are often found in depressions adjacent to rivers and in old glacial lake beds. In Uxbridge, they run along the riverbed of the Blackstone River. The seasonal high water table of Freetown soils is within 12 inches of the surface.

Undesirable soils for on-site wastewater treatment systems are typically characterized as having steep slopes, outcrops, susceptibility to flooding, high shrink-swell potential, seasonal high groundwater, and are poor draining. Low permeability soils may not percolate fast enough to allow an on-site system to be sited.

Discussions with the Town's Board of Health Engineer indicated no known areas where septic system failures are caused by undesirable soils. It was noted that the northwest portion of the Town typically has "tighter" soils and that larger land areas are required to accommodate a Title V system

on these properties. However, the majority of properties in this portion of Town are large and there have been no noted problems with existing septic systems in the area.

4.3.3 Groundwater

Most of the aquifers in the Blackstone River Basin were formed by sand and gravel deposited by streams from the melting continental glacier. The Town of Uxbridge obtains its public drinking water from seven gravel packed wells within the Town. The seven wells are community water systems. A community system is defined in 310 CMR 22 as a public water system (PWS) that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year round residents for at least 60 days of the year.

The Town's Zone I and Zone II protection areas are shown in Figure 4-2[1]. A Zone I area is a protective radius around a public water supply well or wellhead. The protective radius is determined by the well's approved yield. A Zone II area is defined as the area of land that may contribute to a drinking water supply well after 180 days of pumping with no precipitation.

Four transient non-community (TNC) public water systems and three non-transient non-community (NTNC) public water systems are also located within the Town of Uxbridge. TNC's are defined in 310 CMR 22 as a public water system that is not a community water system and either:

- Has at least 15 service connections or
- Serves water to 25 different people at least 60 days of the year.

Examples of TNC's include restaurants, motels, camp grounds, parks, golf courses and community centers.

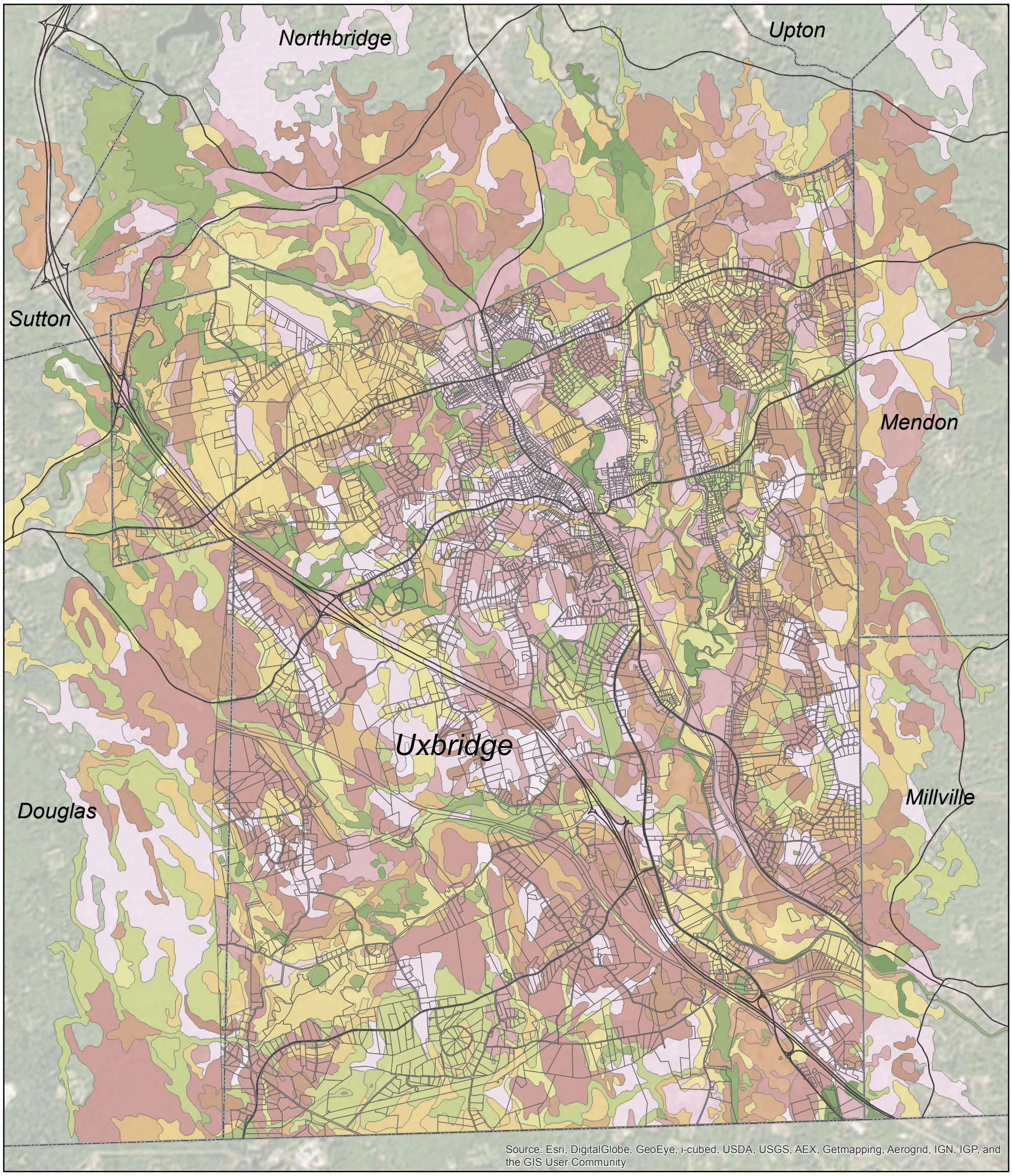
A NTNC is defined as a public water system that is not a community water system and:

- Has at least 15 service connections or
- Regularly serves at least 25 of the same persons or more approximately four or more hours per day, four or more days per week, more than six months or 180 days per year.

An example of a NTNC is a workplace providing water to its employees.

As part of the SDWA, every state is required to create a Source Water Assessment Program for all of their public drinking water systems. The Zone II within Uxbridge is described in the 2002 MassDEP Uxbridge Source Water Assessment and Protection (SWAP) Report as a mixture of forest, residential, commercial, and light industrial uses. The SWAP Report also noted that the wells are located in an aquifer with a high vulnerability to contamination due to the absence of hydrogeological barriers (i.e., clay) to prevent contaminant migration. As shown in Figure 4-3, the majority of the Zone 1 protection areas are on Town property. Water quality data from the public water systems in Uxbridge is discussed in Chapter 6.

[1] The Spaghetti Shed shown in Figure 4-2 is closed and no longer an active PWS. The Little Texas Restaurant has been renamed the Quaker Tavern.



Legend

Uxbridge Soils

Soil Name

- Canton fine sandy loam, 15 to 25 percent slopes
- Canton fine sandy loam, 3 to 8 percent slopes
- Canton fine sandy loam, 3 to 8 percent slopes, extremely stony
- Canton fine sandy loam, 8 to 15 percent slopes
- Canton fine sandy loam, 8 to 15 percent slopes, extremely stony
- Canton fine sandy loam,15 to 35 percent slopes, extremely stony
- Charlton fine sandy loam, 15 to 35 percent slopes, extremely stony
- Charlton fine sandy loam, 3 to 8 percent slopes
- Charlton fine sandy loam, 3 to 8 percent slopes, extremely stony
- Charlton fine sandy loam, 8 to 15 percent slopes
- Charlton fine sandy loam, 8 to 15 percent slopes, extremely stony
- Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes
- Chatfield-Hollis-Rock outcrop complex, 3 to 15 percent slopes
- Freetown muck, 0 to 1 percent slopes
- Freetown muck, ponded, 0 to 1 percent slopes
- Hinckley sandy loam, 0 to 3 percent slopes
- Hinckley sandy loam, 15 to 35 percent slopes
- Hinckley sandy loam, 3 to 8 percent slopes
- Hinckley sandy loam, 8 to 15 percent slopes
- Hinckley-Urban land complex, 0 to 15 percent slopes
- Merrimac fine sandy loam 15 to 35 percent slopes
- Merrimac fine sandy loam, 0 to 3 percent slopes
- Merrimac fine sandy loam, 3 to 8 percent slopes
- Merrimac fine sandy loam, 8 to 15 percent slopes
- Montauk fine sandy loam, 15 to 35 percent slopes, extremely stony
- Montauk fine sandy loam, 3 to 8 percent slopes
- Montauk fine sandy loam, 3 to 8 percent slopes, extremely stony
- Montauk fine sandy loam, 8 to 15 percent slopes
- Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony
- Paxton fine sandy loam, 15 to 35 percent slopes, extremely stony
- Paxton fine sandy loam, 3 to 8 percent slopes
- Paxton fine sandy loam, 3 to 8 percent slopes, extremely stony
- Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony
- Pits, gravel
- Pootatuck fine sandy loam, 0 to 3 percent slopes
- Ridgebury fine sandy loam, 0 to 3 percent slopes
- Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony
- Ridgebury fine sandy loam, 3 to 8 percent slopes
- Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony
- Rippowam fine sandy loam, 0 to 3 percent slopes
- Saco mucky very fine sandy loam, 0 to 3 percent slopes
- Scarboro and Walpole soils, 0 to 3 percent slopes
- Scituate fine sandy loam, 0 to 3 percent slopes
- Scituate fine sandy loam, 3 to 8 percent slopes
- Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony
- Sudbury fine sandy loam, 0 to 3 percent slopes
- Sudbury fine sandy loam,3 to 8 percent slopes
- Swansea muck, 0 to 1 percent slopes
- Udorthents, smoothed
- Water
- Whitman sandy loam, 0 to 3 percent slopes
- Whitman sandy loam, 0 to 3 percent slopes, extremely stony
- Windsor loamy fine sand, 0 to 3 percent slopes
- Windsor loamy fine sand, 15 to 25 percent slopes
- Windsor loamy fine sand, 3 to 8 percent slopes
- Windsor loamy fine sand, 8 to 15 percent slopes
- Woodbridge fine sandy loam, 0 to 3 percent slopes
- Woodbridge fine sandy loam, 3 to 8 percent slopes
- Woodbridge fine sandy loam, 3 to 8 percent slopes, extremely stony

Paper Size ANSI B

0 2,700 5,400 10,800 Feet

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

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Town of Uxbridge, MA
Comprehensive Wastewater Management Plan

Job Number 86-14914
Revision A
Date 31 Oct 2014

SOILS MAP

Figure 4-1

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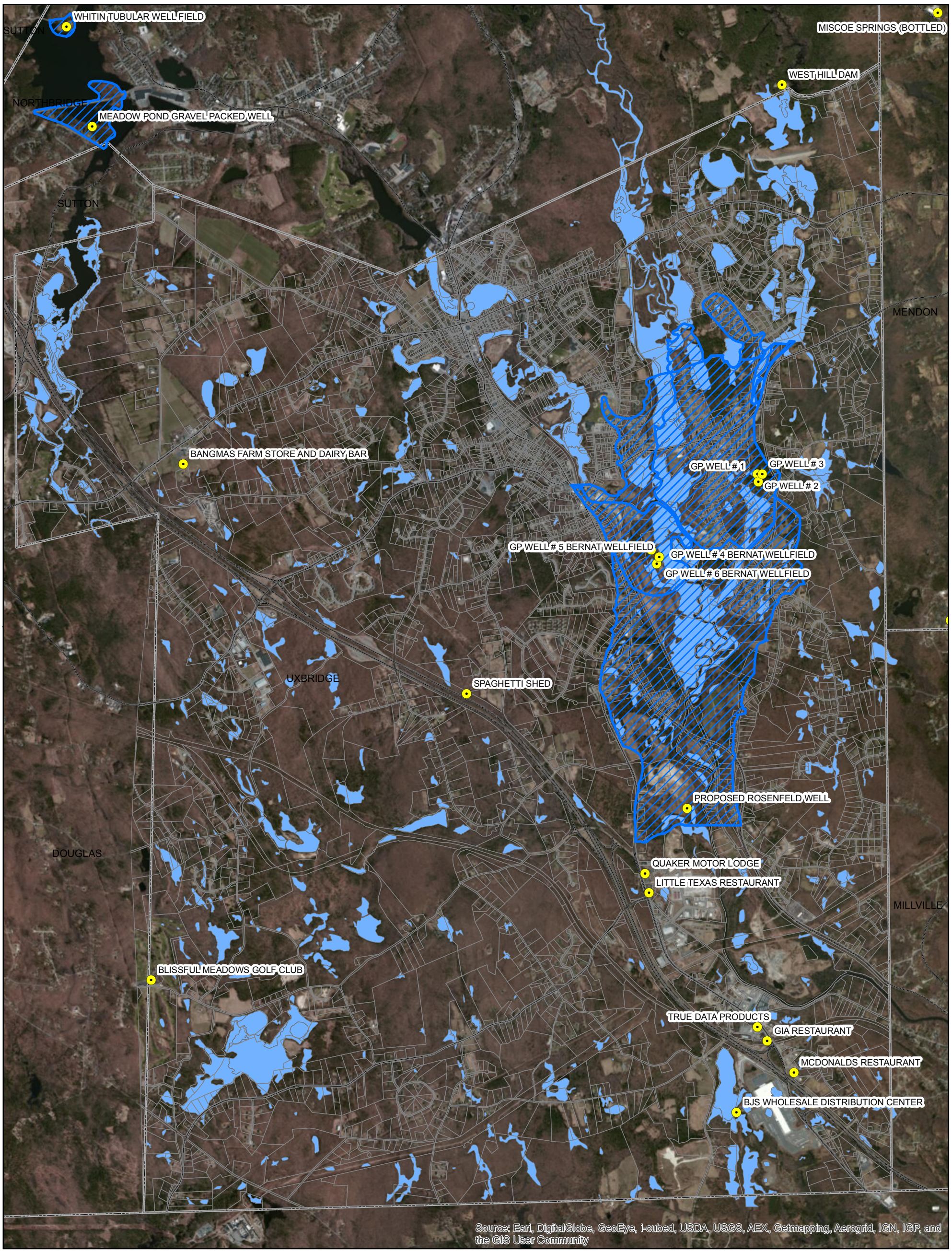

Legend

Public Water Supply Well | DEP Approved Zone IIs | Surface Water

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

WATER RESOURCE MAP

Job Number	86-14914
Revision	A
Date	31 Oct 2014

Figure 4-2

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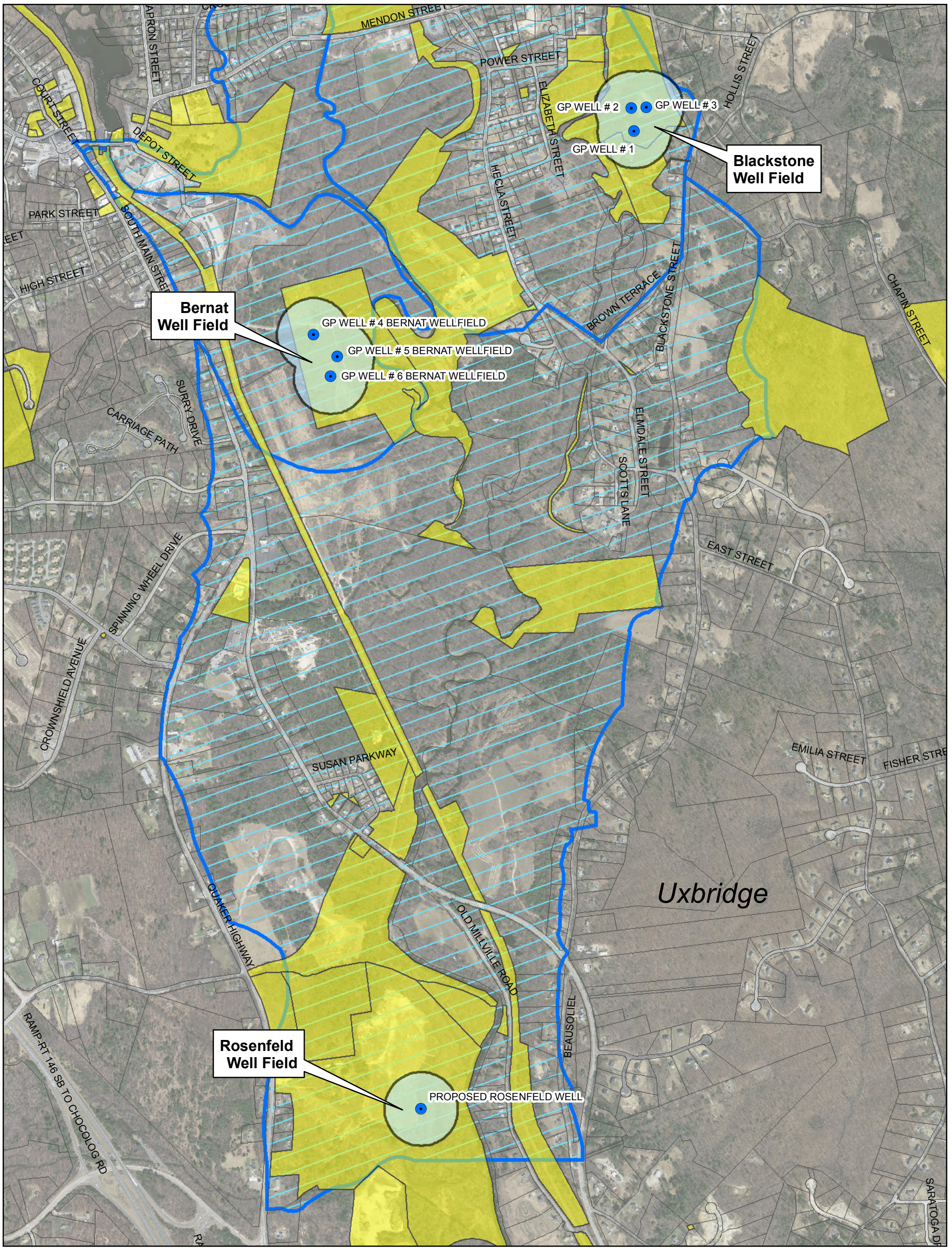

1 inch = 1,000 feet

Legend

- Public Water Supply Well
- Zone 1 (400 Ft)
- Town Owned Parcel
- DEP Approved Zone IIs

Paper Size ANSI B

0 500 1,000 2,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, MA
Comprehensive Wastewater Management Plan

ZONE 1
PROTECTION AREAS

Job Number	86-14914
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Figure 4-3

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4.4 Basin Wide Initiatives and Other Plans to the Town's Watershed Basin

4.4.1 Blackstone Watershed

The Town of Uxbridge is located entirely in the Blackstone River watershed which is comprised of 382 square miles in south-central Massachusetts and 258 square miles in northern Rhode Island

The 48-mile long Blackstone River runs from the Worcester area and through the Town of Uxbridge before flowing into Rhode Island and draining to Narragansett Bay. The six major tributaries of the Blackstone River are the Quinsigamond, West, Mumford, Branch, Mill and Peters Rivers. The Mumford River joins the Blackstone in Uxbridge. The West River flows through Uxbridge and joins the Blackstone River south of the Town. Major surface water bodies in the Town of Uxbridge are shown in Figure 4-4.

4.4.2 Water Quality of Surface Waters in Uxbridge

In Massachusetts, surface waters are categorized by the Massachusetts Surface Water Quality Standards into the following classifications:

Class A. Includes waters designated as a source of public water supplies and their tributaries. Designated as excellent habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation.

Class B. Designated as a habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, with appropriate treatment, they can be used as a source of public water supply.

Class C. Designated as a habitat for fish, other aquatic life and wildlife, and for secondary contact recreation.

From its source to the Rhode Island border, the Blackstone River is designated as a Class B warm water fishery. The Mumford and West Rivers are also designated as Class B.

Every two years, the State of Massachusetts is required to submit a state-wide report to USEPA describing the status of water quality in the Commonwealth. The Massachusetts Year 2012 Integrated List of Waters was prepared by the Massachusetts Division of Watershed Management Watershed Planning Program to fulfil this requirement. The Integrated List for 2012 divides water bodies in Massachusetts into the following categories:

- Unimpaired and not threatened for all designated uses.
- Unimpaired for some uses and not assessed for others.
- Insufficient information to make assessment for any uses.
- Impaired or threatened for one or more uses, but not requiring the calculation of a TMDL.
- Impaired or threatened for one or more uses and requiring a TMDL.

Because of a state-wide Department of Public Health advisory on the consumption of fish due to widespread mercury contamination found in freshwater fish, no waters were listed as Category 1 in the 2012 report. Table 4-1 lists the water bodies in Uxbridge that are included on the Integrated List, their categorization, and causes of impairment.

Table 4-1 Uxbridge Water Bodies Listed on the Massachusetts Year 2012 Integrated List of Waters

Water Body	Category	Nutrient-Related Impairment?	Contributors to Nutrient Related Impairment Cause
Emerson Brook	2	No	
Laurel Brook	2	No	
Scadden Brook	2	No	
Chockalog Pond	3	No	
Doctors Pond	3	No	
Houghton Pond	3	No	
Joels Pond	3	No	
Peabody Pond	3	No	
Pout Pond	3	No	
Ironstone Reservoir	4	No	
Rivulet Pond	4	No	
Blackstone River	5	Yes	Downstream of several WWTFs
Cedar Swamp Brook	5	No	
Mumford River	5	Yes	Downstream of Douglas WWTF
West River	5	Yes	Downstream of Upton WWTP

4.4.3 Basin Wide Initiatives / Plans Relating to the Town's Watershed and Potential Impacts to the CWMP

Local Level – Town of Uxbridge

The Town has established several local initiatives that serve to protect the Town's natural resources:

Wetlands Setback Policy: In 2001, the Uxbridge Conservation Commission established a setback policy prohibiting any alteration or construction within 25 feet from the edge of a wetland. The policy aims to minimize:

- Disturbance of natural vegetation along wetland boundaries
- Run-off of pollutants, fill materials and other substances into wetlands
- Stockpiling or dumping of materials or debris that migrate over time into wetlands
- Disturbance of wildlife habitat such as nesting sites and movements corridors that are important to wetlands wildlife species

Land Use Regulations: Regulations have been developed for Uxbridge Conservation Land in order to minimize impacts to these natural areas.

Open Space Zoning. Open space development bylaws were developed in order to encourage:

- Optimum utilization of natural land features and characteristics through a greater design flexibility
- Preservation of open spaces for conservation, outdoor recreation or park purposes
- Efficient provision of municipal services; and

Legend

- Rivers, Brooks
- Lakes, Estuaries, Ponds
- Uxbridge Town Boundary

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

UXBRIDGE WATER BODIES LISTED ON MASS 2012 INTEGRATED LIST OF WATERS

Job Number 86-14914
Revision A
Date 11 Dec 2014

Figure 4-4

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- Retention of the rural setting

Conservation Design Development Zoning. As outlined in the Town's bylaws, the conservation design development bylaws were developed to:

- Encourage the preservation of open land
- Enhance agricultural, open space, forestry and recreational uses
- Protect community water supplies
- Preserve historical and archaeological resources
- Protect the natural environment
- Protect the value of real property
- Promote more sensitive siting of buildings and better overall site planning
- Perpetuate the appearance of Uxbridge's traditional New England landscape
- Facilitate the construction and maintenance of streets, utilities and pulic services in a more economical and efficient manner; and
- Promote the development of affordable housing

Regional Level

The Blackstone River Coalition (BRC) is a partnership of organizations with the common goal of restoring and protecting the water quality and wildlife habitats of the river corridors. Member organizations include the Blackstone Headwaters Coalition (BHC), Blackstone River Watershed Association (BRWA), Blackstone River Watershed Council/Friends of the Blackstone (BRWC/ROB), Mass Audobon, Save the Bay and the Conservation Law Foundation. In 2008 he BRC developed a report entitled "The Blackstone River – Clean by 2015" The campaign had the following goals:

- Stormwater and polluted runoff – reduce pollutants washed in to the waterways and the volume of stormwater
- Wastewater treatment plants – implement more stringent limits on nutrients such as nitrates and phosphate
- Land uses – protect undeveloped areas, restore wetlands and riparian areas, protect cold water fishery streams and encourage Low Impact Development strategies such as reduced impervious surfaces, increased infiltration and native plantings.
- Streamflow – restore flow by methods suchs as: improve impoundment management; breach or remove appropriate dams; and establish fish passage for anadromous species at the four lower-most dams.
- Recreational opportunities – continue to build a system of river access points to increase opportunities to fish, paddle and enjoy passive recreation.
- Education and outreach – develop programs to increase watershed awareness and appreciation and to encourage active stewardship.

The BRC also organizes a volunteer water quality monitoring program that collects data on the watershed.

State Level

The following priorities were established by the EEA and listed on the State website for the Blackstone River Watershed:

- Finalize the Bi-State Blackstone Watershed Five-Year Action Plan (the most recent action plan posted to the EOEEA website is dated 2004).
- Complete the Army Corps of Engineers Feasibility Study. The feasibility study evaluates alternatives to help reduce the impact of contaminated sediments through the watershed by reducing re-suspension fo the most problematic sediments, while also restoring and creating fish and wildlife habitat.
- Build a constructed wetland to polish Grafton's wastewater treatment plant effluent
- Remove Mass Electric Dam in Millbury
- Restore Leesville Point, Dorothy Pond, Indian Lake and Lake Manchaug
- Ensure brownfields impact to the Blackstone are consistent with the future use of the river

Federal Level

As discussed in Section 3.4 the Federal Clean Water Act (CWA) establishes a structure for regulating quality standards for surface waters and regulating discharges of pollutants into the Waters of the United States.

4.4.4 Wetlands

The Wetlands Protection Act is administered and enforced by MassDEP's Wetlands Program. The WPA imposes restrictions on the removal, filling, dredging, or alteration of any designated wetland. The Town's Wetland Setback Policy is discussed in Section 4.4.1.

Wetlands located in the Town of Uxbridge are shown in Figure 4-5.

4.4.5 Floodplains

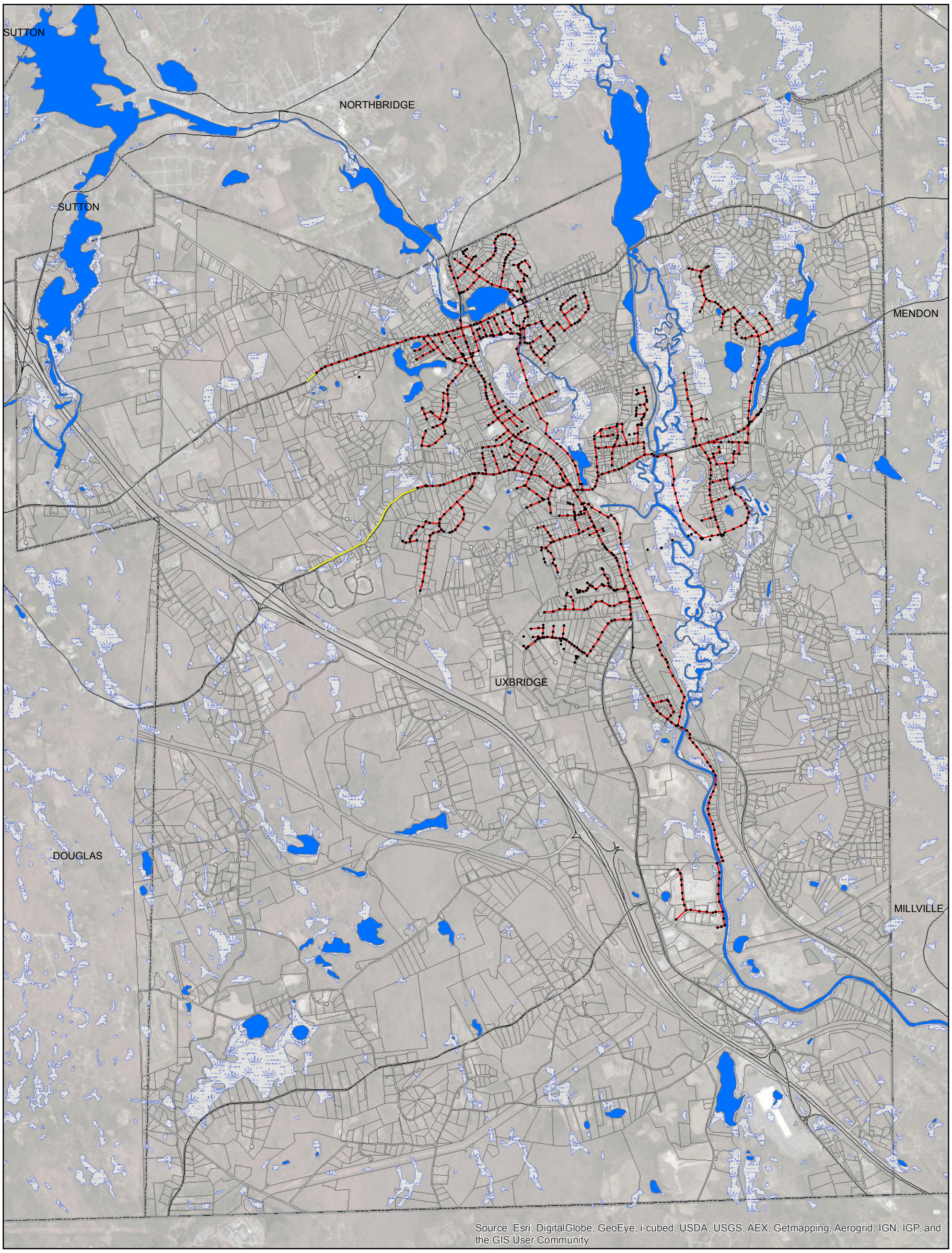
Federal Emergency Management Agency (FEMA) designated floodplains are shown in Figure 4-6.

4.4.6 Forests

According to the UMass Amherst Forest Conservation Program, over 60 percent of Massachusetts is forested. In many parts of the state, this number is declining. For example, it is estimated that Worcester County lost 7.9 percent of its forests from 1985 to 1998.

4.4.7 Protected Natural Areas

The Areas of Critical Environmental Concern (ACEC) Program was formed in 1975, is administered by the Department of Conservation and Recreation, and identifies "areas of critical environmental concern to the Commonwealth." Areas are identified and nominated by a community and designated by the Massachusetts Secretary of Environmental Affairs. There are currently no ACECs in the Town of Uxbridge.



Legend

- Existing Sewer
- Additional Sewer (Not included in Town's GIS Data)
- Surface Waters
- DEP Wetlands

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

DEP WETLANDS

Job Number	86-14914
Revision	A
Date	31 Oct 2014

Figure 4-5

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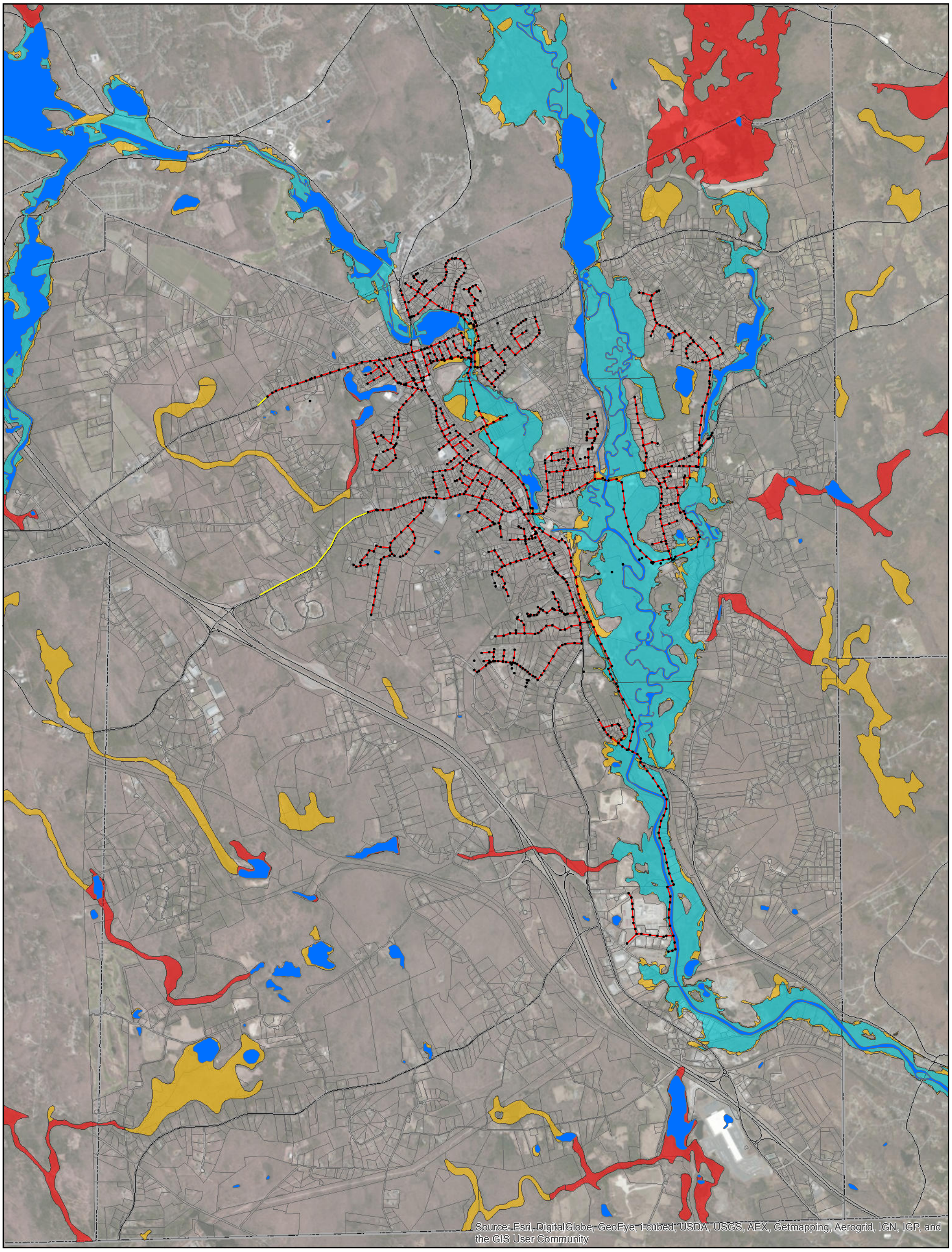

Legend

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Existing Sewer

Additional Sewer (Not included in Town's GIS Data)

Surface Waters

Paper Size ANSI B

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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

Job Number 86-14914
Revision A
Date 30 Oct 2014

FEMA FLOOD ZONES

Figure 4-6

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4.4.8 Habitats

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) maintains an atlas of estimated habitats and priority sites for rare plants and wildlife in Massachusetts. NHESP categorizes rare species into one of three categories:

- **"Endangered Species** are in danger of extinction throughout all or a significant portion of their range or are in danger of extirpation from Massachusetts.
- **Threatened Species** are likely to become endangered in Massachusetts in the foreseeable future throughout all or a significant portion of their range.
- **Special Concern Species** have suffered a decline that could threaten the species if allowed to continue unchecked or occur in such small numbers or with such restricted distribution or specialized habitat requirements that they could easily become threatened in Massachusetts."

Species noted by the NHESP as endangered, threatened, or of special concern in the Town of Uxbridge are listed in Table 4-2.

Table 4-2 Endangered, Threatened, and Species of Special Concern

Grouping	General Name	Scientific Name	Classification
Sponges	Smooth Branched Sponge	*Spongilla aspinosa*	SC
Mussels	Triangle Floater	*Alasmidonta undulata*	Non-listed SWAP species
Butterflies	Hessel's Hairstreak	*Callophyrs hesseli*	SC
Dragonflies	Mocha Emerald	*Somatochlora linearis*	SC
Dragonflies	Arrow Clubtail	*Stylurus spiniceps*	Non-listed SWAP species
Amphibians	Marbled Salamander	*Ambystoma opacum*	T
Reptiles	Wood Turtle	*Glyptemys insculpta*	SC
Reptiles	Eastern Hognose Snake	*Heterodon platirhinos*	Non-listed SWAP species
Reptiles	Northern Black Racer	*Coluber constrictor*	Non-listed SWAP species
Plants	Papillos Nut-sedge	*Scleria pauciflora*	E
Plants	Grass-leaved Ladies-tresses	*Spranthes vernalis*	T
Plants	Tall Nut-sedge	*Scleria triflomerata*	E
Priority Natural Community	Alluvial Red Maple Swamp		S3
Priority Natural Community	Alluvial Atlantic White Cedar Swamp		S2
Priority Natural Community	Inland Atlantic White Cedar Swamp		S2
Priority Natural Community	Acidic Shrub Fen		S3
Priority Natural Community	Level Bog		S3

E = Endangered T = Threatened SC = Special Concern
S1 = Critically Imperiled Communities S2 = Imperiled Communities
S3 = Vulnerable Communities SWAP = State Wildlife Action Plan

Figure 4-7 shows the areas in the Town of Uxbridge designated as habitats for priority habitats and estimated habitats for rare wildlife. Priority habitats are defined as 'the geographical extent of habitat

for all state-listed rare species, both plants and animals as codified under the Massachusetts Endangered Species Act (MESA).' Estimated habitats are a sub-set of priority habitats and show the geographical extent of state-listed rare wetland wildlife habitats as codified under the WPA.

4.4.9 Wildlife Management Areas

Wildlife Management Area's are lands owned by the Massachusetts Divisions of Fisheries & Wildlife that are open to hunting, fishing, trapping and other outdoor recreational activities.

The following WMA's are located partially within the Town of Uxbridge:

Lackey Pond – A 150 acre impounded section of the Mumford River located within Uxbridge and Suttom, which is managed as a shallow pond and wetland to optimize waterfowl breeding opportunities and migratory waterfowl habitat.

West Hill Wildlife Management Area – A 1,460 acre parcel located within the towns of Upton, Northbridge, Mendon and Uxbridge which is a habitat for stocked pheasant, grouse, woodcock, cottontail rabbit, aquatic fur-bearers, deer, gray squirrel, waterfowl and non-game species.

4.4.10 Regional Water Quality

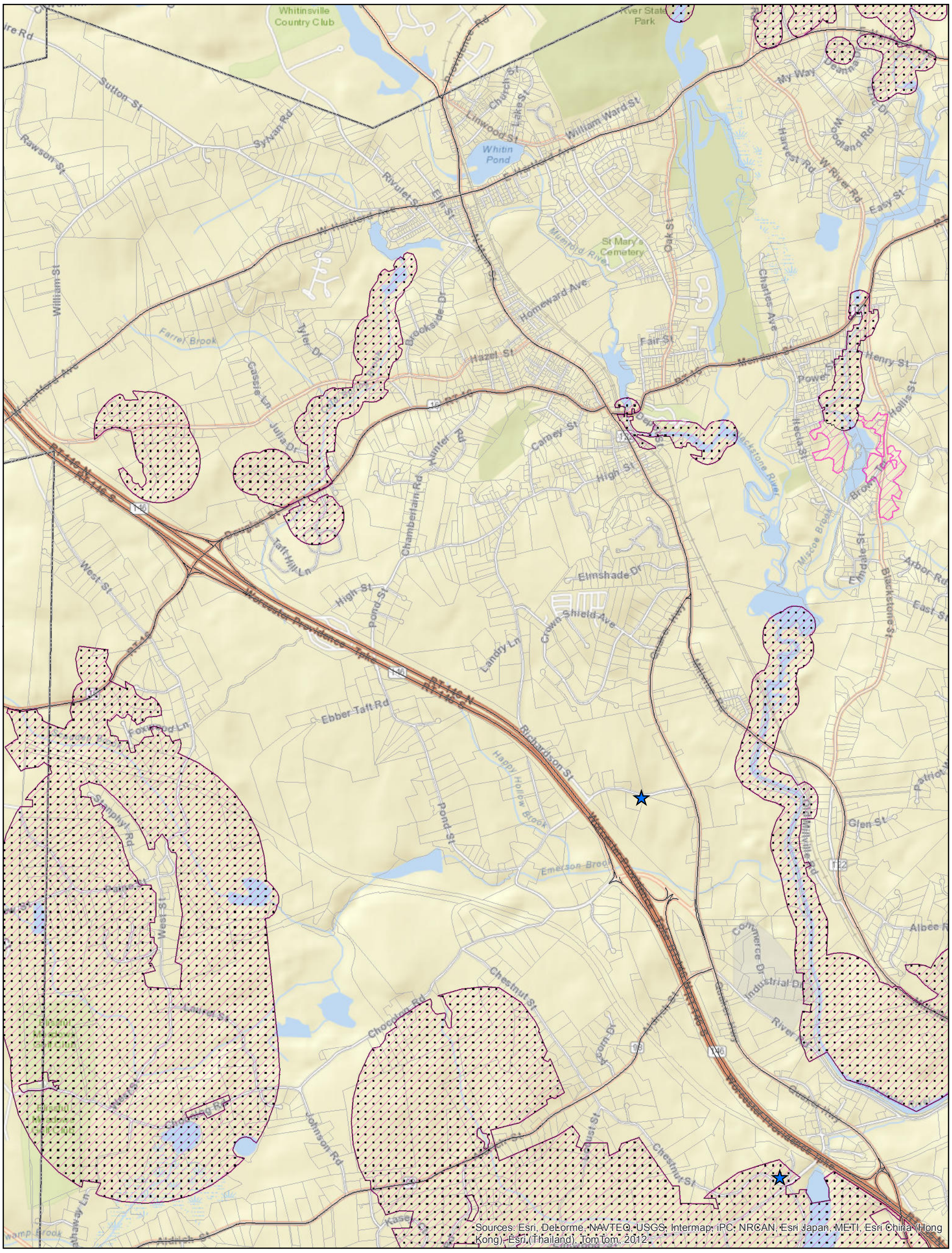
In the Massachusetts Department of Public Health's "Marine and Freshwater Beach Testing in Massachusetts Annual Report for the 2013 Season," three locations were tested weekly for E.Coli. No violation sample exceedances were found at Fairwoods or Pout Pond. West Hill Park experience three single sample exceedances.

4.4.11 Air Quality

40 CFR Part 50 outlines the National Ambient Air Quality Standards set by USEPA for pollutants considered harmful to public health and environment. Standards are set for seven "criteria" pollutants – carbon monoxide, lead, nitrogen dioxide, ozone, sulphur dioxide and two classes of particulate matter.

MassDEP operates 27 ambient air quality monitoring stations in 19 communities across the state. The stations are used to collect representative air samples across the Commonwealth. Conclusions of the Massachusetts 2013 Air Quality Report, produced by MassDEP, are summarized below:

- All of Massachusetts is designated as in attainment of the carbon monoxide standards
- All of Massachusetts is designated as unclassifiable/attainment of the lead standards
- All of Massachusetts is designated as unclassifiable/attainment of the nitrogen dioxide standards
- All sulphur dioxide monitors in Massachusetts show levels below the 2010 standard.
- EPA will make a final attainment/nonattainment designation for the new 2012 particulate matter standards by December 2014.
- All of Massachusetts (except for Dukes County) is designated as unclassifiable/attainment for ozone.



Legend

★ Vernal Pool (MassGIS 2009) — Estimated Rare Species Habitat — Priority Rare Species Habitat

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

N

Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

Job Number 86-14914
Revision A
Date 31 Oct 2014

NATIONAL HERITAGE ENDANGERED SPECIES HABITAT

Figure 4-7

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4.4.12 Noise

In 310 CMR 7.00 noise is defined as "sound of sufficient intensity and/or duration as to cause a condition of air pollution." MassDEP evaluations noise when reviewing applications for approval under its air pollution regulations (310 CMR 7.02) or in response to complaints from the public about noise generated by an existing source. A complaint may be filed with the Zoning Enforcement Officer, which in the Town of Uxbridge is also the Building Inspector.

4.5 Land Use and Zoning

4.5.1 Number of Uxbridge Properties and State Land Use Classifications

Properties are assigned a standard State Land Use Code for tax assessment purposes. Analysis of the Town's 2013 GIS database documents a total of 4,971 parcels with a State Land Use Code. The properties and tax codes have been summarized into groupings as shown in Table 4-3.

Table 4-3 Summary of Uxbridge Land Use

Land Use Grouping	State Land Use Codes	Total Number of Properties	Percentage of Total
Developed Properties			
Single-Family Residential	101, 103	3,307	67
Multi-Family Residential	013, 102, 104, 105, 109, 111,112	534	11
Commercial	031, 304, 310, 314, 316, 317, 321, 323, 325, 326, 330, 331, 332, 333, 334, 335, 337, 338, 340, 341, 342, 350, 353, 354, 369, 376, 377, 382	141	3
Industrial	400, 401, 402, 403, 410, 424, 427, 430, 431	51	1
Municipal – Educational(1)	934	4	0
Other – Includes undevelopable, forest, agricultural, recreational and exempt properties	016, 106, 132, 392, 442, 601, 713, 716, 717, 718, 720, 801, 803, 805, 806, 814, 900, 903, 905, 906, 908, 909, 910, 911, 919, 921, 924, 926, 932, 935, 936, 940, 941, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 970, 971, 997	514	10
Developable Properties			
Residential	130, 131	365	7
Commercial	390, 391	22	0
Industrial	440, 441	31	1
Municipal – Educational(1)	933	2	0
TOTAL		**4,971**	**100**

(1) Since Municipal-Educational parcels could potentially have a large water demand, they were separated from all other exempt properties which were classified as "Other." As discussed later in the Project, none of the parcels classified as Other are expected to have a significant demand on the Town's public water system.

Figure 4-8 shows the breakdown of residential properties by number of units per property.

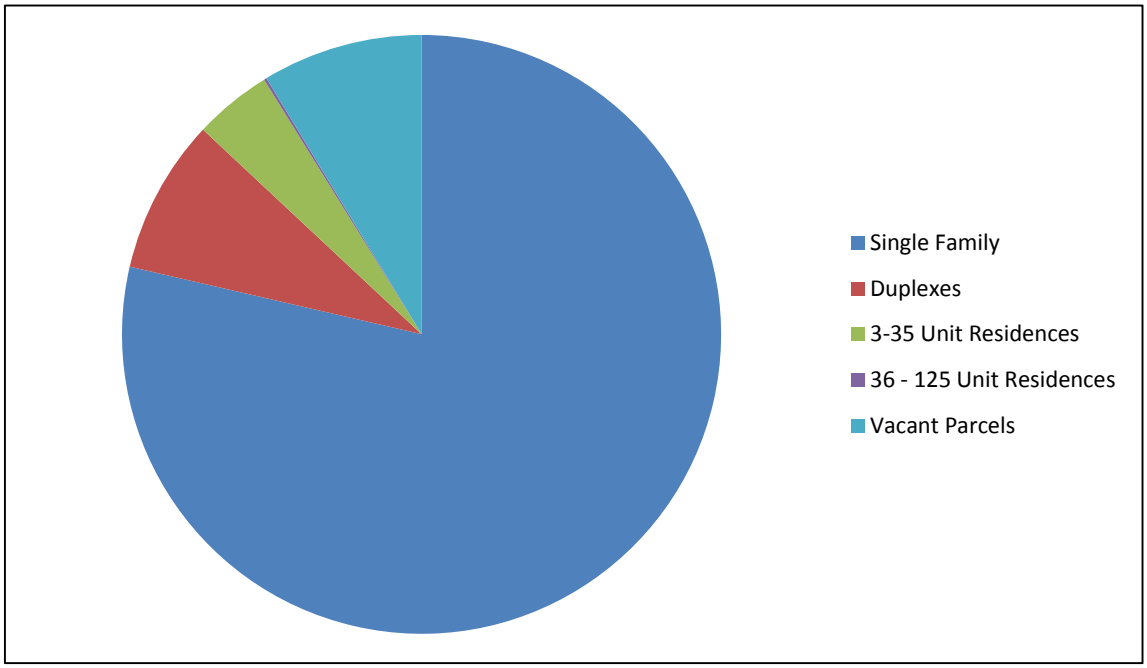


Figure 4-8 Breakdown of Residential Properties by Number of Units per Property

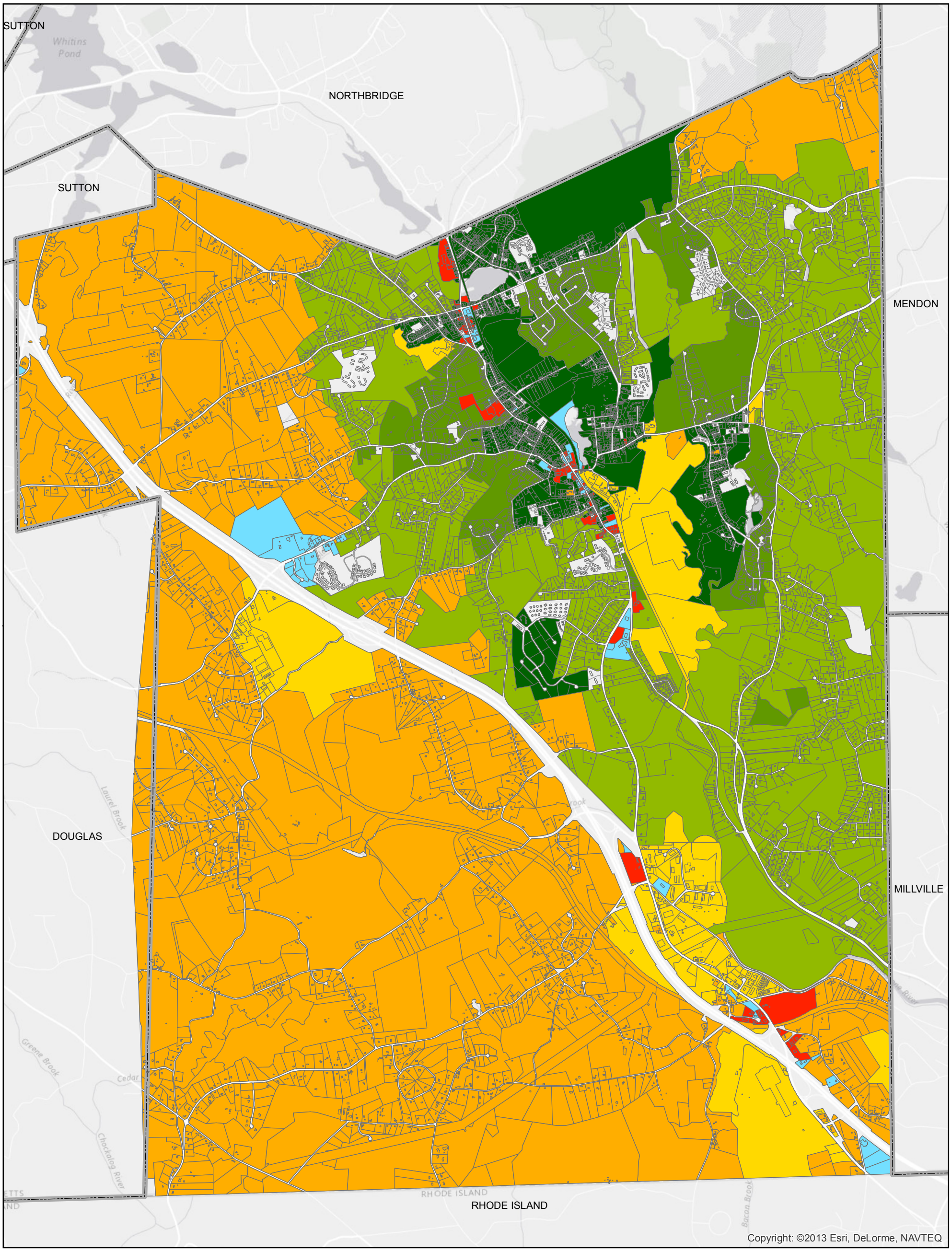
4.5.2 Town Zoning

Several zoning requirements have been established for the Town of Uxbridge with respect to new development, including minimum lot sizes, frontage, road setbacks, and maximum building heights. The requirements for these dimensions vary by zoning class and are identified in the Town's zoning bylaws. The zoning bylaws, as amended on May 14, 2013, have six zoning districts. Minimum lot sizes for each type of parcel are listed in Table 4-4. The distribution of the Town's zoning districts is shown in Figure 4-9.

Table 4-4 Minimum Lot Size in Accordance with Town of Uxbridge Zoning Bylaws

Category	Minimum Lot Size (square feet)
Residence A (R-A)	20,000
Residence B (R-B)	43,560
Residence C (R-C)	43,560
Agricultural (A)	87,120
Business (B)	15,000
Industrial (I)	30,000

The bylaws state that "only one dwelling and private garage shall be erected or maintained on a single lot in any residential zoning district." If a residential parcel is developed, it is assumed it would be developed into a single-family residential property.



Legend

Zoning Code

- AG
- B
- C
- I
- RA
- RB
- RC

*Note: Zoning map compiled from Town provided GIS parcel information using the"Zoning_1" data field.

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

Job Number 86-14914
Revision A
Date 31 Oct 2014

TOWN OF UXBRIDGE ZONING MAP

Figure 4-9

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4.5.3 Overlay Districts and Other Special Use Provisions

Overlay districts are often used by towns to establish alternative land development requirements within a specific portion of the community. The bylaws outline three overlay districts which allow for higher density development, all three of which fall within the extent of the collection system:

1. The Bernat Mill Adaptive Reuse Overlay District allows for the development of up to 100 residential units on the Bernat Mill Complex. The regulations also stipulate that 50 percent of the facility shall remain in commercial use.
2. The Waucantuck Mill Adaptive Reuse Overlay District is comprised of 19 parcels and includes the Stanley Woolen Mill. The maximum density of the development is 15 units per gross acre of all combined parcels of the development.
3. The Age Restricted Development Overlay District allows for one dwelling unit for every 20,000 square feet of the total area of the lot for the three parcels identified as being part of this District.

The overlay districts in Uxbridge are shown in Figure 4-10.

4.5.4 Protected Cultural Areas

The Blackstone River was incorporated into the National Heritage Corridor system in 1986 and was designated as an American Heritage River in 1998. Much of the land around the mills was converted to state and national parks after the industries they once housed left. The Town has 54 sites on the National Register of Historic Places as of August 2014.

4.5.5 Chapter 61 Land

In order to promote the preservation of forests, farmland and recreational land Chapter 61 of Massachusetts General Law (MGL) allows for a property that to be classified as forest land, instead of at its highest and best value. A lien is placed on the property requiring the land to remain in an undeveloped state and not be converted to residential, industrial or commercial uses. Chapter 61A land is devoted to agricultural and horticultural uses. Chapter 61B requires that land be either kept for recreational activities such as hiking, camping, fishing and boat

The Town's GIS database lists approximately 9% of the land in Uxbridge as either Chapter 61, Chapter 61A or Chapter 61B. The breakdown of properties is as follows:

- 686 acres of land (33 properties) classified as Chapter 61
- 664 acres of land (31 properties) classified as Chapter 61A
- 302 acres of land (14 properties) classified as Chapter 61B

4.5.6 Chapter 40B/40R Planning

Chapter 40B. MGL Chapter 40B was enacted to encourage the production of affordable housing in all of the cities and towns in Massachusetts. Under this legislation, if less than 10% of the units in a municipality are not included on the Department of Housing and Community Development's Subsidized Housing Inventory (SHI), a developer can apply for a Comprehensive Permit. The permit would allow denser development than municipal zoning bylaws permit if a certain percentage of the units are considered "affordable"

As of December 5, 2014 the SHI listed 4.9% of the housing units in Uxbridge as SHI units.

Chapter 40R. MGL Chapter 40R promotes the development of dense residential or mixed-used smart growth zoning districts. Development under 40R is encouraged to have high percentage of affordable housing units, be located near transit stations and to focus development in concentrated developments such as city and town centers. The Town of Uxbridge does not have a smart growth zoning district.

4.5.7 New and Proposed Developments

The CMRPC 2012 Blackstone Prioritization Report lists the following locally-identified priority development areas:

- Route 146 industrial site
- Route 146 43D/CEDS
- Stanley Woolen Mill Redevelopment
- Bernat Mill
- Waucantuck Mill
- BJ Industrial Area

4.5.8 Open Space

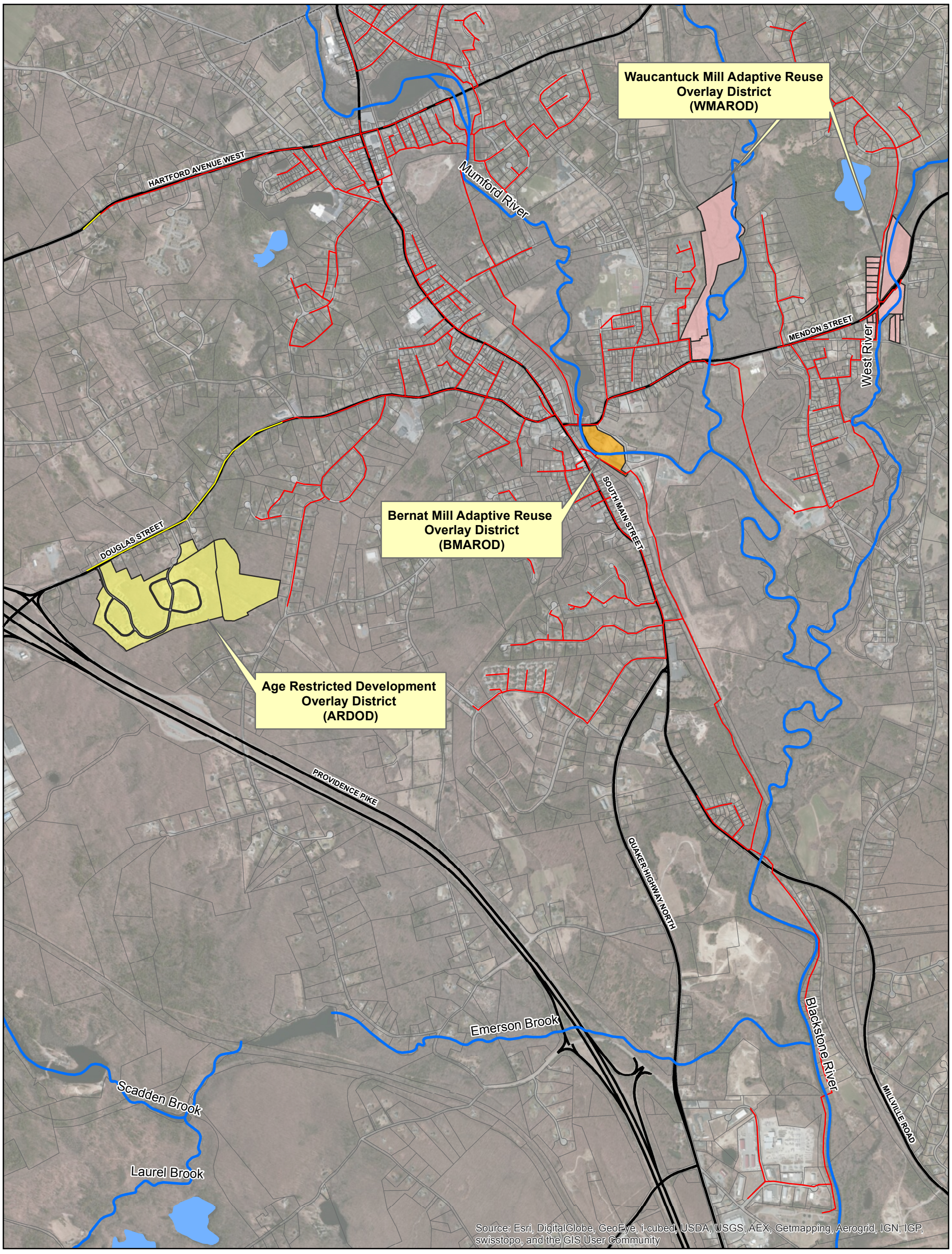
MGL Chapter 59 defines open space as “land which is not otherwise classified and which is not taxable under the provisions of Chapter 61, 61A or 61B or taxable under a permanent conservation restriction.” This type of land is intended to be maintained in an open or natural condition. The Town’s GIS database does not classify any properties as “open space”.

4.6 Town Demographics

4.6.1 Current Population

Under an agreement with the Massachusetts Secretary of the Commonwealth, the University of Massachusetts Donahue Institute (UMDI) has produced population projections for all Massachusetts municipalities at five-year intervals through 2030. The projections for the Town of Uxbridge indicate a continuation of recent trend of about a 7 percent increase in the population every five years. The UMDI projections end in 2030, and with the planning period for this report extending to 2035, the same straight line projection from 2015 through 2030 was used to estimate the growth from 2030 to 2035, to complete the population projection. Historical population data was obtained from the U.S. Census Bureau.

Figure 4-11 and Table 4-5 show the Town’s historical and projected growth.



Legend

- Rivers, Brooks
- Lakes, Estuaries, Ponds
- Major Roadways
- Existing Sewer
- Additional Sewer (Not included in Town's GIS Data)

Overlay Districts

- ARDOD
- BMAROD
- WMAROD

Paper Size ANSI B

0 800 1,600 3,200 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

OVERLAY DISTRICTS

Job Number	86-14914
Revision	A
Date	11 Dec 2014

Figure 4-10

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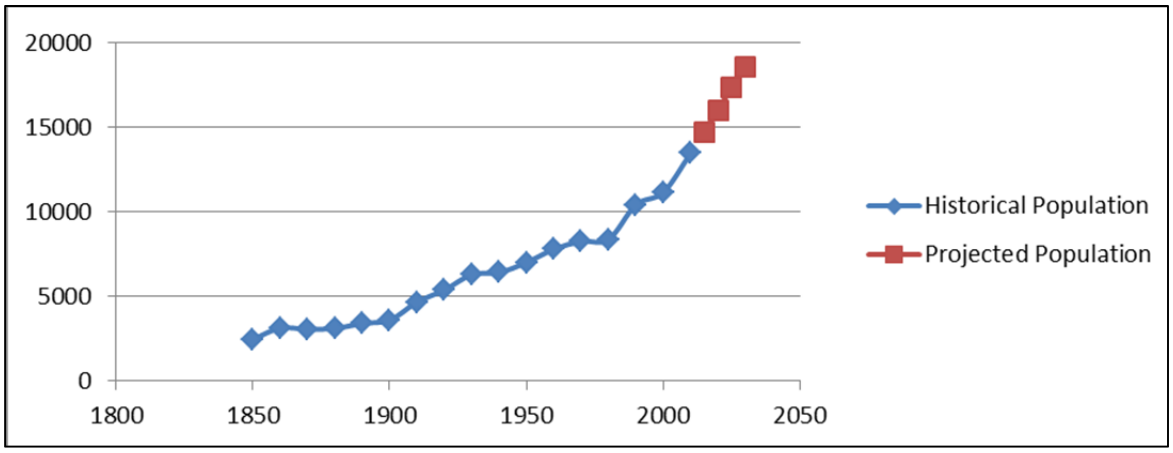


Figure 4-11 Town of Uxbridge Population – Historical and Projected

Table 4-5 Town of Uxbridge Population – Historical and Projection

Year	Population	Year	Population
1850	2,457	1960	7,789
1860	3,133	1970	8,253
1870	3,058	1980	8,374
1880	3,111	1990	10,415
1890	3,408	2000	11,156
1900	3,599	2010	13,457
1910	4,671	2015	14,685
1920	5,384	2020	16,022
1930	6,285	2025	17,358
1940	6,417	2030	18,531
1950	7,007	2035	19,783

Urbanized areas within the Town, as outlined in the 2000 U.S. Census, are shown in Appendix B.

4.6.2 Resident Characteristics

Due to its proximity to I-495 and I-395, the southeast sub-region of the Blackstone Valley (which Uxbridge is a part of) was noted, as expected, to grow faster than any other region in Central Massachusetts, per the Greater Worcester Area CEDS Report prepared in 2012 by the CMRPC.

The 2010 U.S. Census listed the total population of Uxbridge as 13,457 people, with a median age of 41.3 years. The demographic breakdown of the population is 50.2% female and 49.8% male. The population is 97.4% white, 1.3% black or African America, 0.5% American Indian and Alaska Native, 1.4% Asian, 0.1% Native Hawaiian and Other Pacific Island and 0.7% “some other race”.

The age breakdown of the Town, as listed in the 2013 Population Estimates Program, is shown in Figure 4-12.

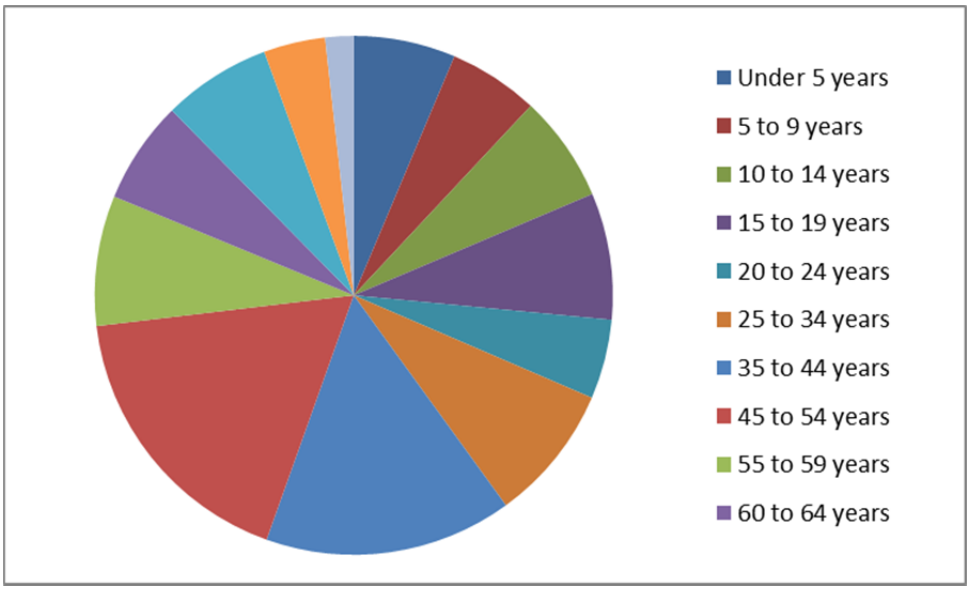


Figure 4-12 Town of Uxbridge Age Breakdown

The population is predominantly year round with 0.3 percent of the housing occupancy categorized for seasonal, recreational, or occasional use. The average household size was listed as 2.65 people. The majority (95.4 percent) of housing units within the Town were occupied at the time of the Census; 79.4 percent of the units are owner-occupied with the remainder renter-occupied.

4.6.1 Economy

The 2008-2012 American Community Survey five-year estimates list the Town's income per capita as $34,683. Approximately 6 percent of the population is below the poverty line. Figure 4-13 shows the breakdown of the Town's employment by industry.

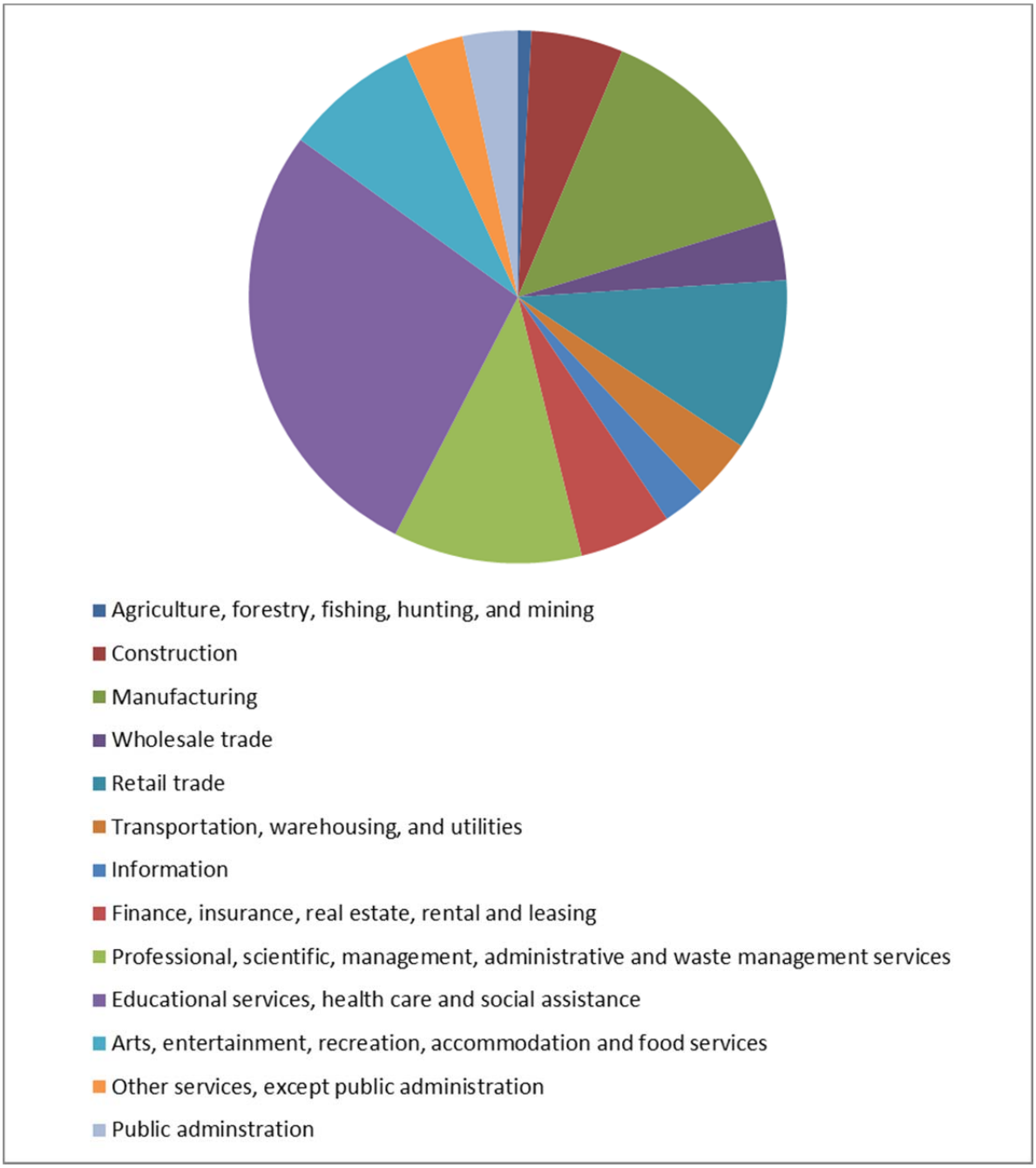


Figure 4-13 Industries in Uxbridge, 2008-2012 American Community Survey Five-Year Estimates

4.6.2 Town Government and Governance Authorities

The executive arm of the Town of Uxbridge is a five-member Board of Selectmen (BOS) which meets twice a month. BOS members are elected officials that also serve as the Town's Water and Sewer Commissioners. BOS meetings are open Town Meetings and are open to the public. Meeting times are advertised and the event is televised. In an open Town Meeting all of the Town's voters may vote on all matters.

The Board of Health (BOH) serves as the local arm of the Massachusetts Department of Public Health and MassDEP. Its duties include:

- Developing, implementing and enforcing health policies
- Overseeing inspections to maintain minimum standards for sanitation in housing and food services
- Assuring that the basic health needs of the community are met

The responsibilities of the BOH include oversight of septic systems, wells, water quality, public pools, public beaches, day camps, restaurant, food establishments, housing inspections, lead inspections and infectious disease reporting & surveillance.

5. Existing Water and Wastewater Infrastructure

5.1 Existing Centralized WWTF

The Uxbridge WWTF, a conventional activated sludge facility, is located at 80 River Road in the Town of Uxbridge, MA. It accepts septage both from within the Town of Uxbridge and several neighboring communities. The Uxbridge sanitary sewer system serves commercial districts and residential areas north and east of Route 146. The sewered areas typically have a hilly topography and are drained by the Blackstone River and its tributaries. According to the 1969 *"Report on General Sewerage System and Waste Treatment Plant"* by Haley and Ward, Inc., the WWTF was designed to accept and treat wastewater from 93 percent of the projected Year 2000 population. As shown in Figure 5-1, the anticipated sewered population has not been reached.

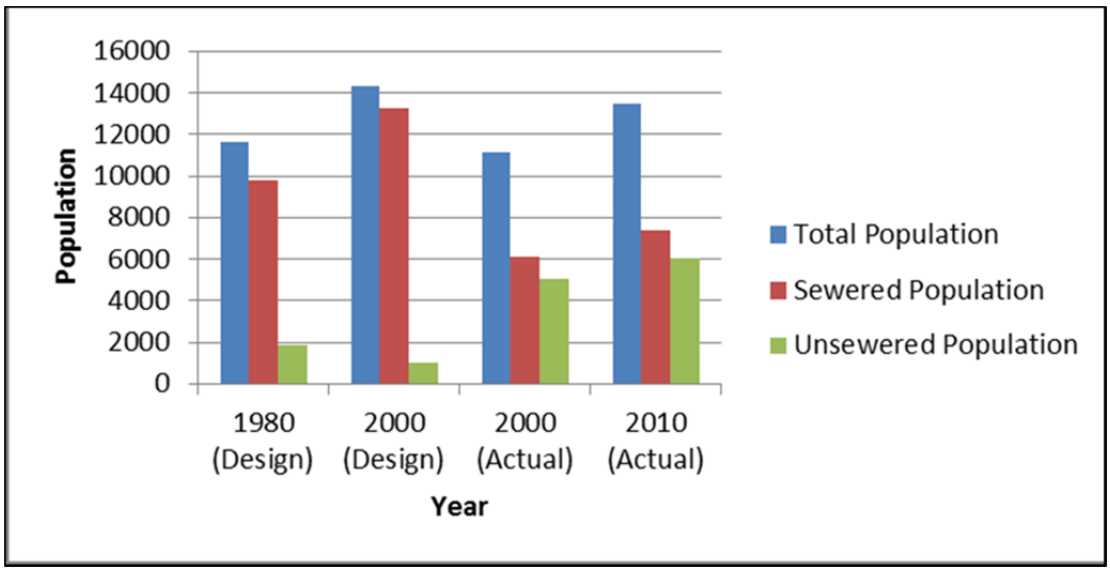


Figure 5-1 Design and Actual Sewered Populations

5.1.1 History of the Uxbridge WWTF

The Uxbridge WWTF commenced operation in the 1970s to provide secondary treatment for the sewered portions of the Town. The facility was designed to treat an average flow rate of 2.45 mgd which included an allowance for 1.01 mgd of industrial waste discharge and 0.15 mgd of infiltration. Approximately 50 percent of the allocated industrial waste discharge was estimated to come from the Stanley Woolen Mill and the Bernat Mill, both industries that no longer operate in Uxbridge.

The facility was built as a conventional activated sludge process. In 2007, a lime tower and lime feed system was added to the treatment facility. This has been the only major upgrade since its original construction. The facility has one main pumping station on site which receives raw wastewater flow from the Town's collection system and pumps it from the receiving wet wells to the head of the plant. The remainder of the plant is driven by gravity flow. Treated effluent is discharged into the Blackstone River, which flows to Narragansett Bay.

Most of the equipment at the plant is from the original 1979 construction and is approaching 35 years of age which, for mechanical equipment, is well beyond its life expectancy. Some of the equipment lacks the energy efficiencies and controls of new equipment and current technologies that improve performance and provide automation and energy conservation.

During the original construction of the facility, a vacuum filtration system was installed to dewater thickened primary and activated sludge. A 0.75-acre sludge disposal area was designated adjacent to the site. The disposal area was decommissioned and capped in the early 2000s. The Town currently sends thickened sludge to a regional processing facility.

Five pump stations are connected to the collection system. The Main Pump Station at the WWTF, the West River Pump Station, and the Liberty Estates Pump Station are owned and operated by the Department of Public Works (DPW). The Taft Elementary School Pump Station and Uxbridge High School Pump Station are both owned but not operated by the DPW. The Town provides monitoring and performs minor repairs on these stations.

5.1.2 Summary of Existing Flows and Loads

Total flow to the plant is a function of wastewater discharged to the collection sewers, septage received at the septage receiving station, and I/I of extraneous water that enters the collection sewers from groundwater and rainfall. While domestic wastewater may remain relatively constant over a calendar year, I/I may change dramatically with a rainfall event or with the season.

Wastewater From the Collection System

Based on water usage data provided by the Town, the majority (approximately 89 percent) of the wastewater received at the facility is residential with the remainder being commercial (5 percent), industrial (1 percent), and exempt properties (5 percent). Exempt properties are that that are exempt from taxation and include municipal, educational and Commonwealth of Massachusetts properties.

Septage

The Uxbridge WWTF accepts septage from commercial haulers who serve customers from unsewered areas located within the Town. When septage receiving capacity is available, the facility will also accept septage from commercial haulers who serve customers in unsewered areas located outside of the Town. Septage loads from sources located within the Town that containing grease, industrial, or commercial wastes must be approved before they are accepted at the facility. Loads containing grease, industrial, or commercial wastes from sources located outside of the Town are not accepted.

Septage is discharged to a septage holding tank equipped with a coarse bar rack (2-inch x 3/8-inch bars spaced at 2 inches on centers) to remove large solids and stringy materials. Coarse bubble air diffusers are installed in the septage holding tank for mixing and aeration of the septage. The tank provides short-term storage, blending, and equalization of the septage received. Two air-operated diaphragm pumps are provided for pumping septage from the holding tank to the aerated grit chamber where it is blended with the raw wastewater influent.

The septage holding tank is equipped with an 8-inch unvalved overflow pipe which connects to the plant drain system via a manhole located near the grit chamber. When the volume of septage received exceeds the rate of withdrawal of septage from the tank by the septage transfer pumps, the level in the holding tank increases. When the level reaches the invert elevation of the overflow pipe (approximately 7,700 gallons maximum holding capacity), septage begins to overflow the

holding tank and flow by gravity to the plant drain system, which in turn drains to the wet well at the main pumping station. Based on the current volumes of septage received, the operators report that overflows of the septage holding tank occur frequently.

The operators at the Uxbridge WWTF record the volume of septage received based on the estimated capacity of truckloads delivered. In addition, the operators collect a sample of the contents of each truckload for subsequent laboratory analysis for BOD_5 and suspended solids. Samples collected from multiple truckloads received on any given day are combined into a composite sample to reduce the required number of laboratory analyses. In addition, to accommodate the laboratory staff's schedule, septage samples are sometimes composited over two or more days.

Records compiled by the Uxbridge WWTF staff over the period of January 2009 through July 2014 were reviewed and analyzed to determine the quantities and characteristics of septage received for treatment. As shown in Figure 5-2, monthly septage volumes have ranged from a minimum of just under 60,000 gallons (February 2009) to a maximum of 542,000 gallons (November 2011). In general, the least amount of septage received for treatment is during the winter months and the highest during late fall (October-November).

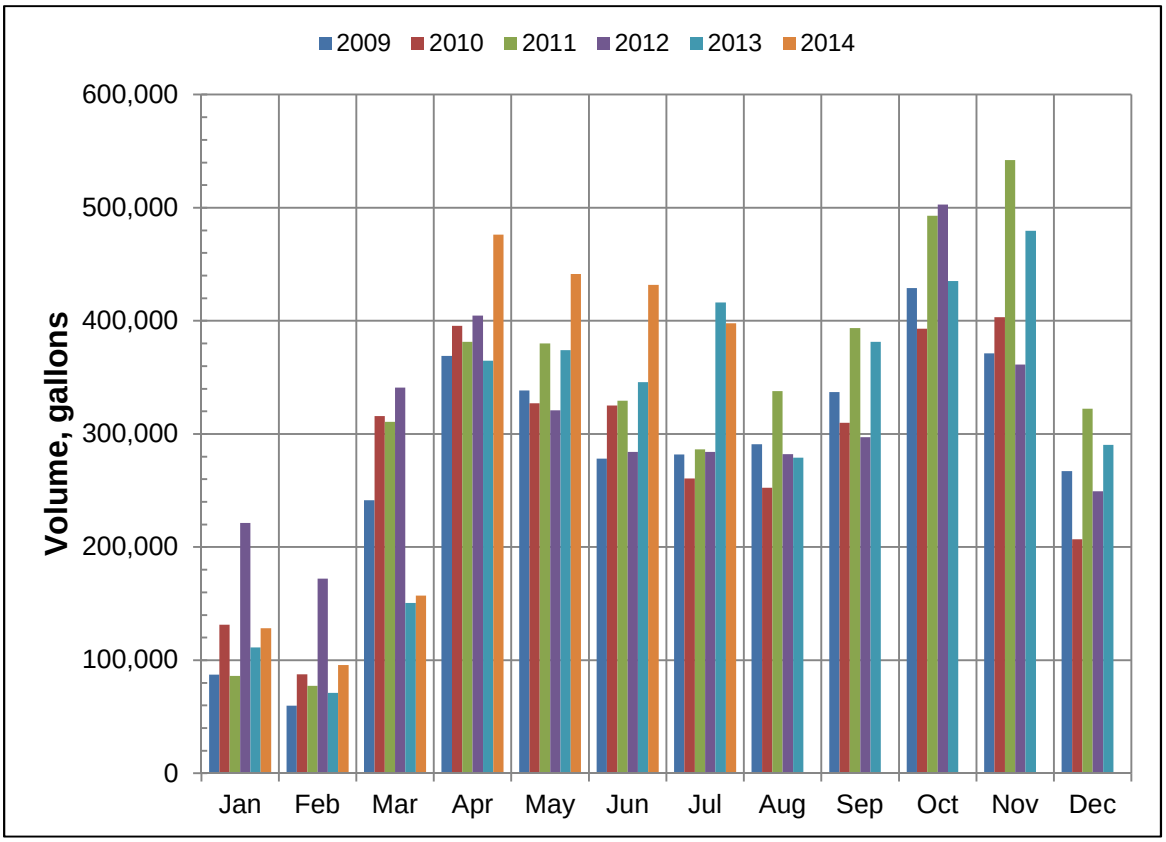


Figure 5-2 Monthly Volumes of Septage Received at the Uxbridge WWTF

Over the entire 67-month period of record, the maximum volume of septage received over a continuous 52-week (annual) period was approximately 4.23 million gallons (April 11, 2011 through April 8, 2012). The maximum volume received over a continuous 4-week (monthly) period was approximately 521,500 gallons (October 11 through November 7, 2011), and the maximum volume received on any single day was 58,750 gallons (November 21, 2011).

Since April 2014, the plant has experienced a significant increase in the volume of septage received. As shown in Table 5-1, the volumes of septage received during the months of April, May, June, and July 2014 were significantly greater than the average volume received during the same months over the 5-year period of 2009 through 2013. The increase is attributed to a growing population and a recent decision by another nearby wastewater treatment facility to discontinue accepting septage for treatment.

Table 5-1 Recent Increase in Volume of Septage Received

Month	Average Volume for 2009-2013 (gallons)	Volume for 2014 (gallons)	Apparent Increase in Septage Volume
April	383,090	476,250	24.3%
May	348,100	441,400	26.8%
June	312,550	431,750	38.1%
July	305,900	397,950	30.1%
Total (4 Months)	**1,349,640**	**1,747,350**	**29.5%**

Based on discussion with Town and MassDEP representatives, it is reasonable to expect that the recent increase in volume of septage received at the Uxbridge WWTF will continue. As shown in Table 5-2, the volume of septage received has increased by approximately 30 percent. For planning purposes and for sizing of wastewater treatment facilities, current septage volumes have been estimated based on a 30 percent increase in maximum septage volumes received over the 5-year period of 2009 through 2013 (Table 5-2).

Table 5-2 Estimated Current Septage Volumes

	2009-2013 (gallons)	Allowance for 2014 Increase in Volume (gallons)	Estimated Current Septage Volume (gallons)
Annual volume, gallons	4,230,000	1,270,000	5,500,000
Maximum month volume	542,000	163,000	705,000
Peak one-day volume	59,000	18,000	77,000
Annual volume, gallons	4,230,000	1,270,000	5,500,000

Review of septage sampling data collected and compiled by the Uxbridge WWTF staff over the 67-month period of record indicates wide variability in BOD_5 and suspended solids concentrations. This wide variability is considered typical for sampling of septage. As shown in Table 5-3, however, the average and median concentrations from the sampling data are significantly less than average concentrations reported in the 2011 edition of TR-16 (Guides for the Design of Wastewater Treatment Works) published by the New England Interstate Water Pollution Control Commission.

Table 5-3 Septage Sampling Data

	BOD_5 (mg/L)	Suspended Solids (mg/L)	TKN (mg/L)	Total Phosphorus (mg/L)
Town of Uxbridge Data (January 2009 – July 2014)				
No. sample data	823	864	No data available	No data available
Range	0.1 – 41,713	0.1 – 35,856		
Mean	2,762	4,862		
Median	2,520	4,392		
Standard deviation	1,991	2,749		
TR-16 (Table 12-1)				
Range	440 – 78,600	310 – 93,378	66 – 1,060	20 – 760
Mean	6,480	12,862	588	210

For the purpose of wastewater facilities planning, current BOD_5 and suspended solids loads associated with septage receiving have been estimated using the median concentrations from Town of Uxbridge data for annual average conditions. For estimation of maximum month and peak day loads, concentrations approximately equal to the median concentration plus one and two standard deviations have been used, respectively. For BOD_5, the peak day concentration (mean concentration plus two standard deviations) is approximately equal to the mean concentration reported in TR-16.

For TKN and total phosphorus, mean concentrations reported in TR-16 were used to estimate peak day loads associated with septage. Annual average concentrations were then scaled based on the ratio of the mean concentrations for Town of Uxbridge data and TR-16 data for BOD_5. The maximum month loads were then estimated using concentrations midway between the concentrations used for average and peak day conditions.

Estimates of septage flows and loads representative of current operating conditions are summarized in Table 5-4. Average daily flows for annual average and maximum month conditions are estimated based on acceptance of septage on normal workdays only (250 days per year for annual average condition and 20 days per month for maximum month conditions).

Table 5-4 Estimated Current Septage Flows and Loads

	Annual Average	Maximum Month	Peak Day
Volume, gallons	5,500,000	705,000	77,000
Flow, gpd	22,000	35,000	77,000
BOD_5, mg/L	2500	4500	6500
BOD_5, lb/day	460	1,300	4,200
TSS, mg/L	4400	7150	9900
TSS, lb/day	810	2,100	6,400
TKN, mg/L	230	410	590
TKN, lb/day	42	120	380
TP, mg/L	80	150	210
TP, lb/day	15	44	130

Infiltration and Inflow

I/I is rain or groundwater that seeps or flows into the collection system and contributes to the total volume of wastewater treated by the Uxbridge WWTF. Infiltration is generally defined as a steady

24-hour flow that results from groundwater entering a sewer system through leaking pipe joints and manholes. The quantity of infiltration is therefore most affected by increases in the groundwater level during wet weather periods. Infiltration rates are normally measured in terms of gallons per day per inch-diameter mile (gpd/idm).

Inflow is the direct discharge of runoff into the collection system during rainfall events. This can occur through the flow of rainwater into holes in manhole covers or through illegal direct connections of catch basins, roof drains, foundation drains, cellar drains, and sump pumps into the collection system.

An I/I analysis was conducted by Beta Group Inc. in 2006. The study area for the I/I analysis included the limits of the existing wastewater collection system, which is located in the areas of Town north and east of Route 146. Flow monitoring was conducted during two seasons – in the spring when groundwater levels were at their highest and when groundwater levels were at their lowest. The maximum infiltration rate measured during the study was 2,475 gpd/idm. Using the MassDEP metric that peak infiltration rates greater than 4,000 gpd/idm are considered excessive infiltration, the study concluded that excessive amounts of I/I were not entering the sewer system. Though the quantity of infiltration was not high enough to be considered “excessive,” several sub-areas were noted as experiencing infiltration flow during high groundwater conditions and were recommended for further investigation.

5.1.3 Wastewater Flow

The flow of raw wastewater received by municipal wastewater treatment facilities typically varies on a seasonal and diurnal basis. Seasonal flow variations can result for a number of reasons, including seasonal variability in non-resident population (e.g., areas with significant seasonal tourist or college student populations), industrial wastewater contributions, and sewer I/I. In the case of the Uxbridge WWTF, seasonal variability in wastewater flow is primarily influenced by wet weather conditions that increase the volume of flow due to sewer I/I. Diurnal variations in wastewater flow are primarily attributed to the size of the sewer service area and characteristics of the population served. In general, lower flows are received during early morning hours and highest flows during mid-morning and mid-evening hours.

For planning and design of municipal wastewater treatment facilities, it is important to develop wastewater flow projections for a number of operating conditions, including annual average, maximum monthly average, maximum 24-hour average and peak hourly flow conditions. Annual average flow is used by regulatory agencies to define the capacity of wastewater treatment facilities (as contained in NPDES permits). Changes in annual average flow over time are indicative of long-term trends in the sewer service area. Maximum monthly average flows are important because the treatment facility must be designed to provide consistent and reliable compliance with effluent limits in the discharge permit during monthly reporting periods. Peak day and peak hourly flows are important because the treatment facilities must have hydraulic capacity to convey those flows with no overflows. In addition, certain wastewater treatment systems must be sized to handle the peak flows received.

It is also important to develop flow and load projections that correlate with seasonal variations with the degree of wastewater treatment required. In the case of Uxbridge, seasonal variations in effluent limits require enhanced treatment for nitrogen removal over the period of May 1 through October 31, and for phosphorus removal over the period of April 1 through October 31. In addition, the 2013

permit issued by MassDEP requires that the Uxbridge WWTF be operated to maximize nitrogen removal to the extent feasible during the period of November 1 through April 30.

The facility has two flow meters – an influent flow meter immediately downstream of preliminary treatment and an effluent flow meter downstream of the secondary clarifiers. The influent flow meter is no longer used. Effluent flow is continuously metered by an ultrasonic flow meter installed at the Parshall flume downstream of the secondary clarifiers..

Annual Average Flow

The 52-week (annual) average flow recorded over the 10-year period of record was 1.08 mgd (graphically depicted in Figure 5-3). This flow occurred over the period of February 25, 2011 through February 24, 2012 and was largely due to extreme wet weather conditions during the latter half of 2011 and the early months in 2012. According to precipitation data published by the National Climatic Data Center, the 12-month total precipitation recorded at the NOAA weather station in Worcester, MA was more than 18 inches above normal (37 percent). For planning and design purposes, a 52-week (annual) average flow of 1.03 mgd was used as representative of current operating conditions.

Based on the estimated current sewer service area population (approximately 8,100 people), the maximum annual average wastewater flow (1.03 mgd) is equivalent to a per capita flow of 127 gpd per person. This flow is nearly twice the per capita flow (65 gpd per person) indicated by average annual metered water usage for the three-year period of 2011 through 2013 (525,600 gpd).

Average annual water production for the same three-year period was approximately 708,800 gpd, or approximately 87.5 gallons per capita per day based on the estimated sewer service area population of 8,100 persons. It is likely that actual per capita water usage falls somewhere between the 65 and 87.5 gallons per capita per day indicated by metered water usage and water production data. The remainder of the total wastewater flow (approximately 0.32 to 0.50 mgd) may be attributed to sewer I/I. In other words, on an annual average basis, sewer I/I is estimated to comprise somewhere between 31 and 49 percent of the total flow received by the WWTF during a “wet” year.

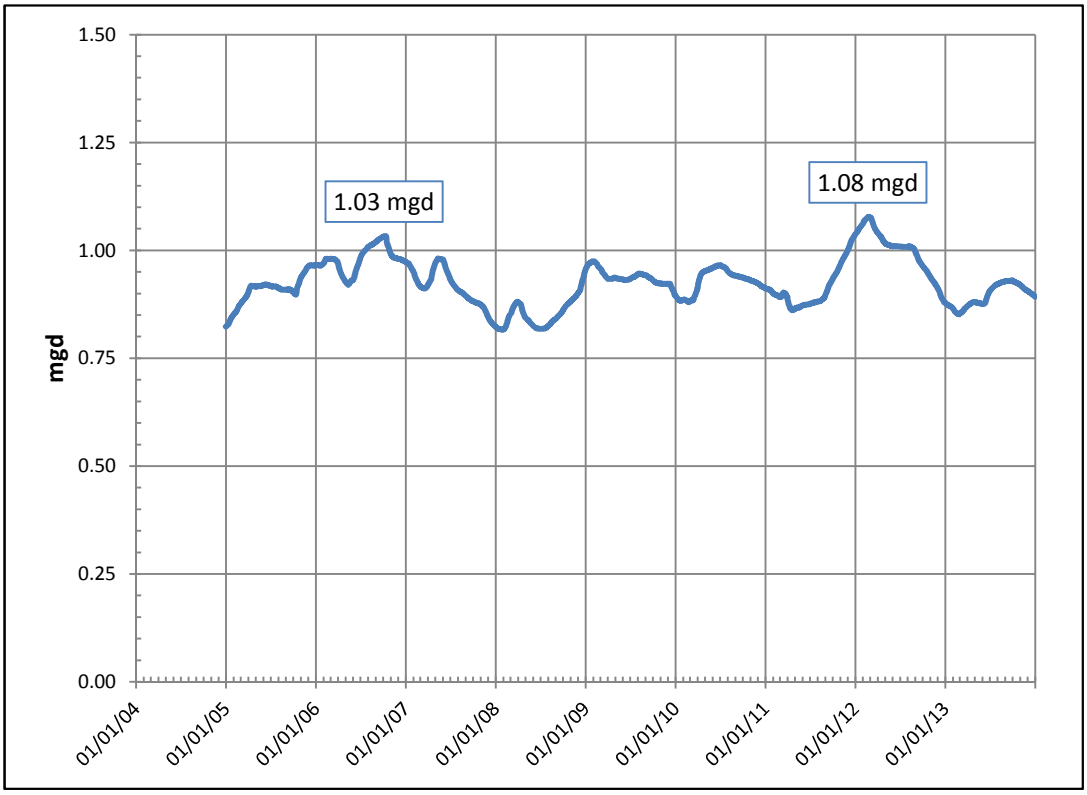


Figure 5-3 52-Week (Annual) Average Wastewater Flow

Recommendations for design of municipal wastewater treatment facilities published in TR-16 suggest using a flow of 70 to 100 gallons per capita per day unless historical data indicates per capita flow outside of this range. Although historical data suggests a per capita flow (127 gpd per person) that is outside the range of flows recommended in TR-16, it is important to recognize that the historical flow includes the impact of internal plant recycle flows (thickener overflow, tank drains, etc.) within the WWTF as well as septage. It is also important to consider that future increases in flow will likely occur within minimal extensions of sewer service. For these reasons, future flow projections based on population growth will be estimated based on a flow of 100 gpd per person, the upper end of the range recommended in TR-16.

Analysis of the flow monitoring data indicates daily average flows of 1.11 mgd and 0.96 mgd corresponding to the time periods when effluent limits for nitrogen removal are in effect (May 1 through October 31) and not in effect (November 1 through April 30), respectively.

Maximum Monthly Average Flow

Review of the data indicates that the maximum 30-day (monthly) average flow of 1.79 mgd was significantly influenced by extremely wet weather conditions from approximately mid-March through mid-April 2010 that resulted in widespread flooding across the region. As shown in Figure 5-4, the 30-day average flow recorded over this period was more than 20 percent greater than the next highest maximum 30-day average flow recorded over the 10-year period of record (1.45 mgd for April 4 through May 3, 2007). To avoid oversizing wastewater treatment facilities based on an extreme event, the current maximum monthly average flow is estimated at 1.45 mgd. Analysis of the data indicates that the maximum monthly average flow is not expected to vary significantly during time periods when nitrogen removal requirements are in effect (1.41 mgd for May 1 through October

31) and not in effect (1.45 mgd for November 1 through April 30). For planning purposes, a maximum monthly average flow of 1.45 mgd will be used for both periods.

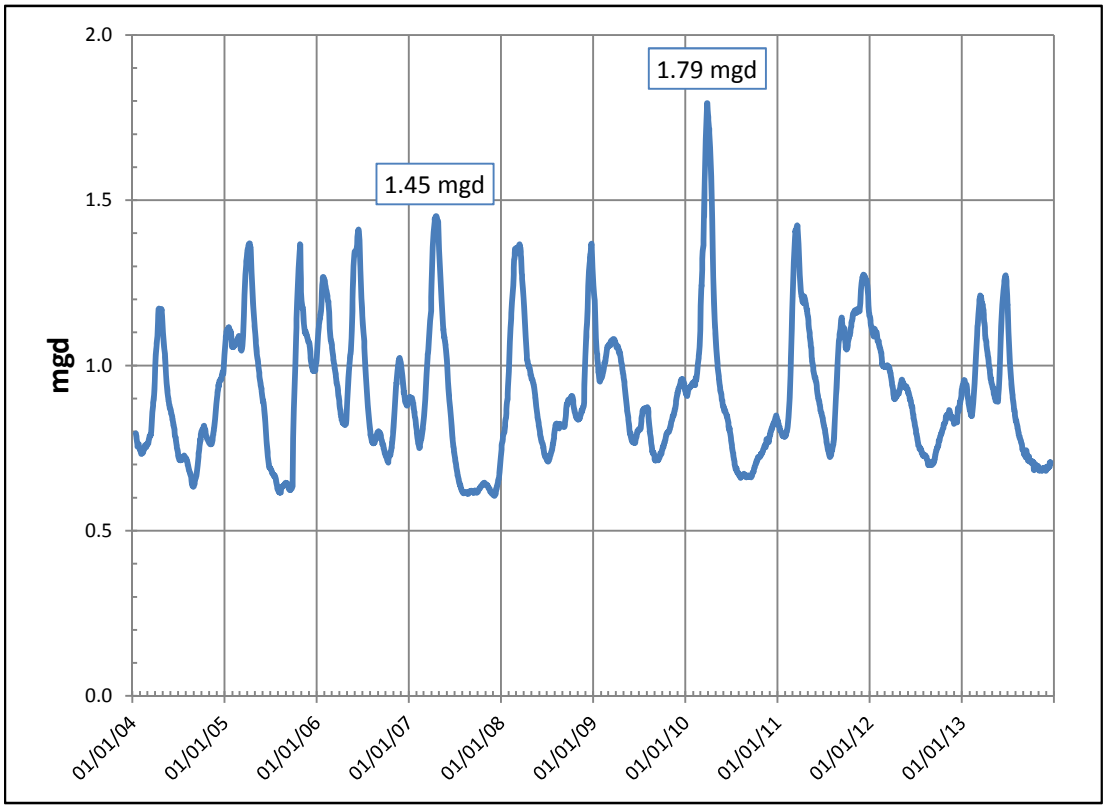


Figure 5-4 30-Day Average Wastewater Flow

Maximum 24-Hour Average Flow

Daily (24-hour average) flows recorded over the 10-year period of record are graphically illustrated in Figure 5-5. The top 10 peak flow days for the period are summarized as follows:

3.19 mgd ..... October 14, 2005
2.99 mgd ..... April 1, 2010
2.75 mgd ..... October 15, 2005
2.71 mgd ..... April 30, 2010
2.39 mgd ..... April 2, 2010
2.24 mgd ..... April 15, 2007
2.20 mgd ..... April 10, 2010
2.11 mgd ..... April 4, 2010
2.10 mgd ..... April 16, 2007
2.10 mgd ..... April 3, 2010

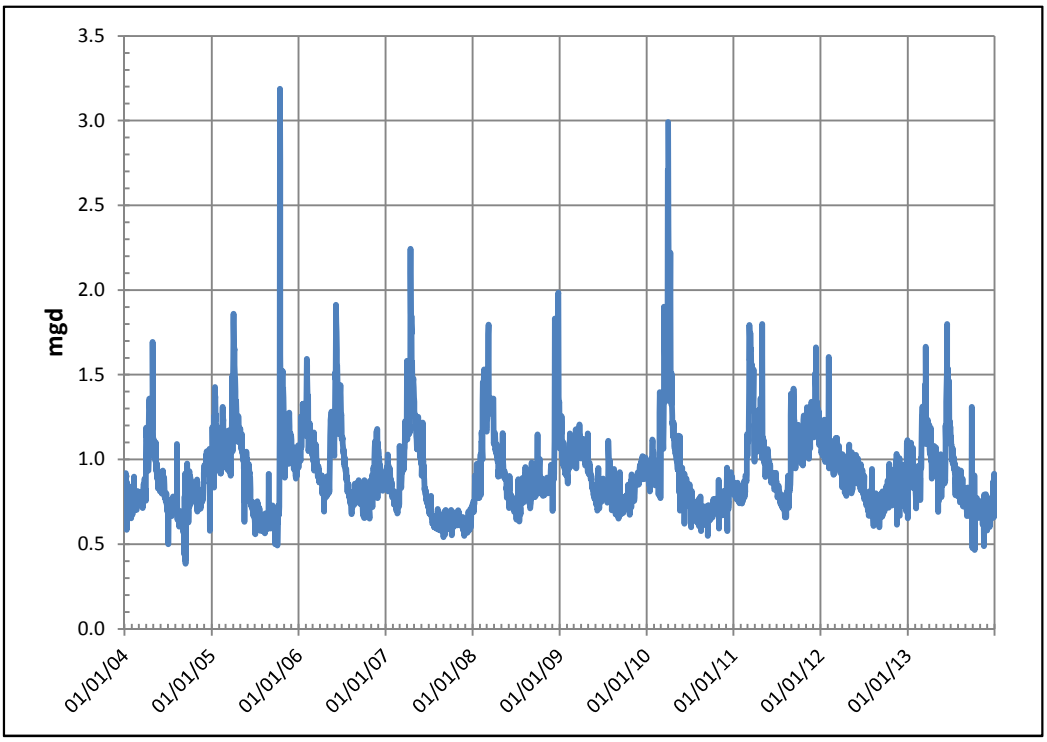


Figure 5-5 Daily Average Wastewater Flow

As expected, the peak flow days are all associated with wet weather conditions that typically occur in late fall and early spring when sewer I/I is at a maximum due to typically high groundwater conditions. Six of the top 10 peak flow days occurred in April 2010, when extreme wet weather conditions resulted in widespread flooding in the area. Two of the top 10 peak day flows occurred on October 14-15, 2005 when, according to records published by the National Climatic Data Center, more than 5.3 inches of precipitation were recorded at the NOAA weather station in Worcester, MA.

Discounting the periods of extreme wet weather conditions, a peak day (24-hour average) flow of 2.25 mgd was selected as representative of current operating conditions. Analysis of the data suggests that the peak day flow can be expected to occur during periods when nitrogen removal requirements are in effect and when those requirements are not in effect.

Peak Hourly Flow

Figure 5-6 summarizes peak hourly flows recorded over the 10-year period of record. The top 10 peak flow days for the period are summarized as follows:

5.50 mgd ..... March 17, 2013
4.70 mgd ..... May 8, 2005
4.00 mgd ..... October 30, 2008
4.00 mgd ..... April 1, 2010
3.70 mgd ..... April 9, 2010
3.50 mgd ..... March 30, 2010
3.50 mgd ..... April 6, 2010
3.40 mgd ..... October 15, 2005
3.35 mgd ..... October 14, 2005
3.35 mgd ..... March 21, 2006

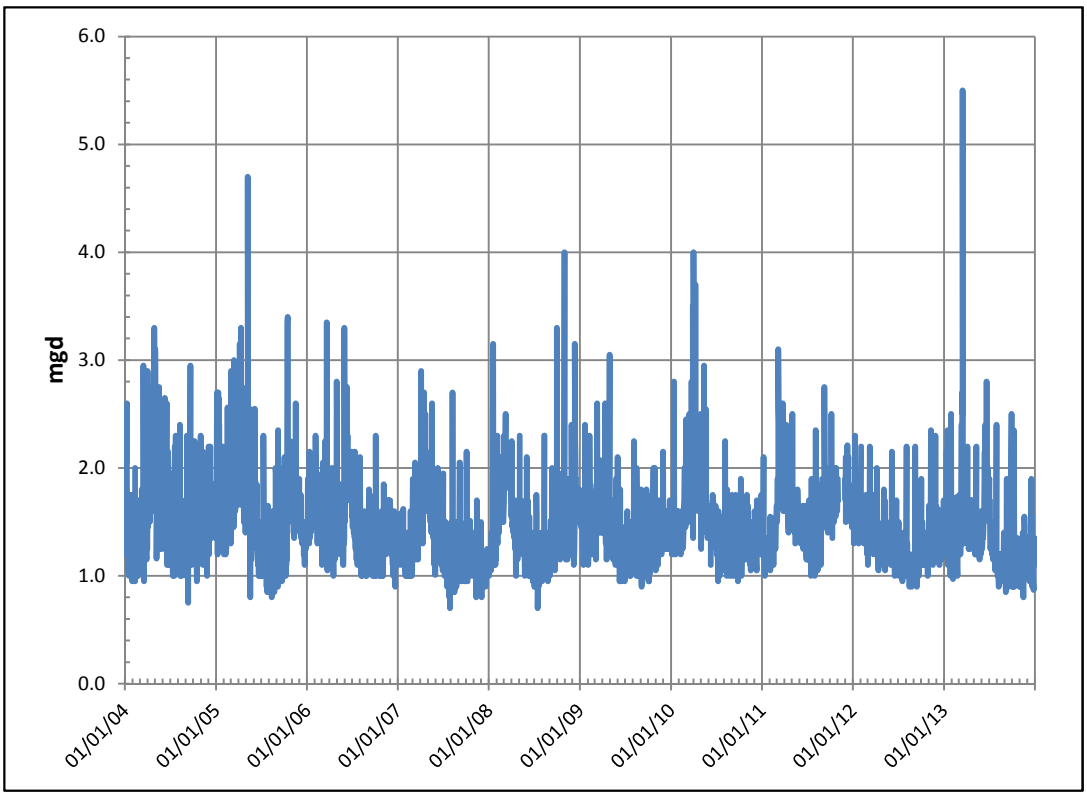


Figure 5-6 Daily Maximum (Peak Hour) Wastewater Flow

The top two peak hourly flows are considered to be data entry errors as the influent flow meter is calibrated for a maximum flow of 4 mgd. As expected, the list of the top peak hourly flow days is dominated by the days of extreme wet weather conditions (March-April 2010 and October 14-15, 2005). For planning purposes, a peak hourly flow of 4.0 mgd is considered to be representative of current operating conditions.

In summary, analysis of historical wastewater flow metering data collected and compiled by the Uxbridge WWTF staff indicates current wastewater flow conditions as shown in Table 5-5.

Table 5-5 Current Wastewater Flow Conditions

	May 1-October 31 (mgd)	November 1-April 30 (mgd)	Annual (mgd)
Daily average	0.96	1.11	1.03
Maximum month	1.45	1.45	1.45
Maximum 24-hour	2.25	2.25	2.25
Peak hourly	4.00	4.00	4.00

Existing Loads

1. **Analysis of Facility Sampling Data**

Routine sampling of the Uxbridge WWTF influent is performed in accordance with conditions of the discharge permit issued by MassDEP. Samples (24-hour composite) of the WWTF influent are collected by an automatic sampler located in the main pumping station. The location of the sampler is important because it is downstream of internal plant recycle flows (gravity thickener overflow, tank drains, etc.), which are returned to the wet well at the main pumping station via the plant drain

system. For this reason, the sampling data does not represent true influent wastewater characteristics.

Septage is not normally captured in the influent sample. However, when the septage holding tank reaches maximum capacity, it overflows to the plant drain system and is conveyed to the main pumping station. When this occurs, septage may also be picked up in the influent sample. The facility does not have the ability to determine if septage is overflowing from the septage holding tank to the main pumping station. As a result, the impact of septage overflows on historical data is unknown.

Laboratory analyses are typically performed three days per week for BOD_5, total suspended solids, and total ammonia and once per week for total phosphorus. Sampling results for the 10-year period of record are summarized in Table 5-6.

Table 5-6 WWTF Influent Wastewater Sampling Concentration Data

	Uxbridge WWTF Data	Typical Untreated Domestic Wastewater		
		Strong	Medium	Weak
BOD_5				
No. of data points	1547	400	220	110
Range, mg/L	23 – 1101			
Mean, mg/L	289			
Median, mg/L	267			
Standard deviation, mg/L	151			
TSS				
No. of data points	1563	350	220	100
Range, mg/L	0.4 – 3343			
Mean, mg/L	448			
Median, mg/L	389			
Standard deviation, mg/L	297			
Ammonia, total (as N)				
No. of data points	1493	50	25	12
Range, mg/L	0.1 – 50.1			
Mean, mg/L	20.1			
Median, mg/L	19.5			
Standard deviation, mg/L	7.1			
Phosphorus, total				
No. of data points	510	15	8	4
Range, mg/L	0.8 – 30.4			
Mean, mg/L	5.2			
Median, mg/L	4.6			
Standard deviation, mg/L	2.9			

As shown in Table 5-6, the sampling data appears to suggest influent characteristics that lean toward the “strong” end of “typical” concentrations for BOD_5 and TSS and toward the “weak” end of typical untreated domestic wastewater concentrations for total ammonia and total phosphorus. The concentration data for BOD_5 and suspended solids appear to be contrary to the wastewater flow data, which indicate that concentrations might tend to be weak due to the relatively significant contribution of flow from sewer I/I.

Based on the annual average flow of 1.03 mgd and mean concentrations indicated by the sampling data, annual average BOD_5 and suspended solids mass loads would be estimated at approximately 2,500 lbs per day and 3,800 lbs per day, respectively. Using the estimated sewer service area population, these loads are equivalent to per capita loadings of 0.31 and 0.47 lbs per person per day. These per capita loads are significantly greater than per capita loadings (0.17 to 0.22 lbs per capita per day for BOD and 0.20 to 0.25 lbs per capita per day depending on whether garbage grinders are prevalent in the sewer service area) recommended in TR-16 as "typical" for domestic wastewater. In comparison, the annual average mass load of phosphorus would be estimated at approximately 45 lbs per day, or approximately 0.0056 lbs per capita per day, which is roughly equivalent to the 0.006 lbs per capita per day recommended in TR-16 as "typical" for domestic wastewater. This observation is significant because phosphorus in domestic wastewater is largely present in soluble (dissolved) form. As a result, it seems that the influent sampling data for BOD_5 and TSS could be significantly impacted either by internal plant recycle flows or perhaps by solids accumulation at the sampling location (main pumping station wet well).

2. **Development of Estimated Existing Loads**

To evaluate the influent sampling data, GHD prepared a BioWin model for the existing wastewater treatment plant. The model was then used to assess performance based on the annual average wastewater flow for 2011 and mass loads based on sampling data. The model was not able to produce an output with these inputs – indicating that the data was likely erroneous. As discussed above, potential sources of error include the facility having no way to accurately measure the impact of septage overflow to the Main Pump Station and the large amount of I/I in the system.

The model was also used to assess performance based on the annual average wastewater flow for 2011 and mass loads based on the per capita loads recommended by TR-16 for typical domestic wastewater without prevalence of garbage grinders (0.17, 0.20, 0.04, and 0.006 for BOD_5, TSS, TKN, and phosphorus, respectively). The model results for these inputs indicated similar performance based on analysis of other sampling data collected at the plant (i.e., aeration tank MLSS, effluent ammonia, effluent BOD_5, etc.).

Based on the correlation of plant performance and BioWin model results, raw wastewater loads of BOD_5, TSS, TKN, and phosphorus were estimated based on the typical per capita loads and peaking factors recommended in TR-16 (Table 5-7).

Table 5-7 Typical Per Capita Loadings and Peaking Factors

Parameter	Per Capita Loading (lbs per day per person)	Peaking Factor	
		Maximum Month: Annual Average	Peak Day: Annual Average
BOD_5	0.17	1.26	1.60
TSS	0.20	1.30	1.90
TKN	0.04	1.24	1.40
Phosphorus	0.006	1.20	1.36

Table 5-8 summarizes estimated daily average, maximum monthly average, and peak 24-hour average flows and loadings for current operating conditions at the Uxbridge WWTF.

Table 5-8 Estimated Current Wastewater Flows and Loadings Based on TR-16

	May 1 – October 31	November 1 – April 30	Annual
Daily Average			
Flow, mgd	0.96	1.11	1.03
BOD_5, mg/L	172	149	161
BOD_5, lb/day	1,380	1,380	1,380
TSS, mg/L	202	175	189
TSS, lb/day	1,620	1,620	1,620
TKN, mg/L	40	35	37
TKN, lb/day	320	320	320
TP, mg/L	6.2	5.4	5.8
TP, lb/day	50	50	50
Maximum Monthly Average			
Flow, mgd	1.45	1.45	1.45
BOD_5, mg/L	144	144	144
BOD_5, lb/day	1,740	1,740	1,740
TSS, mg/L	174	174	174
TSS, lb/day	2,110	2,110	2,110
TKN, mg/L	33	33	33
TKN, lb/day	400	400	400
TP, mg/L	5.0	5.0	5.0
TP, lb/day	60	60	60
Maximum 24-Hour			
Flow, mgd	2.25	2.25	2.25
BOD_5, mg/L	118	118	118
BOD_5, lb/day	2,210	2,210	2,210
TSS, mg/L	164	164	164
TSS, lb/day	3,080	3,080	3,080
TKN, mg/L	24	24	24
TKN, lb/day	450	450	450
TP, mg/L	3.6	3.6	3.6
TP, lb/day	68	68	68

5.1.4 Summary of Wastewater Performance and Compliance History

Table 5-9 shows the effluent discharge limits in effect when the plant was originally designed and constructed. Table 5-10 contains the effluent discharge limits issued in 1999. No substantive modifications were made to the plant upon issuance of the 1999 permit.

Table 5-9 Wastewater Treatment Design Criteria

Parameter	Effluent Limit
BOD_5	30 mg/L
Suspended solids	30 mg/L
Fecal coliform	200/100 mL
pH	6.0 - 9.0
Phosphorus	1 mg/L

Table 5-10 1999 NPDES Effluent Permit Limits

Parameter	Limit – Average Monthly
(C) BOD_5	
November – May	30 mg/L
June - October	20 mg/L
TSS	
November – May	30 mg/L
June - October	20 mg/L
Ammonia-Nitrogen	
December – April	15 mg/L
May, November	10 mg/L
June - October	5 mg/L
Total Phosphorus	
April - October	1.0 mg/L
November - March	Report
Nitrate, Nitrite	Report
Fecal Coliform	
April - October	200 /100 mL
Dissolved Oxygen	5.0 mg/L

Over the past five years, the plant has performed exceptionally well. BOD and TSS levels on average were less than 3 and 2 mg/L, respectively. The average ammonia and phosphorus levels over the same time period were 0.1 and 1.1 mg/L, respectively.

Uxbridge has violated its dissolved oxygen permit level of 5 mg/L during low flow conditions in the summer. The facility experienced 12 violations of the minimum DO requirement from 2005 to 2010.

In June of 2013, a new permit was issued by USEPA. The Town advised USEPA that it would be unable to meet the new permit with its existing infrastructure. USEPA issued the Town an Order for Compliance on Consent, outlining a schedule for the Town to come into compliance with the new permit.

Table 5-11 highlights select differences between the 1999 and 2013 permits. Both permits are included in Appendix A. Although USEPA could not guarantee that permit limits would not become more stringent in the future, they did not note any foreseeable changes to permit limits in the "Uxbridge Wastewater Treatment Facility – Response to Comments" (see Appendix A.)

Table 5-11 1999 and 2013 NPDES Permit Comparison

Parameter	1999 Permit – Monthly Limit	2013 Permit - Monthly Limit
Total Nitrogen	Report Nitrate, Nitrite	
May – October		8 mg/L
November - April		Report
Total Phosphorus		
April - October	1.0 mg/L	0.2 mg/L
November - March	Report	1.0 mg/L
Fecal Coliform	200 / 100 mL	
Escherichia Coli		
April - October	None	126 cfu/100 mL
Entercocci	None	73 cfu/100 mL
Aluminum	None	87 µg/L

5.1.5 Projected Wastewater Flows and Characteristics

Wastewater flow and load projections were developed based on analysis of current operating conditions at the Uxbridge WWTF and population growth projections for the Town of Uxbridge.

As discussed in Section 5.1.3, the population of the Town of Uxbridge is projected to increase by approximately 5,100 persons over the 20-year planning period (2015-2035). For planning purposes, and to maintain consistency with the 2012 Blackstone Prioritization Report produced by the Central Massachusetts Regional Planning Commission, it has been assumed that all of the population growth will occur either within areas of the Town that are currently served by sanitary sewers or within areas in close proximity to the current sewer service area where future extension of municipal sewers appears practical. Revitalization of city and town centers and neighborhoods through the promotion of development that is compact, conserves land and encourages the remediation and reuse of existing sites, structures and infrastructure rather than new construction in undeveloped areas is also promoted in the Sustainable Development Principles of the Commonwealth of Massachusetts.

Wastewater flows and loads associated with the projected population growth within the sewer service area were estimated based on the per capita contributions and peaking factors summarized in Table 5-9. It is assumed that commercial and industrial growth will develop at the current ratio of residential properties to commercial and industrial. The per capita flows and loads are based on “typical” per capita contributions for domestic sewage published in the 2011 Edition of TR-16 “Guides for the Design of Wastewater Treatment Works”. Based on analysis of historical flow metering records, metered water use and metered sewage flow appear to be in the range of 65 and 127 gal/capita/day, respectively. However, flow metering records for water production indicate a fair amount of unaccounted usage of water. The difference between the per capita metered water use and sewage flow is attributed to a combination of unmetered water consumption and sewer infiltration/inflow. A per capita flow of 100 gallons per day for the projected increase in sewer service area population is considered appropriate as sewer extensions and connections will be accomplished by methods resulting in less infiltration and inflow. The per capita rate represents a composite rate of residential flow and commercial/industrial flows.

Peaking factors for wastewater flow are based on analysis of flow monitoring data collected and compiled by the WWTF staff over the 10-year period of January 2004 through December 2013. Peaking factors for Five-Day Biochemical Oxygen Demand (BOD_5), total suspended solids (TSS), total Kjeldahl nitrogen (TKN) and total phosphorus (TP) are based on typical peaking factors for domestic sewage published in TR-16.

As discussed in the Section 5.1.3 it was assumed that the recent increase in septage volume, attributed to a growing population and a recent decision by another nearby wastewater treatment facility to discontinue accepting septage for treatment, is expected to continue. For planning purposes and for sizing of wastewater treatment facilities, current septage volumes have been estimated based on a 30 percent increase in maximum septage volumes received over the 5-year period of 2009 through 2013.

Table 5-12 Basis for Wastewater Flow and Load Projections

	Per Capita Flow/Load	Peaking Factor (ratio to annual average)		
		Maximum Month	Peak Day	Peak Hour
Flow	**100 gal/day**	**1.45**	**3.19**	**4.00**
BOD5	**0.17 lb/day**	**1.26**	**1.60**	**- - -**
Suspended Solids (TSS)	**0.20 lb/day**	**1.30**	**1.90**	**- - -**
Total Kjeldahl Nitrogen (TKN)	**0.04 lb/day**	**1.24**	**1.40**	**- - -**
Total Phosphorus (TP)	**0.006 lb/day**	**1.20**	**1.36**	**- - -**

Table 5-13 summarizes wastewater flow and load projections developed for the sewer service area. The projections are based on assessment of current sewage flows and loads and estimated flows and loads for the population growth (5,100 persons) projected to occur over the 20-year planning period.

Table 5-13 Current and Projected Future Wastewater Flows and Loads

	Current Condition (2014)	Future Growth Capacity	Design Condition (2035)
Wastewater Flow			
Annual Average	**1.0 MGD**	**0.5 MGD**	**1.5 MGD**
Maximum Month	**1.5 MGD**	**0.7 MGD**	**2.2 MGD**
Peak 24-Hour	**3.2 MGD**	**1.6 MGD**	**4.8 MGD**
Peak Hour	**4.0 MGD**	**2.0 MGD**	**6.0 MGD**
Biochemical Oxygen Demand (BOD5)			
Concentration			
Annual Average	165 mg/L	205 mg/L	179 mg/L
Maximum Month	144 mg/L	178 mg/L	156 mg/L
Peak 24-Hour	83 mg/L	103 mg/L	90 mg/L
Mass Load			
Annual Average	1,380 lb/day	870 lb/day	2,250 lb/day
Maximum Month	1,740 lb/day	1,100 lb/day	2,840 lb/day
Peak 24-Hour	2,210 lb/day	1,400 lb/day	3,610 lb/day
Suspended Solids, Total (TSS)			
Concentration			
Annual Average			
Maximum Month	194 mg/L	240 mg/L	210 mg/L
Peak 24-Hour	174 mg/L	216 mg/L	188 mg/L
Mass Load	116 mg/L	143 mg/L	125 mg/L
Annual Average			
Maximum Month	1,620 lb/day	1,020 lb/day	2,640 lb/day
Peak 24-Hour	2,110 lb/day	1,330 lb/day	3,440 lb/day
	3,080 lb/day	1,940 lb/day	5,020 lb/day

	Current Condition (2014)	Future Growth Capacity	Design Condition (2035)
Total Kjeldahl Nitrogen (TKN)			
Concentration			
Annual Average	40 mg/L	49 mg/L	43 mg/L
Maximum Month	34 mg/L	44 mg/L	37 mg/L
Peak 24-Hour	18 mg/L	22 mg/L	19 mg/L
Mass Load			
Annual Average	330 lb/day	210 lb/day	540 lb/day
Maximum Month	410 lb/day	270 lb/day	680 lb/day
Peak 24-Hour	470 lb/day	300 lb/day	770 lb/day
Phosphorus, Total (TP)			
Concentration			
Annual Average	5.9 mg/L	7.3 mg/L	6.4 mg/L
Maximum Month	4.9 mg/L	6.0 mg/L	5.3 mg/L
Peak 24-Hour	2.5 mg/L	3.1 mg/L	2.7 mg/L
Mass Load			
Annual Average	49 lb/day	31 lb/day	80 lb/day
Maximum Month	59 lb/day	37 lb/day	96 lb/day
Peak 24-Hour	67 lb/day	42 lb/day	109 lb/day

The WWTF is currently permitted to discharge 2.5 million gallons per day (MGD) on an average monthly basis. Since the projected average monthly flow in 2035 is less than the design capacity, the facility upgrades will be divided into two phases. In Phase 1 the WWTF will be upgraded to meet the project average monthly flow of 1.5 MGD (max month flow of 2.2 mgd). Phase 2 will be a future build-out that will allow the WWTF to treat to its full design capacity of 2.5 MGD.

5.1.6 Review and Condition Assessment of Existing Liquid Treatment Facilities

Wastewater from within the Town flows by gravity to the main pumping station at the WWTF site. All flow is then pumped to preliminary treatment and enters the treatment process. Figure 5-7 illustrates the liquid treatment schematic for the Uxbridge WWTF.

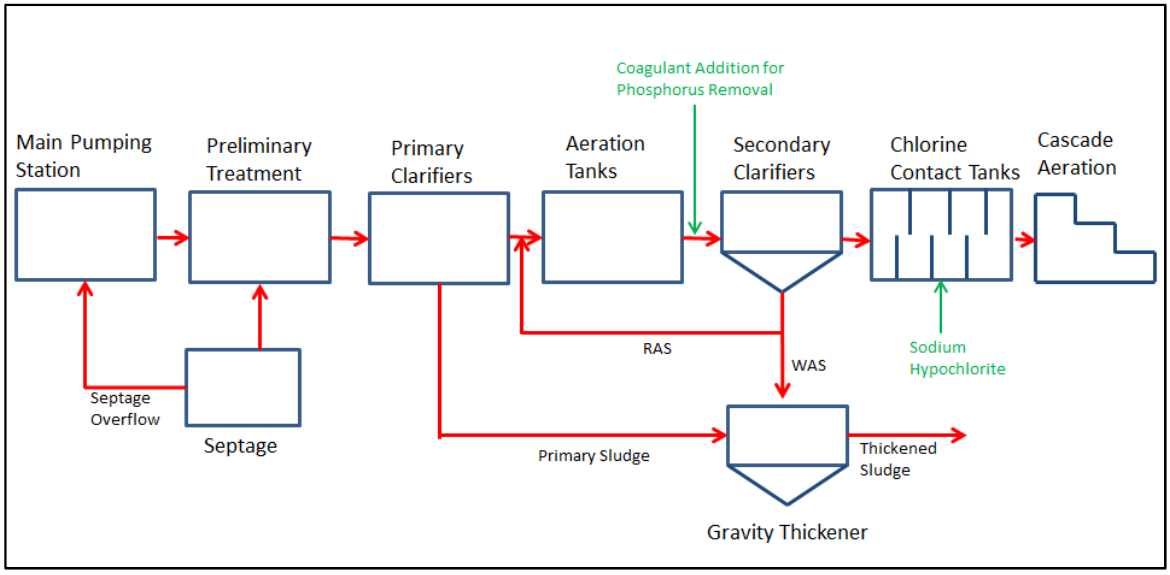


Figure 5-7 Uxbrige WWTF Liquid Treatment Schematic

From preliminary treatment, wastewater flows by gravity through the treatment facility. The flow first passes through an aerated grit chamber and then through a grinder, and is then conveyed by gravity to the primary settling tanks. After passing through the primary settling tanks, flow is conveyed by gravity to the aeration tanks.

The facility has three aeration tanks which have diffused aeration. The blowers for these tanks are located within the Process Building. The aeration tanks are set up to operate with minimal air in the first tank, full aeration in the second tank, and low air in the third tank to remove some nitrogen, recover alkalinity, and decrease energy usage.

The aeration tanks are followed by three secondary clarifiers. A phosphorus removal coagulant, which is stored in a tank in the Process Building, is added to the secondary clarifier distribution box prior to the sludge entering the clarifiers for phosphorus removal in the secondary clarifiers. Sludge that settles in the secondary clarifiers is pumped back to the aeration tanks for further processing. The return and waste activated sludge pumps are located in the sludge pumping station.

Effluent from the secondary clarifiers flows into chlorine contact tanks for disinfection. Sodium hypochlorite, which is stored in the Process Building, is added to the beginning of the chlorine contact tanks for disinfection. Flow then passes through a cascade aeration system for post-aeration, after which the plant effluent is discharged to the Blackstone River.

Septage received at this facility is stored in a septage storage tank and is then introduced to the waste stream at the grit chamber. Septage received in quantities that exceed the capacity of the storage tank will overflow to the on-site main pumping station.

All plant recycle flows are conveyed to the on-site main pumping station where they enter into the plant influent prior to sampling. Most septage is introduced to the waste stream after the influent sampler; however, some septage overflows the septage storage tank and flows by gravity to the main pumping station and that septage will be included in the influent samples. The effluent sampler is located after disinfection.

It should be noted that much of the existing facility is now 30 years old and well beyond its design life. The facility has been well maintained by the plant staff; however, equipment that has reached this age, whether it is for process, electrical or HVAC, will become much less reliable and very difficult to service. Spare parts are no longer routinely stocked for outdated equipment as demand declines, requiring special order or much more expensive custom order status.

5.1.7 Review and Condition Assessment of Existing Septage and Sludge Treatment Facilities

Septage is received at the facility in the septage holding tank. It is introduced to the treatment process during preliminary treatment. If the volume of septage in the tank exceeds its capacity, the tank overflows to the main pumping station.

Primary and waste activated sludge are co-thickened in a gravity thickener prior to being hauled off site for disposal as a liquid. Sludge is currently disposed of at the New England Treatment Company sewage sludge incinerator in Woonsocket, RI.

5.1.8 Inventory of Facilities

A process-by-process evaluation of the facilities follows. Flow-based criteria will not be reviewed as part of this section since projected future flows will be developed in a subsequent phase of the Project. In this evaluation, mechanical equipment is assumed to have a 20-year life. Concrete facilities were reviewed by a GHD structural engineer on April 3, 2013. All facilities were evaluated against current design standards from several resources including:

- TR-16 Guides for the Design of Wastewater Treatment Works; New England Interstate Water Pollution Control Commission, 2011 Edition.
- Water Environment Federation; “Design of Municipal Wastewater Treatment Plants”; WEF Manual of Practice No 8; Fifth Edition; 2010
- Tchobanoglous, George; Burton, L. Franklin; Stensel, H. David; “Wastewater Engineering: Treatment and Reuse”; Metcalf and Eddy, Inc.; Fourth Edition; 2003

Preliminary Treatment

1. **Existing.** Water flows in a 16-inch force main from the main pumping station to an aerated grit chamber and then to an JWC Channel Monster comminutor. Two blowers located in the Blower and Pump Building provide air to the aerated grit chamber. Grit that settles in the chamber is removed by a bucket elevator to a screw conveyor and hauled off site for landfill disposal. A manual bar screen is used to bypass the grinder if needed. The manual bar screen is designed to remove materials greater than 1-1/2 inches. Flow

through the grinder or bypass bar screen is controlled by the positioning of four slide gates. Physical characteristics for the aerated grit chamber, grit screw conveyer, grit dewatering screw and comminutor are included in Tables 5-14 to 5-16.

Table 5-14 Aerated Grit Chamber – Physical Characteristics

Parameter	Value
Width	12 feet
Length	17 feet
Effective depth	10 feet
Manufacturer	FMC

Table 5-15 Grit Screw Conveyer – Physical Characteristics

Parameter	Value
Diameter	12 inches
Length	18 feet
Manufacturer	FMC

Table 5-16 Grit Dewatering Screw – Physical Characteristics

Parameter	Value
Diameter	12 inches
Length	10 feet
Manufacturer	FMC

Table 5-17 Comminutor – Physical Characteristics

Parameter	Value
Model	CMD2410-AD
Manufacturer	JWC

2. **Evaluation.** Grinding influent screenings is no longer considered the standard in the industry. Ground material can be re-aggravated and cause problems in sensitive downstream processes. Many downstream treatment technologies require removal of screenings with 6 mm or smaller screen openings. Rags and stringy material that make it through the grinder may also clog pumps downstream.

   The mechanical equipment, including the grit chamber equipment, blowers, and related accessories, is almost 35 years old and well beyond their design life. The concrete in this area was found to be in good condition.

Primary Settling Basins

1. **Existing.** The facility has three primary settling basins (Table 5-18) with a total of 3,600 square feet of settling area and a side water depth of 10 feet. Sludge and scum are collected by a chain-and-flight mechanism with non-metallic flights mounted on parallel chains. Settled sludge is carried along the bottom of the basin by the flights to sludge hoppers located at the influent end of the basins. A cross collector screw mechanism in each tank transfers the sludge to the tank's hopper where it is removed by the facility's four primary sludge pumps (Table 5-19), located in the utility tunnel, and is pumped to the sludge holding tank. A Penn Valley Double Disk sludge pump is intended to be a standby unit. It has a common header and can be used as needed with any of the primary settling tanks. Scum is collected in the scum troughs at the end of the tank and pumped out of the tank by primary scum pumps (Table 5-20) to the sludge holding tank.

Table 5-18 Primary Settling Tanks

Parameter	Value
Number of units	3
Length	60 feet
Width	20 feet
Side water depth	10 feet
Surface area	3,600 feet

Table 5-19 Primary Sludge Pumps

Parameter	Value	
Type	Air-operated diaphragm	Double Disc
Quantity	3	1
Drive	Variable (timer)	
Capacity	152 gpm	
Strokes/minute	40	
Gallons/stroke	3.8	
Manufacturer	Dorr-Oliver	Penn Valley Pump Company Inc.

Table 5-20 Primary Scum Pumps

Parameter	Value	
Type	Diaphragm, mechanical	Diaphragm, air operated
Quantity	1	1
Drive	Variable	Variable (timer)
Capacity	108 gpm	152 gpm
Manufacturer	ITT, Marlow	Dorr-Oliver

2. **Evaluation.** The tanks are adequately size according to TR-16 guidance. The overflow weirs should be adjustable. The mechanical equipment is almost 35 years old and well beyond its design life. The concrete tank in this area was found to be in good condition.

Primary Effluent Flow Distribution

1. **Existing.** Flow from the primary clarifiers enters Diversion Chamber #2 through a 24-inch pipe. Adjustable weirs control flow from the diversion chamber to each of the three aeration tanks.
2. **Evaluation.** Flow distribution to the aeration tanks is inadequate as it does not provide an acceptable means of distributing flow. Influent flow to each unit should be controlled by slide gates with visible status indication. Weirs and flow route symmetry should not be relied upon for flow control.

Aeration Tanks

1. **Existing.** The facility has three existing aeration tanks (Table 5-21); each is 66 feet long by 30 feet wide by 17.5 feet deep. Air is distributed through air diffusers in each tank through an 18-inch air pipe. Air is provided to the system through four blowers (Table 5-22) located in the Blower Room of the Process Building. An 18-inch air header runs from the Process Building through the utility tunnel to the air diffusers in each tank.

   Each aeration tank is equipped with a foam control spray line. Sludge bulking is controlled, if needed, through the addition of sodium hypochlorite at the secondary sludge pumping station. The tanks were designed to primarily operate in parallel with mixed liquor flowing over an adjustable weir gate at the end of each tank to a common outlet channel and through a 24-inch pipe to the rapid mix basin. In order to achieve some denitrification in the aeration tanks, the operators are currently operating the aeration tanks in series.

Table 5-21 Aeration Tanks

Parameter	Value
Number of units	3
Length	66 feet
Width	30 feet
Water depth	15 feet

Table 5-22 Aeration Blowers

Parameter	Value
Number of units	4
Type	Centrifugal
Manufacturer	Hoffman
Model number	74106A1

2. **Evaluation.** All existing support systems including the aeration blowers and diffusers would require replacement due to the age of the mechanical equipment. The concrete in this area was found to be in good condition.

Rapid Mix Basin and Process Chemical Additive System

1. **Existing.** The rapid mix basin (Table 5-23) is used to introduce chemicals into the wastewater. The basin contains two turbine mixers, which are reused from the original vacuum filter floor tanks. The facility currently uses alum for phosphorus removal, but other chemicals may be used. The chemical is stored in Chemical Room No. 2 in the Process Building and is piped through the utility tunnel to the rapid mix basin. The chemical feed pumps are described in Table 5-24. Flow is directed from the rapid mix basin down a 24-inch pipe to Diversion Chamber No. 3.

Table 5-23 Rapid Mix Basin

Parameter	Value
Length	11 feet
Width	5 feet
Depth	6 feet
Unit volume	2,468 gallons

Table 5-24 Chemical Feed Pumps

Parameter	Value	
Chemical	Alum	Sodium hypochlorite
Quantity	2	3
Type	Duplex diaphragm	Diaphragm
Drive	Constant	SCR variable
Capacity, gph	120	32

2. **Evaluation.** Flow distribution to the secondary clarifiers does not meet current standards for maintaining quiescent conditions that are conducive for a good flow split. Mechanical equipment is almost 35 years old and well beyond its design life. The concrete in this area was found to be in good condition.

Secondary Clarifiers

1. **Existing.** There are three existing 57-feet diameter, 12-feet deep secondary clarifiers equipped with updraft tubes for high-rate sludge return (Table 5-25). Flow enters the center feedwell of each clarifier through a 16-inch ductile iron pipe and is controlled by the weir level setting in each clarifier. Settled sludge is withdrawn through a suction reader. Scum is skimmed off the surface into a scum collection box. From April to October, when the plant is required to remove phosphorus, a coagulant is added ahead of the secondary clarifiers for phosphorus precipitation. A portion of the sludge collected in the clarifiers is returned to the aeration tanks by the sludge return pumps (Table 5-26) located in the utility tunnel. The remaining sludge is pumped by waste activated sludge (Table 5-27) pumps to the sludge holding tank.

Table 5-25 Secondary Clarifiers

Parameter	Value
Quantity	3
Diameter	57 feet
Depth	12 feet
Unit volume	229,046 gallons
Unit surface area	2,552 square feet

Table 5-26 Return Sludge Pumps

Parameter	Value
Quantity	4
Type	Centrifugal, non-clog
Drive	Variable
Unit capacity, gpm	100 to 500

Table 5-27 Waste Activated Sludge Pumps

Parameter	Value
Quantity	2
Type	Diaphragm (air operated)
Manufacturer	Dorr-Oliver
Drive	Variable
Unit capacity, gpm	152

2. **Evaluation.** The mechanical equipment is almost 35 years old and well past its design life. The concrete in this area was found to be in good condition.

Chlorine Contact Tanks

1. **Existing.** The facility uses sodium hypochlorite to kill remaining pathogenic bacteria that was not removed in previous plant processes. The physical characteristics of the facilities chlorine contact tanks are outlined in Table 5-28.
2. **Evaluation.** The mechanical equipment is almost 35 years old and well past its design life. The concrete in this area was found to be in good condition.

Table 5-28 Chlorine Contact Tanks

Parameter	Value
Number of basins	2
Length	50 feet
Width	10 feet
Depth	10 feet
Unit volume	37,400 gallons

Cascade Aeration

1. **Existing.** Cascade aeration is used to increase the level of dissolved oxygen in the effluent. Once flow leaves the chlorine contact tank, it is aerated by flowing down a set of 11 cascade aerator steps.
2. **Evaluation.** The present cascade aeration system is undersized and cannot meet the effluent dissolved oxygen permit requirement of 5 mg/L under low flow summer conditions. A portion of the structure is located within the 100-year flood zone. The concrete in this area was found to be in good condition.

Sludge Holding Tank

1. **Existing.** A sludge holding tank is used to store waste activated sludge (Table 5-29). Air diffusers in the tank are used to mix oxygen and hypochlorite, if used, into the sludge. Two separate 6-inch pipes introduce waste activated sludge and primary sludge into the tank.
2. **Evaluation**. The mechanical equipment is almost 35 years old and well past its design life. The concrete in this area was found to be in good condition.

Table 5-29 Sludge Holding Tank

Parameter	Value
Length	70 feet
Width	25 feet
Depth	15 feet
Unit volume	196,350 gallons
Solids capacity	49,140 lbs.
Solids storage	6 days

Gravity Thickener

1. **Existing**. The Uxbridge WWTF uses a co-settling process where activated sludge is returned to the primary tanks for co-settling with primary sludge (Table 5-30). The combined sludges are thickened and then withdrawn from the thickener by thickened sludge pumps. The facility has one Dorr-Oliver air-operated diaphragm pump and one WEMCO pump. Overflow from the thickener is returned to Diversion Chamber No. 1.
2. **Evaluation**. The mechanical equipment is almost 35 years old and well past its design life. The concrete in this area was found to be in good condition.

Table 5-30 Gravity Thickener

Parameter	Value
Diameter	38 feet
Depth	8 feet
Surface area	49,140 lbs.
Solids loading	6.2 square feet/day

Septage Receiving

1. **Existing.** The facility has a septage storage tank with a maximum holding capacity of approximately 7,700 gallons. Septage that cannot be pumped from the tank will overflow to the main pumping station.
2. **Evaluation.** Excessive overflows from the septage receiving tank are expected to be impacting influent wastewater samples. The volume of the tank will be evaluated further in subsequent phases of the Project. The concrete in this area was found to be in good condition.

Plant Water System

1. **Existing.** The main pumping station houses the plant water system which circulates disinfected effluent flow from the chlorine contact tank through a dual basket strainer for non-potable water uses within the facility. A hydropneumatic tank is used to maintain pressure in the system and an air compressor is used to maintain an air cushion in the tank. Physical characteristics of the pumps, hydropneumatic tank, and air compressor are outlined in Tables 5-31 through 5-33, respectively.
2. **Evaluation**. The plant water system is almost 35 years old and well beyond its useful life.

Table 5-31 Plant Water Pumps

Parameter	Value
Quantity	2
Type	Centrifugal horizontal
Drive	Constant
Size	10 HP
Capacity	150 gpm
Manufacturer	Allis-Chalmers

Table 5-32 Hydropneumatic Tank

Parameter	Value
Quantity	1
Diameter	54 inches
Length	120 inches
Capacity	1,000 gallons
Working pressure	75 psi
Manufacturer	John L. Clemens Company

Table 5-33 Air Compressor

Parameter	Value
Quantity	1
Rating	100 psi
Manufacturer	Kellog-American

Odor Control

1. **Existing.** Sodium hypochlorite is applied at the influent force main and septage holding tank to destroy existing odors and slow down odor-causing bacterial growth.
2. **Evaluation.** Depending on the quantity that is required, relying on chemical addition of odor control can result in high operation and maintenance costs for the facility.

5.1.9 Effluent Disposal

The effluent from the WWTF flows by gravity through a 20-inch diameter pipe to the Blackstone River.

5.1.10 Residuals Disposal

Sludge is hauled in a liquid state and disposed of at the incinerator in Woonsocket, RI. The facility produced approximately 375 tons of dry sludge in 2013.

5.1.11 Operations and Maintenance

The "*Operation and Maintenance Manual for the Uxbridge Wastewater Treatment Facility, Uxbridge Massachusetts,"* produced by York Wastewater Consultants, Inc. in 1982, outlines the maintenance procedures employed by the facility and operating procedures for emergencies.

Annual operations are financed through an Enterprise Fund. Operations and maintenance costs for Fiscal Year 2014 are summarized in Table 5-34.

Table 5-34 Fiscal Year 2014 Operations and Maintenance Costs

Item	Cost
Salares	$337,389
Energy	$160,000
Building repairs and maintenance	$15,700
Equipment repairs and maintenance	$25,000
Property-related services	$175,000
Professional and technical services	$20,000
Communications	$2,000
Training and professional development	$2,000
Administration and office supplies	$3,000
Custodial supplies	$2,500
Vehicular supplies	$2,500
Food and food services	$100
Public works supplies	$80,000
Business travel	$400
Dues, memberships, and licensing	$2,000
Total Cost	**$827,589**

5.1.12 Summary

Overall, the existing WWTF is operating well and is well maintained. However the majority of the equipment is from the facility's original construction and is well past its useful life. While the facility was able to meet the 1999 permit without upgrading, it will be unable to meet the more stringent conditions contained in the 2013 permit with its existing infrastructure.

5.2 Existing Wastewater Collection System

5.2.1 System History

The Town of Uxbridge has a separate sanitary collection system with five pumping stations. The location of the pump stations is shown in Figure 5-8. Most of the system is comprised of asbestos cement (AC) with portions made of polyvinyl chloride (PVC), vitrified clay, and ductile iron. The original sewer system was built in the late 1970s and has added several sewer extensions. The majority of the original sewer system is AC; most of the extensions were constructed with PVC pipe in the 1980s. Manholes throughout the system are precast concrete. Though the newer manholes typically have blind pickholes, many of the manholes in the older section of the system have open pickholes.

5.2.2 Compliance History

The Town has had seven reported sanitary overflows as outlined in Table 5-35.

Table 5-35 Reported Sanitary Sewer Overflows

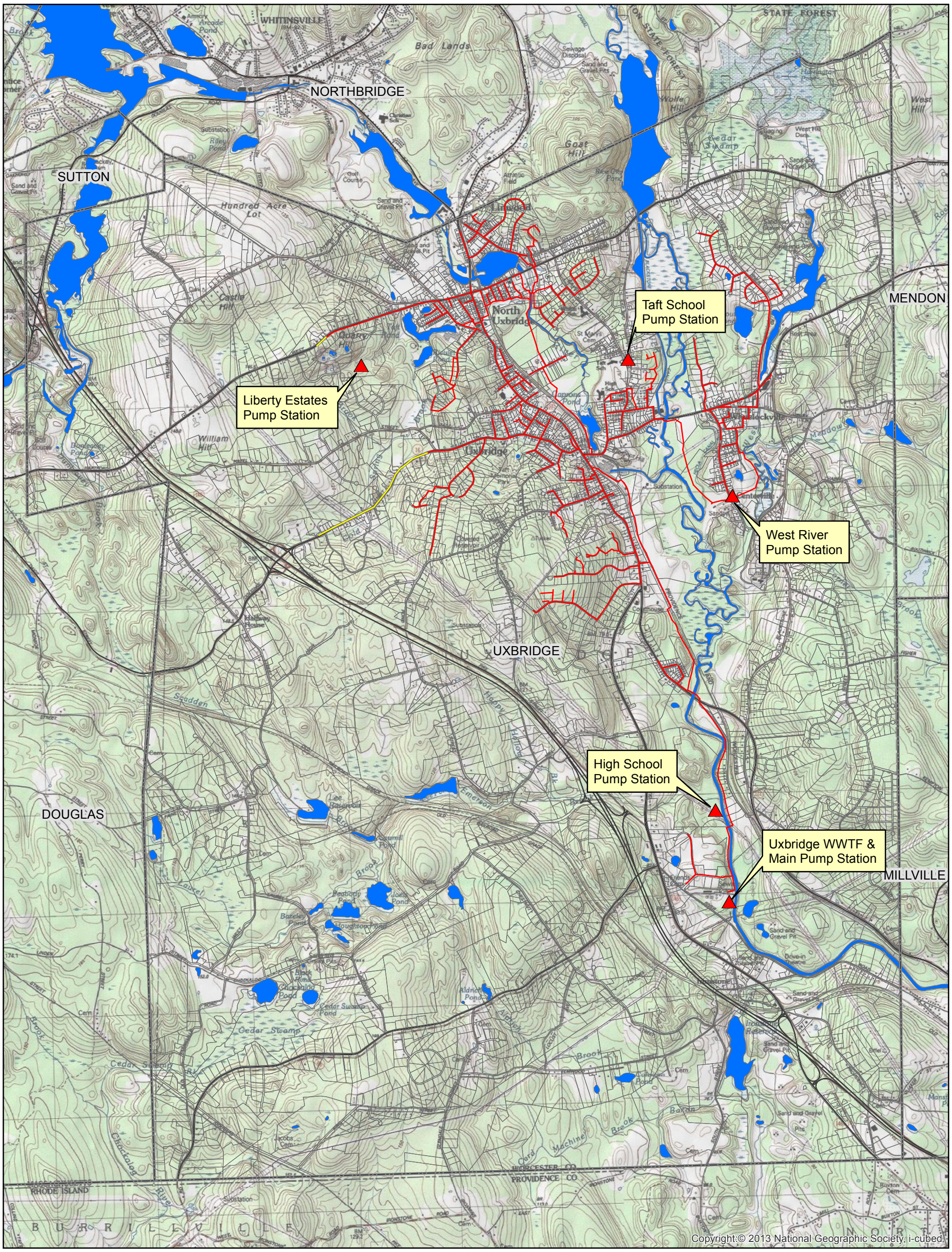
Date	Location	Cause
November 3, 2005	120 Granite Street	Non-dispersables
August 28, 2007	160 Granite Street	Construction debris
May 15, 2008	114 Douglas Street	Hydraulic deficiency
August 12, 2011	Easement between 196 and 204 Main Street	Activities of the property owner
November 9, 2011	160 Granite Street	High flow related to nearby hydrant flushing
August 7, 2012	Crownshield Avenue and Spinning Wheel Drive	Construction debris
November 3. 2012	114 Douglas Street	Hydraulic deficiency

5.2.3 Summary of Existing Facilities

The original collection system is comprised of the following districts: Central District, North Uxbridge District, Blackstone Pumping District, West River Pumping District, and Southern District (see Appendix C).

Collection System and Pumping Stations

1. **Main Pumping Station**. The main pumping station, which is located at the WWTF, receives raw wastewater from the Town's collection system and pumps it to the head of the facility. The pumping station has four Smith & Loveless centrifugal, vertical, variable speed pumps; two are 15 HP and two are 40 HP. A stairway landing provides access to the dry wells. The pumping station has two wet wells which can be joined by opening a sluice gate for normal operation.



Legend

- Wastewater facility
- Additional Sewer (Not included in Town's GIS Data)
- Existing Sewer
- Surface Water

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

EXISTING PUMP STATIONS AND COLLECTION SYSTEM

Job Number	86-14914
Revision	A
Date	11 Dec 2014

Figure 5-8

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1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:atrouchaleau

The mechanical equipment in the main pumping station is well beyond its design life. The structure is in good condition.

2. **West River Pump Station.** The West River Pump Station is owned by the Town and operated by the Department of Public Works. It is a Smith & Loveless buried pump station located on Hecla Street, near the Highway Department garage, and within the 100-year flood zone. The station has two wet wells and two pumps. It is accessed through a fiberglass entrance tube cover to the dry well. From the entrance elevation, the station extends down 25 feet. The station has a high water float and bubbler line. The bubbler system has been noted to lag causing the pumps to become air bound periodically. The station has no flow metering or communications system. The station's generator is housed in the Highway Department garage.

   The pump station is located at flood elevation 224 feet. The ground elevation surrounding the pump station is 223. The fiberglass entrance tube is at elevation 225. During a flooding event, water was observed entering the wet well through conduits and rising to within a couple inches of the top of the entrance tube..

   The station was inspected by Russell Resources on February 3. 2012. Overall, the station appeared to be in good working condition. Surface rust was noted but was not judged to be structural. It was recommended that the station's anode packs be replaced. The mechanical equipment is well beyond its design life.

3. **Liberty Estates Pump Station.** The Liberty Estates Pump Station serves the Liberty Estates condominium community and is owned and operated by the Town. The pump station has a bubbler and a float alarm. Alarms are directed to Mission Communications.

4. **Taft School Pump Station.** The Taft School Pump Station has two Flygt pumps. Water level is measured by a level stick. The Department of Public Works monitors this pump station but does not operate it.

5. **High School Pump Station.** The High School is equipped with two Super T-Series Gorman Rupp pumps, a bubbler, and a float alarm. The Department of Public Works is not responsible for this station but does monitor the alarms.

5.2.4 Hydraulic Capacity of Sewers

It is important to know the full pipe capacity of all major sewer segments for planning and evaluation purposes. This knowledge, combined with existing average and peak flows, helps to determine the available sewer capacity for growth and to plan for upgrades and expansions to the system. Determining the hydraulic capacity of the Town's existing collection system is outside the scope of this Project. Modeling the sewer system with SewerCad would allow the Town to easily manage extensions of their existing system.

The Town has identified two hydraulic deficiencies in their existing system, on Douglas Street and South Main Street.

5.2.5 Infiltration and Inflow

An I/I analysis was done by Beta Group Inc. on the collection system in 2005. The study concluded that the Town was not experiencing a significant I/I problem, but made several recommendations for further investigation, including: (1) inflow investigations for two sub-areas; (2) repairing select pipe defects; (3) repairing identified manhole defects; and (4) conducting a Town-wide manhole inspection and repair program

5.2.6 Operations and Maintenance

A well operating sanitary sewage collection system depends on adequate scheduled operation and maintenance of pumping stations, force mains, and gravity sewers; and proper equipment, spare parts, manuals, safety programs, and trained personnel to perform routine and emergency repairs. With proper preventative maintenance and routine observations of all components, emergency responses are minimized and downtime for overflows and backups are virtually eliminated.

5.2.7 Collection System O&M Equipment

The Town of Uxbridge currently has a number of O&M practices that they adhere to but no written procedures exist. Collection system O&M costs are included in Table 5-32.

5.2.8 Summary

Overall, the existing wastewater collection system is operating well and is well maintained.

5.3 Existing On-Site Systems

5.3.1 Description of Systems

Although the Town has a centralized wastewater collection system, a portion of the properties within the Town boundaries handle their wastewater through the use of on-site systems. On-site systems are used to treat wastewater from individual residential or commercial lots. Wastewater flows less than 10,000 gpd are regulated by Title 5, while flows greater than 10,000 gpd require a state-issued groundwater discharge permit. There are several types of on-site systems in Uxbridge including Title 5 systems, cesspools, and tight tanks.

Title 5 systems are so named because they were designed based on Title 5 regulations. Title 5 of the Massachusetts State Environmental Code provides minimum standards for the "…protection of public health, safety, welfare and the environment by requiring the proper siting, construction, upgrade and maintenance of on-site wastewater disposal systems and appropriate means for the transport and disposal of septage." The regulations contained in 310 CMR 15.00 fall under the jurisdiction of the MassDEP and are enforced in conjunction with the local health department through permits, inspections, and financial fines.

Title 5 systems are composed of three main elements: a septic tank, distribution box, and soil absorption system. Septic tanks remove floatable and settable solids from the waste stream and can act as an anaerobic digester to digest (remove) solids, as well as a flow equalization tank. The tank is usually constructed of concrete and consists of a baffled chamber, or it has inlet and outlet tees designed to isolate the solids in the tank and eliminate short circuiting of floatables. The distribution box is typically a small watertight concrete structure with one inlet and several outlets. It receives effluent from the septic tank and distributes it evenly throughout the leaching system. Soil

absorption systems come in many forms including leaching trenches, leaching pits, leaching galleries, and leaching fields. The selection of a soil absorption system for a particular design will depend upon the specific site considerations and costs.

Cesspools are tanks with open joints or holes in the walls and bottom through which wastewater percolates into the ground. Solids collect in the bottom of the tank where they decompose or can be removed as septage.

Tight tanks are non-discharge systems that collect and store the wastewater until it can be removed. All the wastewater goes directly into the tight tank. The tank has a level indicator with an alarm, and a signal is transmitted when the liquid level reaches a certain height. When the tank is full, a septage hauler empties it and transports the contents to a treatment facility.

5.3.2 Description of Failed Septic Systems

Septic system records were reviewed to determine whether there are any areas of the Town with chronic on-site wastewater disposal system failures. Septic system failures are typically identified during a real estate transaction. If a septic system is pumped out four or more times in one year, it is considered a failed system. In the last decade, no systems have been pumped four or more times in one year. From 2011 through 2013, only 11 properties were recorded as having failed an inspection.

Multiple septic system failures in a concentrated area could be indicative of poor conditions for an on-site wastewater disposal system. Failed septic system locations were plotted for the Town of Uxbridge and no concentrated areas of failures were found. The failed septic systems were scattered throughout the Town.

5.3.3 Description of Innovative/Alternative Systems

Alternative systems are those that use advanced technology to provide a higher level of treatment than regular Title 5 systems. Title 5 regulations allow a smaller soil absorption system when they are used. They can be used to reduce the BOD and nitrogen in the septic tank effluent. These systems often have more monitoring requirements than a regular Title 5 system. Alternative systems are usually requested and approved when a property owner has minimal space for a soil absorption system or when the property is located in a nitrogen-sensitive area.

5.3.4 Historic Grease Trap and Odor Issues Within the Collection System

No issues with either grease traps or odor have been noted within the existing collection system.

5.3.5 Discussion of Properties With Large Wastewater Discharges

Properties with design flows greater than 10,000 gpd are required to obtain a groundwater discharge permit or to connect to a sewer. MassDEP reviews the performance of large wastewater discharges under its Groundwater Discharge Permit Program (314 CMR 5.00).

5.3.6 Properties With Minimal Land for Title 5 Systems

Minimum required land areas for a Title 5 septic system can be determined based on design guidelines outlined in the regulations. The regulations define minimum sizing criteria for a Title 5 system and minimum setback distances between the system and features such as property lines, private water supply wells, and surface water supplies. Properties with minimal land for Title 5 systems will be discussed further in Chapter 6.

5.3.7 Properties With Known High Groundwater or Ledge Conditions

Several portions of Uxbridge have soils indicative of groundwater conditions within 5 feet of the surface. These elevations in combination with 100-year flood zones result in areas where septic systems must be elevated to provide sufficient separation between the top of the groundwater and the bottom of the soil absorption system.

Title 5 regulations require 4 feet of separation between the top of maximum high groundwater elevation and the bottom of the soil absorption system. This distance is increased to 5 feet when the soils have a percolation rate of less than 2 minutes per inch. Properties with high groundwater or ledge conditions will be discussed further in Chapter 6.

5.4 Water Supply and Usage

The Town of Uxbridge utilizes three groundwater sources to supply water to public water supply users. Three wells are located in the Blackstone well field (Wells Nos. 1, 2, and 3), three are in the Bernat well field (Wells Nos. 4, 5, and 6), and one is in the Rosenfeld well field (Well No. 7).

5.4.1 Analysis of Annual Pumpage And Consumption

Data describing monthly (2011-2013) and annual (2011-2013) volumes of water pumped from the three well fields (pumpage) has been obtained and analyzed for this report. Water consumption data (water metered for individual water accounts) has also been obtained and analyzed. Total annual pumpage and consumption from 2011 to 2013 is presented in Table 5-36.

Table 5-36 Annual Pumpage and Consumption(1) (million gallons)

	Year 2011	Year 2012	Year 2013
Total pumpage	249	262	263
Total consumption(2)	192	195	191

(1) Data obtained from the Town of Uxbridge Public Water Supply Annual Statistical Reports prepared for MassDEP.

(2) Excluding process flushing and firefighting uses.

5.4.2 Analysis of Monthly Pumpage

Pumpage was analyzed for 2011 through 2013 to investigate monthly trends. As shown in Table 5-37 and Figure 5-9, monthly flows were consistent over the four-year period. Peak monthly flows ranged from 30 million gallons in 2012 to 32 million gallons in 2011. Peak pumpage rates for 2011 through 2013 occurred in July. Minimum monthly flows occurred in February in all three years and ranged from 16 to 16.5 million gallons.

Table 5-37 Total Monthly Pumpage Annually (Million Gallons Per Month)

Month	Year 2011	Year 2012	Year 2013
January	17.9	18.9	18.5
February	16.0	16.5	16.2
March	17.6	19.8	18.0
April	17.3	22.7	19.2
May	21.1	26.1	25.3
June	25.0	27.1	24.0

Month	Year 2011	Year 2012	Year 2013
July	31.6	30.1	29.7
August	24.6	27.9	30.4
September	21.8	20.7	23.4
October	19.6	18.6	21.0
November	18.0	16.6	18.6
December	18.6	17.4	18.3
Total	**249**	**262**	**263**

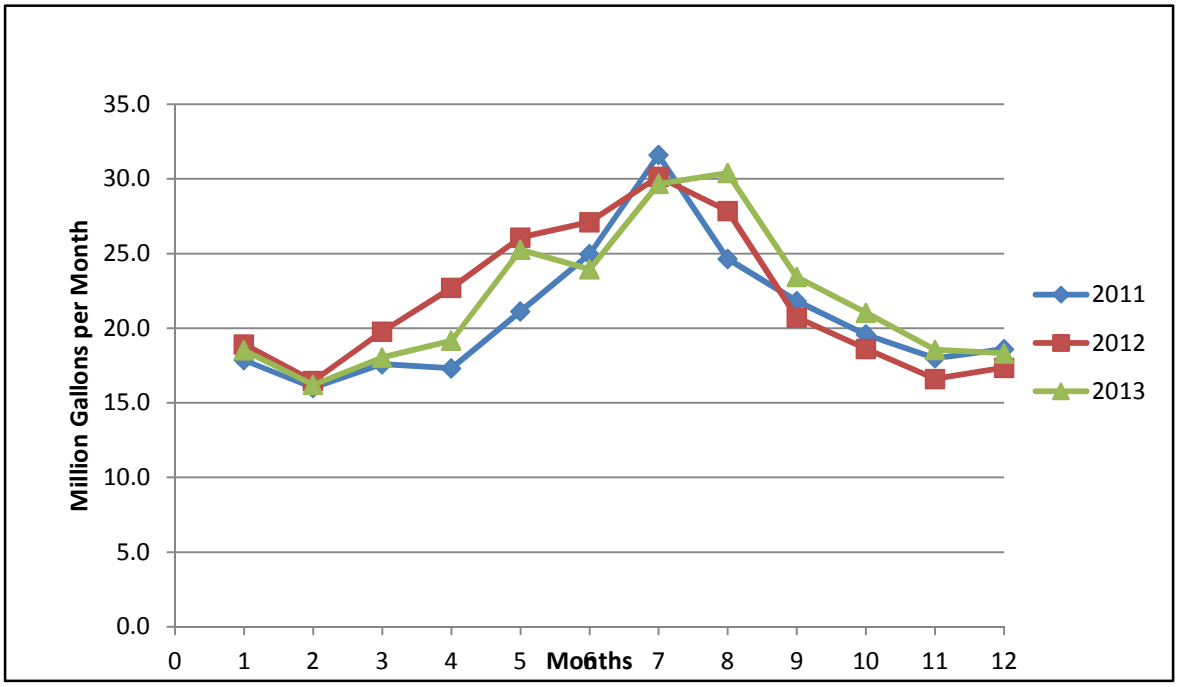


Figure 5-9 Total Monthly Pumpage Annually

5.4.3 Analysis of Water Account Data

All properties in Uxbridge served by the public water supply have water meters and water accounts with the Uxbridge Water Department. Table 5-38 outlines the annual water consumption recorded by the system's water meters.

Table 5-38 Total Annual Consumption (Million Gallons Per Year)

Year	Annual Consumption
2011	192
2012	195
2013	191

The metered water consumption data was analyzed for 2013 to estimate annual water consumption for properties in the Town of Uxbridge. The data indicates that 191 million gallons were consumed in Uxbridge.

The total metered use of 191 million gallons is less than the 263 million gallons pumped from the wells during the same period. The difference is attributed to hydrant flushing, fire flows, street cleaning, and leakage in the distribution system.

During 2013, the Public Water Supply Annual Statistical Report indicated that water consumption was 89 percent residential, 0.8 percent residential institutions, 4.6 percent commercial/business, 0.1 percent industrial, 4.8 percent municipal/institutional/non-profits, and 0.7 percent other. It is noted that this land usage is different than the property land usage assigned by the Tax Assessor.

5.4.4 Development of Water Flows for Properties Served by Public Water Supplies

The Town's GIS database was used to determine an average water usage for four different types of properties, as shown in Table 5-39.

Table 5-39 Average Water Usage by Property Type

Property Type	Average Water Usage (gpd)
Residential	150
Commercial	311
Industrial	334
Municipal - Educational	3,023

Water usage values were not developed for properties classified in "Other" in Section 4.4.1 since none of these properties are expected to have a demand on the public water system. Such properties include:

- Property types which are not currently connected to the public water system and are not expected to be served by the system in the future, such as agricultural parcels
- Properties with very low (if any) water usage such as conservation land and forest. No developed properties with these designations are currently connected to the public water system.
- Undevelopable land.

5.4.5 Development of Per Capita Water Consumption Values

A water balance analysis was developed to determine the percentage of water that enters the Town's collection system as wastewater. The water balance used the following equation:

(Water Usage) x (Water to Wastewater Conversion Factor) = (Wastewater Flow) + (I/I) + (Septage)

Data for water usage, wastewater flow, I/I and septage were provided by the Town. Based on analysis of the available data, it was concluded that approximately 90 percent of the water used by a property on the collection system is converted to wastewater.

The Town has a high percentage of unaccounted-for water within its existing public water supply, as documented in Table 5-40. Potential sources of unaccounted-for water include water meters for every account in the system that are either broken or running slow. In either case, water is still being used and converted to wastewater but is not accurately documented in the water usage data. Therefore, the per capita water usage is likely higher than indicated in the average water usage data.

Table 5-40 Unaccounted-For Water Within the Public Water Supply

Year	Pumped Water (Million Gallons Per Year)	Unaccounted-For Water (Million Gallons Per Year)	Percent of Total Pumped Water
2011	249	37.1	16
2012	262	46	18
2013	263	46.3	19

Since water usage data is likely underestimating per capita usage, TR-16 recommended values were used. The methodology used to develop a per capita wastewater flow rate of 100 gallons per capita per day was discussed in Section 5.1.3. Based on the 90 percent water to wastewater conversion factor, a water usage rate of 111 gallons per capita per day was used as a composite per capita water consumption value.

5.4.6 Existing Water System Capacity

The water system capacity is based on the acceptable well yield and the capacity of pumps installed in the water supply wells. Table 5-41 summarizes the capacities of the Town's existing wells based on information provided in the Public Water Supply Annual Statistical Report.

Table 5-41 Existing Water System Capacity

Well Number	Capacity (gpm)
GP Well 1 – Blackstone Street well field	1,000
GP Well 2 – Blackstone Street well field	1,000
GP Well 3 – Blackstone Street well field	1,000
GP Well 4 – Bernat well field	1,000
GP Well 5 – Bernat well field	1,000
GP Well 6 – Bernat well field	925
GP Well 7 – Rosenfeld well field	700
Total	**6,625**

This pumping capacity in combination with the storage capacity available represents the capacity to meet a peak day's flow. The 6,625 gpm equates to a daily capacity of 9.54 mgd (3,482 MGY), which exceeds the current water peak day demand of 1.44 mgd in 2011-2013, recorded for July 18, 2013.

If it is assumed that the entire projected planning period growth in population is connected to the public water system, the demand on the system is expected to increase by approximately 206 MGY to 470 MGY. The Town's existing wells are capable of providing adequate capacity for future demand.

5.4.7 Water Conservation Program

Populations tend to use large quantities of water during dry summer months for irrigation, swimming pools, and other outdoor uses. The Metropolitan Planning Council and 495/MetroWest Corridor Partnership estimates that residential demands generally increase by approximately 50 percent in June, July, August, and September due to outdoor water use.[3] This is also the same time period when stream flow and water availability are at their lowest. Due to the inverse relationship between

[3] Summer Smart Water Use: A Guide to Peak Season Water Demand Management, Metropolitan Area Planning Council and the 495/MetroWest Corridor Partnership.

water demand and availability, MassDEP mandates water conservation measures in many of its withdrawal permits.

The Town's MassDEP Water Withdrawal Permit requires that the Town limit non-essential outdoor water use through mandatory restrictions from May 1 through September 30. A State of Water Supply Conservation can be declared in accordance with the Town's General Bylaw Section 336. During the State of Water Supply Conservation, non-essential water usage is prohibited in the Town between the hours of 9:00 a.m. and 5:00 p.m. Non-essential outdoor water uses subject to mandatory restrictions include:

- Irrigation of lawns via sprinklers or automatic irrigation systems.
- Washing of vehicles, except in a commercial car wash or as necessary for operator safety.
- Washing of exterior building surface treatments such as paint, preservatives, stucco, pavement or cement.

To further promote water conservation, the Town uses an increasing block rate structure which charges a higher rate for increased water usage. The water rate schedule for FY 2014-2015 is summarized in Table 5-42.

Table 5-42 FY 2014-2015 Water Rate Schedule

	Metered Rates
First Step (0-800 cu/ft)	$17.50
Second Step (801 – 3,000 cu/ft)	$2.61 per 100 cubic feet
Third Step (over 3,000 cu/ft)	$3.79 per 100 cubic feet
Irrigation Rate	$4.46 per 100 cubic feet
Capital Improvement Fees 1	$6.36 per dwelling unit quarterly
Capital Improvement Fees 2	$22.05 per dwelling unit quarterly
Capital Improvement Fees 3	$14.47 per dwelling unit quarterly

The Town also includes information about water conservation in its annual Water Quality Report. Since the water conservation bylaw was adopted by the Town in 2005, the water conservation measures taken in subsequent years are captured in the water use data analyzed for this report.

5.5 Flow and Load Reduction Opportunities

The purpose of this section is to identify and review alternatives for reducing wastewater flows and pollutant loadings. Water conservation is important because it reduces groundwater withdrawal and wastewater flow, and could potentially reduce the size of wastewater treatment facilities. The reduction of pollutant loadings could also potentially reduce the size of wastewater treatment facilities because there would be less waste in the water to treat. The following methods could be used by the Town to promote water conservation and reduce pollutant loadings:

- Modification of current water pricing policies.
- Use of low flow fixtures.
- Use of waterless toilets (composting and incinerating).
- Reuse of recycling of wastewater.
- Prohibited use of kitchen garbage grinders.

- Non-potable private wells for lawn watering.

5.5.1 Pricing Policies

The Town currently utilizes an increasing block rate structure, which increases conservation because the customer is charged a higher rate the more water they use. This pricing could be increased as a further economic incentive to reduce water consumption and wastewater generation.

5.5.2 Low Flow Fixtures

Approximately 70 percent of the total residential wastewater volume is estimated to be generated by toilet, laundry, and bath use. Water consumption (and subsequent wastewater generation) can be reduced by 15 to 20 percent through the use of household water saving devices and low flow fixtures in these areas. Commonly used low flow fixtures include low flow showerheads, toilet dams, faucet aerators, reduced flush toilets, vacuum flush toilets, flow limiting valves, and pressure reducing valves. Current state plumbing codes encourage and require the use of low flow fixtures in new residential and commercial construction. Plumbing codes also require the use of flow control devices for hot water showerheads and public lavatories. The use of low flow fixtures should be further encouraged in Uxbridge.

5.5.3 Waterless Toilets

Water consumption, wastewater flow, and pollutant loadings can be reduced through the use of waterless toilets. Waterless toilet systems operate by separating black wastewater and gray wastewater. Black wastewater is toilet waste, and gray wastewater is generated from non-sanitary sources such as washing clothes and dishes and bathtub and shower use. Black wastewater is treated in the waterless toilet unit, and gray wastewater is discharged to a septic system with potential size reductions. The two most common waterless toilet systems are composting toilets and incinerating toilets.

Composting toilets recirculate black wastewater over accumulated solids to promote a natural decomposition process. Incinerating toilets burn black wastewater and generate a small quantity of ash and gas. Composted material and ash are periodically removed from the respective systems, and air filters and exhaust units are used to minimize odors. Public acceptance of waterless toilet systems is often low due to the composting, incinerating, and handling of human waste within living spaces. A potential use of waterless toilets is in public restrooms and convenience stations. This option eliminates the need for individual users and the incinerating process from residential areas.

Waterless toilets have the following advantages:

- Wastewater flows and loads are reduced if properly designed and installed.
- Water consumption is significantly reduced.
- Minimal environmental concerns occur when properly sited and designed.
- Composting toilets require minimal energy use.
- Size of standard septic system can be reduced to treat only gray wastewater.
- Routine maintenance is minimal and requires no special training.
- Nitrogen loading to the environment is greatly reduced.

Waterless toilets have the following disadvantages:

- Public acceptance is generally low.
- Some incinerating toilets require high energy use.
- Handling of composting toilet contents can be objectionable.
- Incineration units are likely to generate odors if not vented properly.
- Composting toilets are not well suited to high seasonal peak loading.

5.5.4 Wastewater Reuse and Recycling

Identifying wastewater reuse opportunities is important because such reuse can reduce both water consumption and the overall volume of wastewater that must be disposed. Wastewater sources that could be re-used include gray wastewater from individual homes and treated wastewater effluent from the Uxbridge WWTF or from a new wastewater treatment facility. The following wastewater reuse methods are considered:

- Watering lawns from household gray wastewater.
- Using treated effluent from a wastewater treatment facility as industrial boiler makeup water or process water.
- Irrigating golf courses and Town-owned property with treated effluent from a wastewater treatment facility.

The use of reclaimed water must meet guidelines developed by MassDEP (314 CMR 20.00) in addition to the requirements of the Groundwater Discharge Permitting Program.

Reuse of household gray wastewater for lawn watering would be expensive to individual homeowners because it requires the construction of a separate collection, storage, and pumping system. Reuse of treated wastewater effluent from the Uxbridge WWTF for an industry, golf course. or municipal property would also be expensive, difficult to administer, and require additional wastewater treatment due to the health risks associated with potential human contact.

Uxbridge has several golf courses and municipal properties that could potentially utilize irrigation with treated effluent. This type of irrigation would have a high cost for piping and protection against freezing, and it could only be used periodically.

5.5.5 Prohibition of Kitchen Garbage Grinders

Kitchen garbage grinders grind food scraps and send them down the drain to be treated in a septic tank or at a wastewater treatment plant. They are convenient because they reduce the handling of wet and messy food wastes and increase the organic and nitrogen loading on wastewater treatment systems.

Septic systems are typically designed with a larger capacity when a kitchen grinder is used and must be pumped out more frequently. A wastewater treatment plant must process a higher loading when kitchen grinders are used, adding capital and operation costs to wastewater treatment processes. These grinders could be prohibited in a Board of Health regulation or bylaw.

5.5.6 Installation of Non-Potable Private Wells for Lawn Watering

Lawn watering in the summer uses a large quantity of potable water just to make the grass green. This water could be drawn from non-potable wells at the property and distributed to an irrigation system through a pump and pressure tank. These types of systems should be feasible in Uxbridge and would pay for themselves over a short period of time. Large water users who irrigate their lawns with the public water supply could be identified by the Water Department by reviewing seasonal water billing records and comparing them with Title 5 design flows.

This type of non-potable water supply for lawn irrigation would reduce Water Department revenues. Also, this water use would be outside the Town's control and may impact the groundwater level or quantity on which the public water supply depends.

5.6 Stormwater Discharges and Impacts

The state, town, and private roads in Uxbridge collect storm runoff (stormwater) which is then discharged to surface water bodies. The stormwater often contains dirt, fecal material from domestic and wild animals, nitrogen compounds, and phosphorus compounds. The fecal material and its associated coliform bacterial content can force beach closures in Uxbridge. Nitrogen and phosphorus can fertilize surface water bodies and promote production of algae and other aquatic plants. These aquatic plants can further impact surface water quality when they die and settle to the bottom.

Evaluation and recommendation of solutions to mitigate stormwater impacts is beyond the scope of this Project.

6. Needs Assessment

6.1 Introduction

Approximately half of the Town's population relies on the existing collection system for wastewater disposal. The remainder use on-site wastewater disposal systems. If sited properly, these systems can adequately handle the properties' wastewater needs. This chapter looks at environmental factors that may preclude portions of the Town from being well suited for on-site wastewater disposal systems. Factors analyzed include soil type, high groundwater areas, 100-year flood zones, depth to bedrock, lot size, drinking water protection areas, buffer areas around water bodies and wetlands, priority estimated habitat areas and ACECs, Title 5 pass/fails, and groundwater quality.

The above environmental factors can be divided into two categories. Most of the factors are general indicators in that they allow an area to be reviewed based on non-site-specific data. This data is useful for determining problem areas, but is perhaps more useful when combined with known conditions or general factors. However, some factors are based on site-specific data and thus are known conditions. These factors can be divided up as shown in Table 6-1:

Table 6-1 Environmental Factors

Known Conditions	General Indicators
• Title 5 Pass/Fails • Number of septic system pump-outs • Groundwater quality	• Soil type • High groundwater areas • 100-year flood zones • Depth to bedrock • Lot size • Drinking water protection areas • Buffer areas around water bodies and wetlands • Priority estimated habitat areas and ACECs

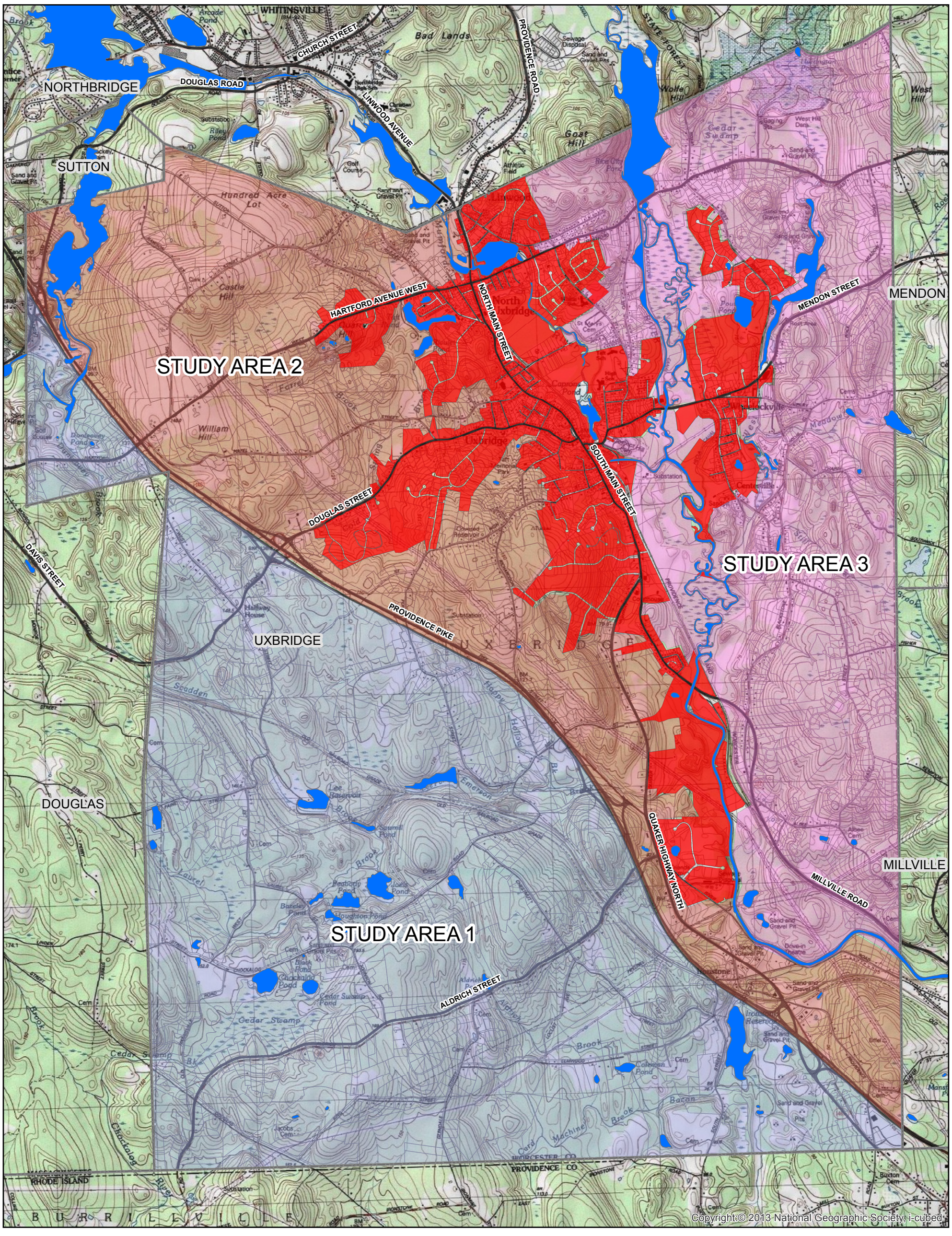
6.2 Determination of Study Areas

The portions of Town outside the existing collection system were divided into three study areas, based on geographic divisions. The three study areas, shown in Figure 6-1, are defined by the following boundaries:

- **Study Area 1** – All land in the Town of Uxbridge south of Route 146.
- **Study Area 2** – Land within the Town of Uxbridge bounded by Route 146 to the west and the existing collection system to the east.
- **Study Area 3** – Land within the Town of Uxbridge bounded by the Town's existing collection system to the west.

These areas were analyzed to determine if sub-areas existed within each, where the continued use of Title 5 disposal systems may be problematic. The sub-areas are referred to as areas that require further study. Alternatives for these areas, if identified, will be discussed in Phase II of the CWMP.

Information available from the Town's GIS system and through MassGIS was used to identify sub-areas that may require further study. Inputting parameter information into the Town's existing GIS



Legend

- Surface Waters
- Parcels within the existing collection system area
- Major Roadways
- STUDY AREA 1
- STUDY AREA 2
- STUDY AREA 3

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

GHD

Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

STUDY AREAS

Job Number	86-14914
Revision	A
Date	11 Dec 2014

Figure 6-1

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1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

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system identified sub-areas that may require further study without having to artificially sub-divide the Town in many sub-areas.

6.3 Known Conditions

6.3.1 Title 5 Passes/Failures

Description

As discussed in Chapter 5, septic systems are considered “failed” if they have failed an inspection (typically at the time of a property transfer) or have been pumped four or more times in one year. Health Department Title 5 inspection records were reviewed to determine if any concentrated areas of septic system failures exist within the Town. One year of plant septic truck data was also analyzed to determine if any properties were pumped out four or more times.

Comments

Septic system records indicate no properties had been pumped four or more times in one year. Those that were pumped multiple times in one year were mapped (Figure 6-2) and no concentrated areas of failed septic systems were found.

6.3.2 Groundwater Quality

Description

Nitrogen compounds can be used as an indicator of groundwater degradation resulting from the use of on-site subsurface disposal systems. Typical sources of nitrates in groundwater include runoff from fertilizer use, leaching from septic tanks, erosion of natural deposits, and atmospheric deposition. Nitrate concentrations in groundwater unaffected by human activities are typically less than 2 mg/L[4].

The Uxbridge Water Department compiles an annual water report summarizing the results of groundwater sampling for the Town’s seven community public water supplies. Samples are taken to determine the presence of radioactive, biological, inorganic, volatile organic, and synthetic organic contaminants. Over the time period 2011-2013, the Town has not violated MCLs set by the USEPA. Water quality sampling nitrate levels were measured in the range of 0.47 to 1.6 ppm, which is within the range of groundwater unaffected by human activity and well below the MCL.

Water quality data from all of the TNC’s and NTNC’s were also analysed for indicators of groundwater degradation. Only one location, the Bangma’s Farm Store and Dairy Bar, showed nitrate concentrations greater than 2 mg/L in 2013.

Bangma’s has had four raw water quality violations for nitrates in the past five years. The following concentrations were reported:

- 10.4 mg/L on 5/20/2014
- 12.8 mg/L on 6/18/2013
- 10.7 mg/L on 6/29/201
- 14.2 mg/L on 4/26/2011

[4] Mueller, D. K.; Helsel, D. R., Nutrients in the Nation's Waters - Too Much of a Good Thing?; U.S. Geological Survey Circular 1136, 1996.

A water treatment system has been installed at the site. Finished water samples in the time period 2011 – 2014 showed nitrate levels below the MCL. Nitrate levels detected in the finished water are shown in Table 6-2.

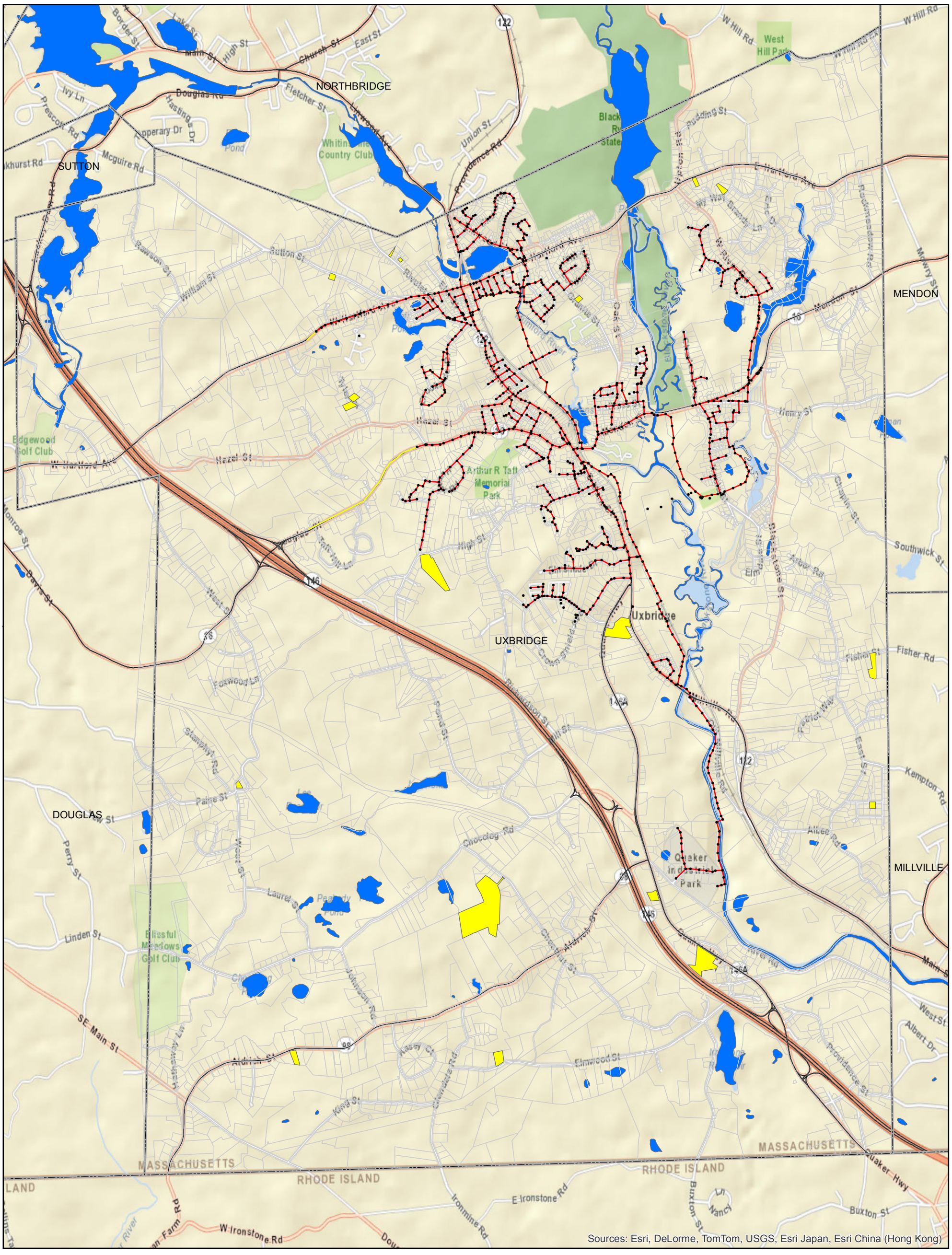
Table 6-12 Finished Water Nitrate Concentrations at Bangma's Farm

Date	Nitrate Concentration (mg/L)
11/4/2014	1.8
8/4/2014	0.66
5/20/2014	1.6
3/24/2014	0.9
12/11/2013	1.6
9/4/2013	1.7
6/18/2013	7.6
6/29/2012	2.1
6/6/2012	1.1
11/9/2011	0.54
7/12/2011	2.6
4/26/2011	1.4
3/23/2011	1.1
Nitrate MCL	10

Bangma's is located on a ninety acre, third generation dairy farm. Although high nitrate levels were detected at this PWS, an analysis of the region showed no other specific or general indicators indicating that the site was un-suitable for on-site wastewater disposal. Due to the large size of the parcel, there is adequate space on the property to separate the on-site wastewater and water infrastructure by a sufficient distance if the septic system was suspected to be the source of contamination. It is possible that fertilizer and/or manure from the farm operations could be contributing to the contamination of this water source.

Comments

Based on the nitrate concentrations detected during annual water sampling, nitrate contamination of groundwater from existing septic systems is unlikely to be a concern. The majority of the nitrate concentrations found in the Town's PWS were within the range expected for groundwater not affected by human activity. One site, Bangma's Farm Store and Dairy Bar, was found to have elevated nitrated concentrations in its raw water. Because no other specific or general indicators were found indicating that the site is problematic for on-site wastewater disposal, it is more likely that the contamination originated from another source - such as fertilizer or manure.



Legend

Septic systems pumped multiple times in one year

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

Job Number	86-14914
Revision	A
Date	31 Oct 2014

SEPTIC SYSTEMS PUMPED MULTIPLE TIMES IN ONE YEAR

Figure 6-2

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jjobrien

6.4 General Indicators

6.4.1 Soils Type

Description

Soil characteristics are a general indicator of potential environmental issues with on-site systems in that many soils are not suitable for use as leaching areas. Those consisting of clay or a clay mix may cause ponding of the effluent on the surface due to poor infiltration. Effluent surfacing causes human health concerns and may result in surface runoff into adjacent resource areas. The opposite condition can occur when the soils are sand or a sand/stone mix which percolates very fast. Very permeable soils allow the wastewater to travel through the soil with little additional treatment beyond that provided by settling in the septic tank.

The Town of Uxbridge has over 50 different types of soils. The soils were analyzed by drainage class to determine areas of the Town that may be problematic for Title 5 wastewater discharge systems. Areas of the Town with excessively drained soils or very poorly drained soils are outlined in Figure 6-3.

Comments

The three study areas have scattered pockets of soils that may be unsuitable for on-site disposal systems. Title 5 inspection records were reviewed and no correlation was found between the location of septic system failures and areas that may have poor soil characteristics.

6.4.2 High Groundwater Areas and 100-Year Flood Zones

Description

Title 5 regulations require 4 feet of separation between the top of maximum high groundwater elevation and the bottom of the soil absorption system. The required separation distance is increased to 5 feet when the soils have a percolation rate of less than 2 minutes per inch. Depth to groundwater was estimated based on Natural Resources Conservation Services (NRCS) soil series descriptions. Areas estimated to be located with high groundwater elevations are shown in Figure 6-4.

Additional properties are located in 100-year flood zones as identified on mapping provided by FEMA. Both of these areas would require raised septic systems to maintain a minimal distance between the top of the groundwater and the bottom of the soil absorption system.

Comments

All three study areas have scattered areas with a potentially high groundwater table as well as areas within the 100-year flood zone. Title V inspection records were reviewed and no correlation was found between the location of historic septic system failures and areas estimated to have high groundwater tables.

6.4.3 Depth to Bedrock

Description

Title V design guidelines were used to determine a minimum depth to bedrock required for the installation of a typical septic system. It was estimated that depth to bedrock should be

approximately 7 feet or greater for the installation of a typical Title V septic system. In areas with a lesser depth to bedrock, a raised system would likely be required. NRCS soil series descriptions were used to determine typical depth to bedrock.

Comments

In general, depth to bedrock for the majority of soils in Uxbridge is typically greater than 60 inches. Areas where the typical depth to bedrock is estimated to be less than 40 inches are identified in Figure 6-5. This area is primarily composed of Chatfield-Hollis-Rock outcrop complex, which is a soil series characterized by rock outcrops. Title 5 inspection records were reviewed and no correlation was found between the location of historic septic system failure and areas estimated to have shallow depth to bedrock.

6.4.4 Lot Size

Description

Minimum required land areas for a Title 5 septic system can be determined based on design guidelines outlined in the regulations. The regulations define minimum sizing criteria for a Title 5 system as well as minimum setback distances between the system and features such as property lines, private water supply wells, and surface water supplies. Title 5 requires a 100-foot radius be maintained between a private well and a septic system. It was assumed that properties less than 1/2 acre in size with an on-site wastewater disposal system and a private well could potentially have difficulty siting a Title V compliant system on their lot or finding a new location for a failed system. These properties are shown on Figure 6-6.

Comments

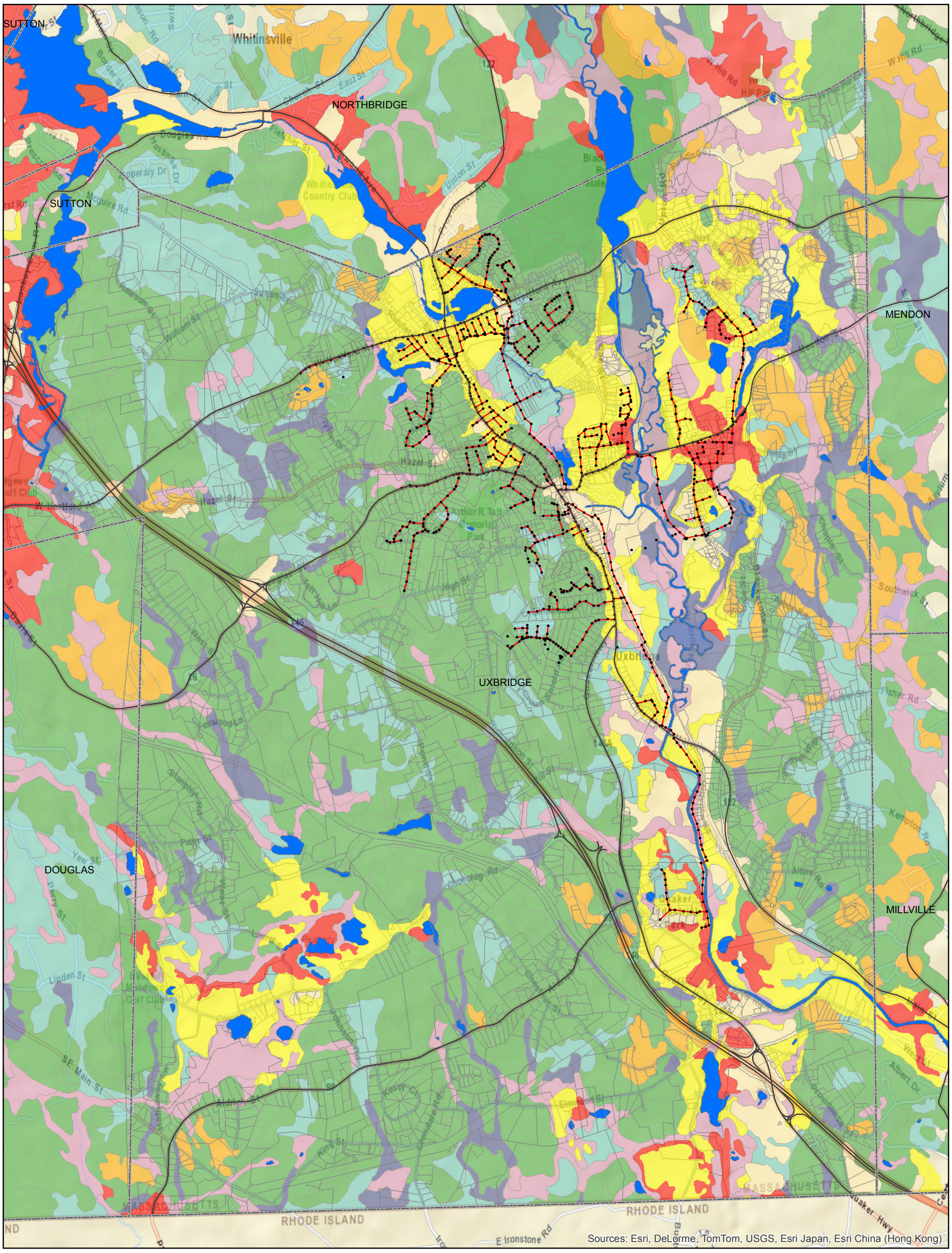
There is a small number of properties scattered in each of the three study areas with minimal land area for a Title V system.

6.4.5 Drinking Water Protection

Description

A Zone II represents the area of an aquifer that will contribute water to a well under the most severe pumping and recharge conditions that can be realistically anticipated after 180 days of pumping at approved yield with no recharge from precipitation. In addition to concerns of nitrogen contamination in a water protection area, more recently, concerns have been raised about a new category of water contaminants referred to as Contaminants of Emerging Concern (CECs). This general category includes three subgroups: endocrine disrupting compounds, pharmaceuticals, and personal care products. These compounds and potential contaminants are not currently regulated by the federal government because their toxicity is not well understood. Many of these compounds originate from medications and personal care products used and discharged to our septic systems and wastewater treatment facilities. Advanced wastewater treatment facilities, such as the Uxbridge WWTF, are believed to provide better removal of these compounds than individual septic systems, but there is insufficient data on the performance of individual septic systems for these contaminants.

Properties within the Town's Zone II protection area that are not on the existing collection system are shown in Figure 6-7.



SOIL DRAINAGE CLASSIFICATION

- EXCESSIVELY DRAINED
- SOMEWHAT EXCESSIVELY DRAINED
- WELL DRAINED / SOMEWHAT EXCESSIVELY DRAINED
- WELL DRAINED
- MODERATELY WELL DRAINED
- POORLY DRAINED
- VERY POORLY DRAINED
- NO INFORMATION

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

Town of Uxbridge, Massachusetts
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SOIL DRAINAGE CLASSIFICATION

Figure 6-3

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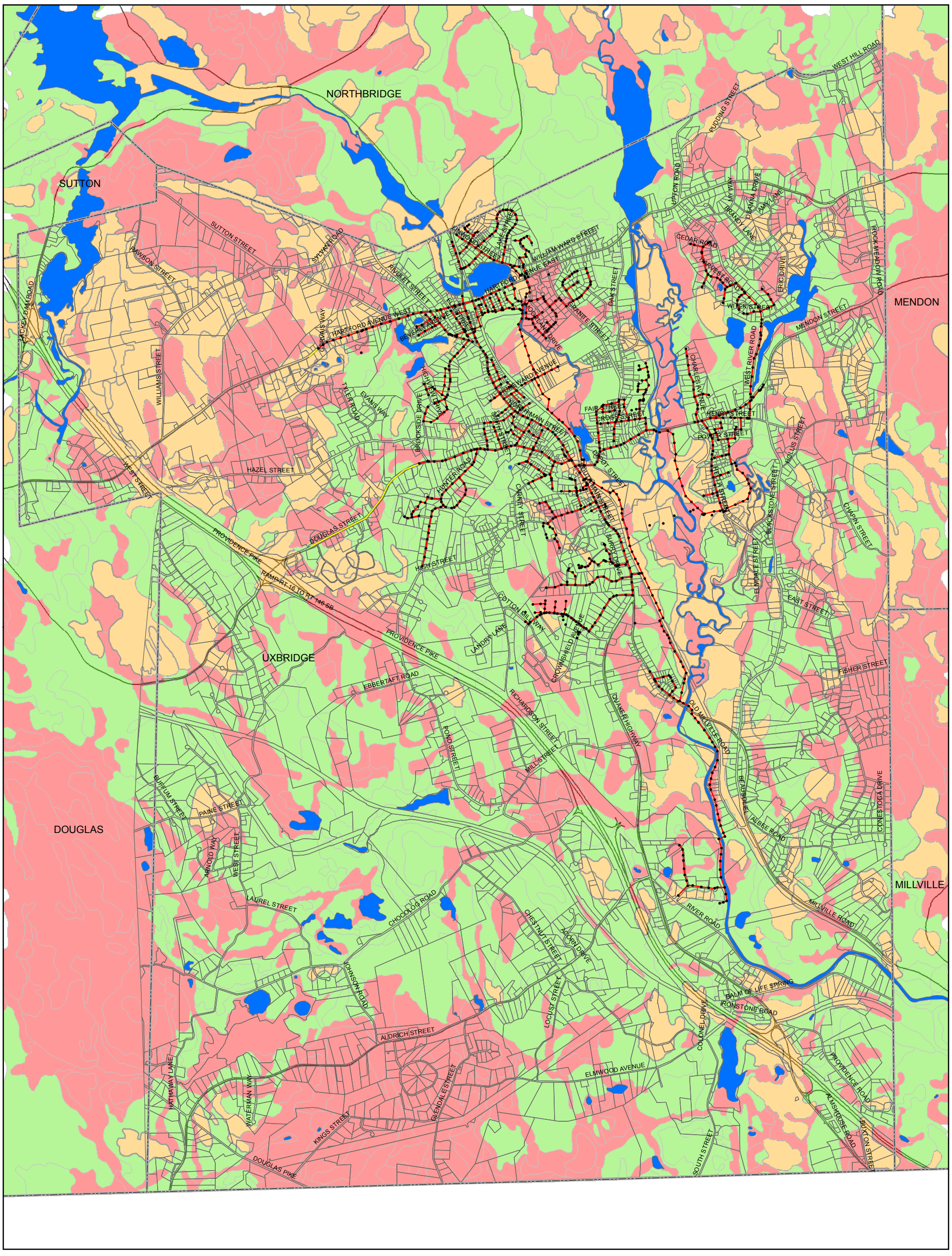

Legend

- Additional Sewer (Not included in Town's GIS Data)
- Existing Sewer
- Surface Waters

Raised Septice Required

- Yes
- No
- Unknown

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Town of Uxbridge, Massachusetts
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Date 31 Oct 2014

AREAS REQUIRING RAISED SEPTIC SYSTEMS

Figure 6-4

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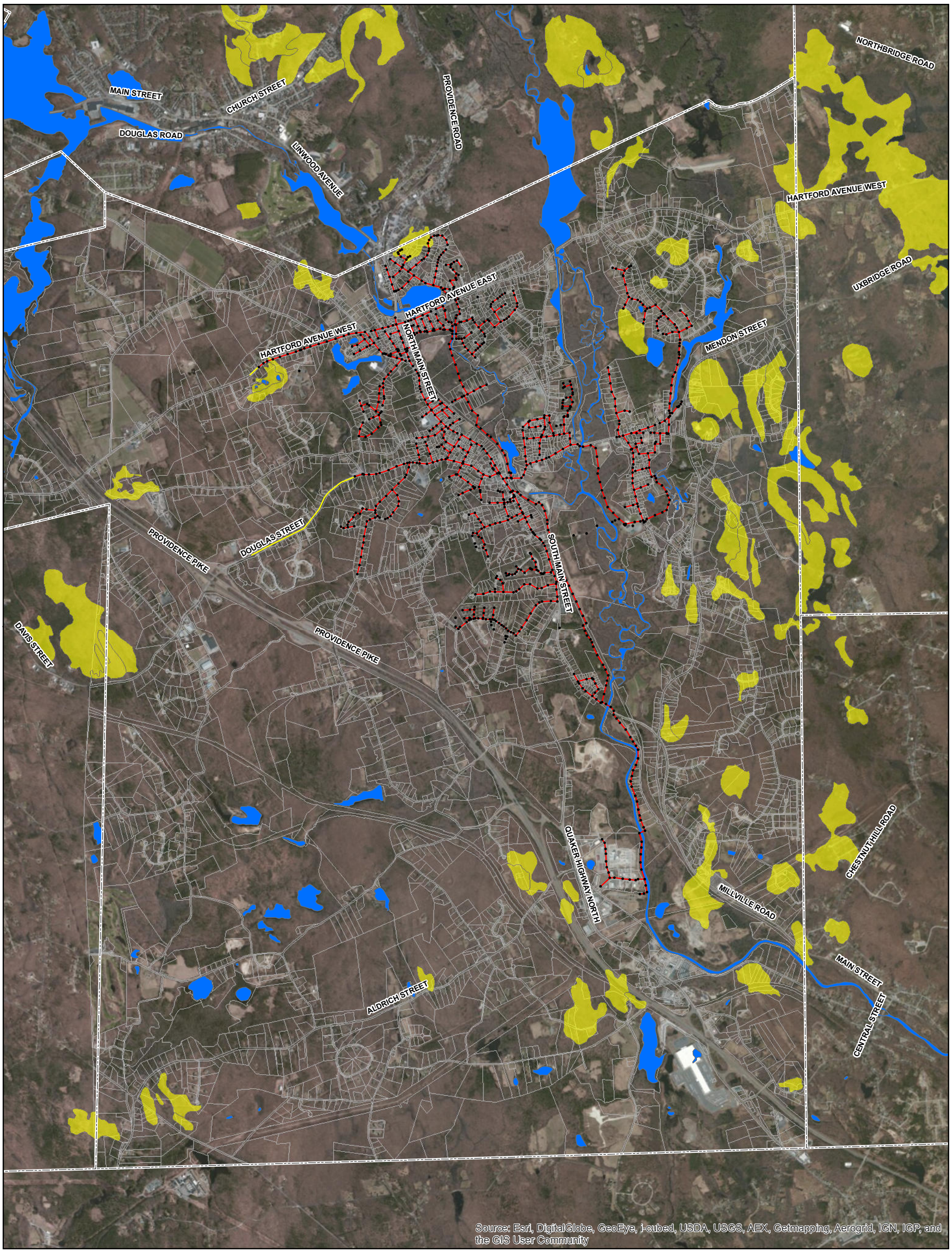

Legend

- Existing Sewer
- Additional Sewer (Not included in Town's GIS Data)
- Surface Waters
- Areas Where Depth to Bedrock < 40-inches

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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SHALLOW AREAS TO BEDROCK DEPTH LESS THAN 40 INCHES

Figure 6-5

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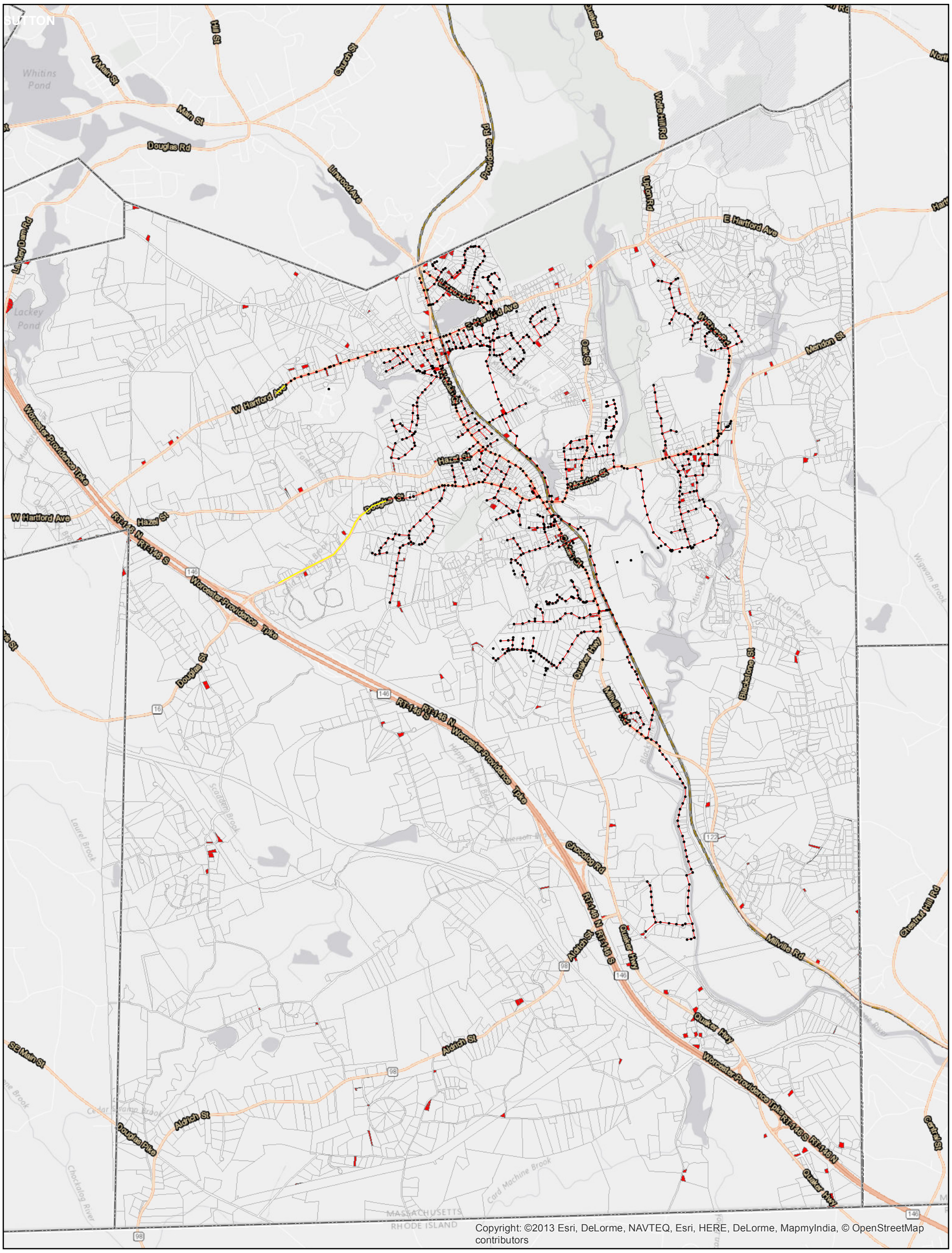

Legend

Existing Sewer — Additional Sewer (Not included in Town's GIS Data) — Less Than Half Acre Propertiesw/Private Well

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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PARCELS WITH MINIMAL LAND AREA FOR TITLE 5 SEPTIC SYSTEM

Figure 6-6

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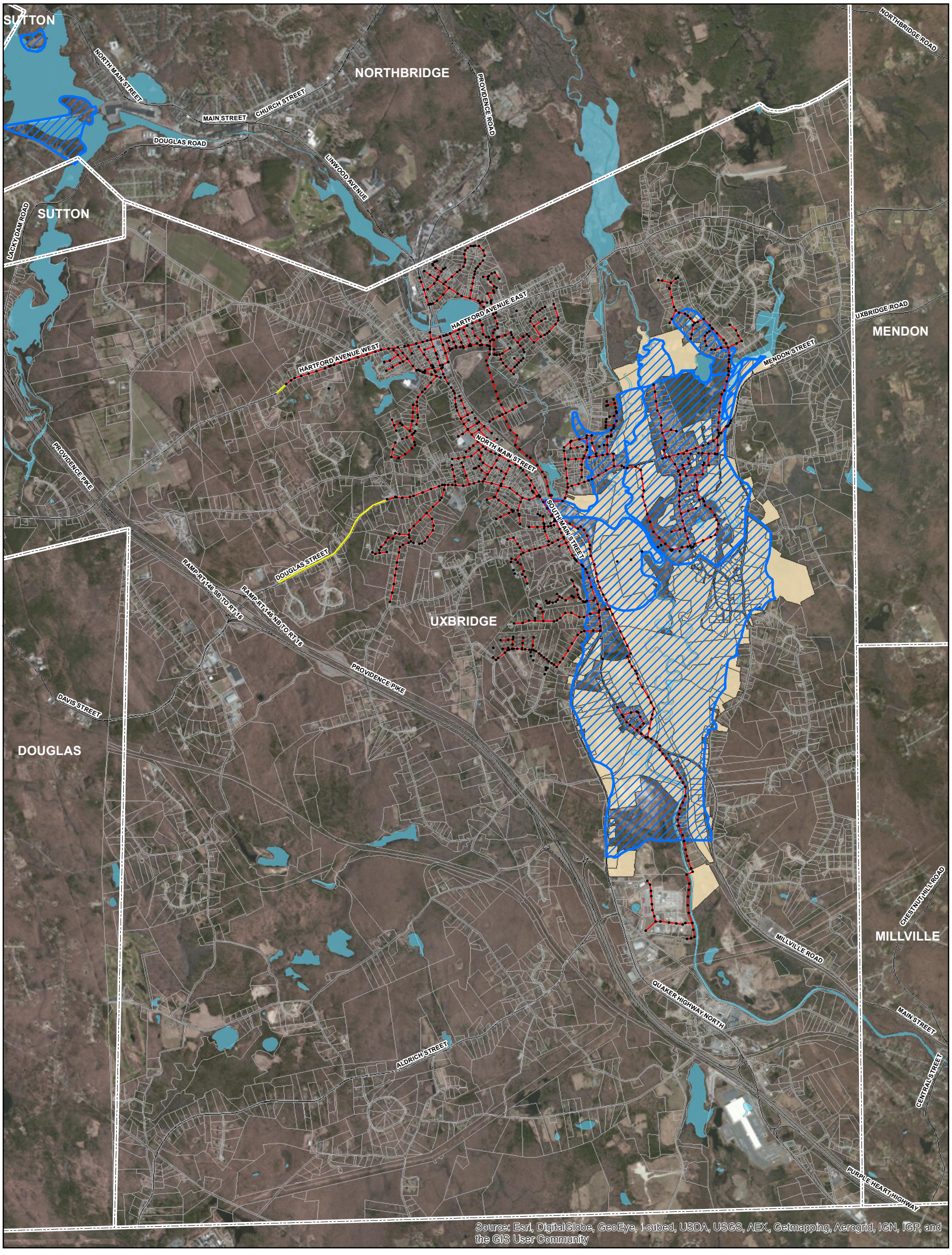

Legend

- Existing Sewer
- Additional Sewer (Not included in Town's GIS Data)
- Surface Waters
- DEP Approved Zone IIs
- Not sewered in Zone II

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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UNSEWERED PROPERTIES IN ZONE II PROTECTION AREA

Figure 6-7

N:\US\Hyannis\Projects\86\14914\GIS\GIS\Maps\MXD_Deliverables\CWMP Figures\Revised Figures JJO\Chapter 6\86-14914-F6-7.mxd

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Comments

Unsewered properties within the Town's existing Zone II protection areas exist in Study Area 2 and Study Area 3. Water quality sampling results from the Town's 2011-2013 Water Quality Reports do not indicate groundwater contamination from on-site wastewater disposal sites.

6.4.6 Buffer Areas Around Fresh Water Bodies and Wetlands

Description

Both phosphorus and nitrogen are available in septic system effluent. Phosphorus is typically the limiting nutrient for fresh water systems; therefore, it is the nutrient that stimulates excess algae production and produces water quality problems in ponds. Unlike nitrogen, phosphorus does not travel far in the groundwater system and is attenuated in the soils. Soil type, groundwater pH, and travel distance are the main factors that determine if the phosphorus will be attenuated or will pass to the fresh water body. Title 5 outlines minimum setback distances from surface water, wetlands and other bodies of water. Figure 6-8 shows Title 5 regulated setbacks.

Comments

Title 5 buffer areas are scattered throughout each of the three study areas.

6.4.7 Priority/Estimated Habitat Areas and Areas of Critical Environmental Concern

There are no ACECs in Uxbridge.

6.4.8 Summary of Findings for Study Areas 1-3

A summary of the results of the Needs Assessment for the three study areas is presented in Table 6-3.

Table 6-3 Needs Assessment Results Summary

	Study Area 1	Study Area 2	Study Area 3
Known Conditions			
Concentrated areas of Title 5 inspection failures			
Septic system failures indicated by multiple pump-outs			
Impaired groundwater quality			
General Indicators			
Sub-optimal soil drainage class	X	X	X
High groundwater areas	X	X	X
100 Year flood zone	X	X	X
Depth to bedrock	X	X	X
Lot size	X	X	X
Unsewered properties within drinking water protection area		X	X
Unsewered properties within buffer areas around water bodies and wetlands	X	X	X
Properties within priority estimated habitat areas ACECs			

Known conditions and general indicators found in each study area are shown in Figures 6-9, 6-10 and 6-11. Analysis of the three study areas found no concentrated, problematic areas for on-site wastewater disposal.

Although general indicators exist in all three study areas for locations that may be problematic for on-site wastewater disposal sites, known conditions such as septic system failures and impaired groundwater quality did not indicate any portions of the Town that would be unsuitable for on-site wastewater disposal systems. Based on the data available no major sewer extensions are recommended for any of the Study Areas.

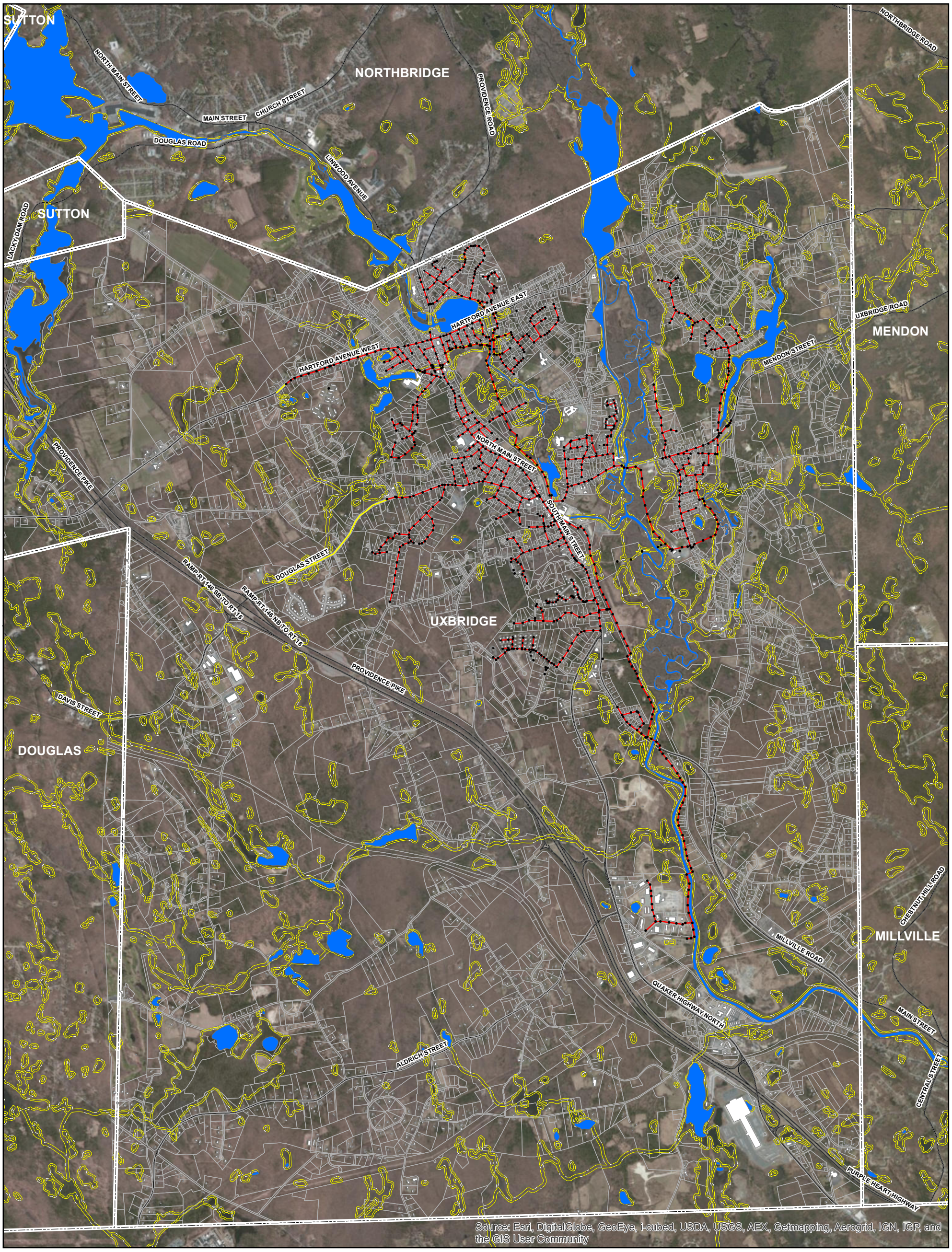
6.5 Summary of the Needs Assessment

The purpose of the Needs Assessment report is to summarize and integrate the Town's existing and future conditions, which will in turn establish the wastewater facility needs for the Town. Major conclusions of this report are summarized as follows:

- Analysis of the three Study Areas did not identify any concentrated areas where on-site wastewater disposal appears problematic. The lack of specific indicators (such as septic system failures or areas or impaired groundwater quality) suggests that these areas appear to be suitable for continued long-term use of on-site wastewater disposal systems. Based on the available data, no need for major sewer extension in any of the Study Areas was found.
- Although analysis of wastewater flow projections indicates that the Uxbridge WWTF has sufficient hydraulic capacity to support population growth, projections for the Town over the time period of the Planning Period and new effluent limits added to the facility's discharge permit by MassDEP will require upgrading the degree of treatment provided for removal of nutrients (nitrogen and phosphorus. and other new or revised parameters.
- The Uxbridge WWTF is over 30 years old and has not had any major upgrades since its construction. Much of the mechanical equipment, electrical equipment, instrumentation and control systems have reached the end of their useful life. Since buildings and structures still have significant value, replacement of the components that have reached the end of their useful life is recommended for the continued long-term reliable and cost-efficient service.

6.6 Next Steps to Identify Solutions for Wastewater Needs

The Needs Assessment Report documents the first of three phases of the CWMP Project. The next phase of the Project will identify and screen centralized, decentralized, and on-site wastewater technologies and solutions for the Areas of Concern and centralized facilities. These technologies and solutions will be described, advantages and disadvantages will be summarized, and unfeasible technologies and solutions will be eliminated from further evaluation. The third phase will evaluate the feasible technologies and solutions in detail and present the recommended Wastewater Management Plan.



Legend

Title 5 Setback Areas — Existing Sewer — Additional Sewer (Not included in Town's GIS Data) — Surface Waters

Note: The Title 5 dataset is a polygon buffer layer representing a variable width buffer zone around water features and other natural resources. These buffer areas are established for the purpose of aiding in the implementation of Title 5 (310 CMR 15.00) regulations for the siting, construction, inspection, upgrade and expansion of on-site sewage treatment and disposal systems, and for the transport and disposal of sewage. The buffer areas represent the setback requirements for the installation of septic systems near specific natural resources and water features. Please refer to the Title 5 regulations for the specific setback requirements. (MassGIS March 2010)

Paper Size ANSI B

0 1,500 3,000 6,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TITLE 5 BUFFER SETBACK AREAS

Figure 6-8

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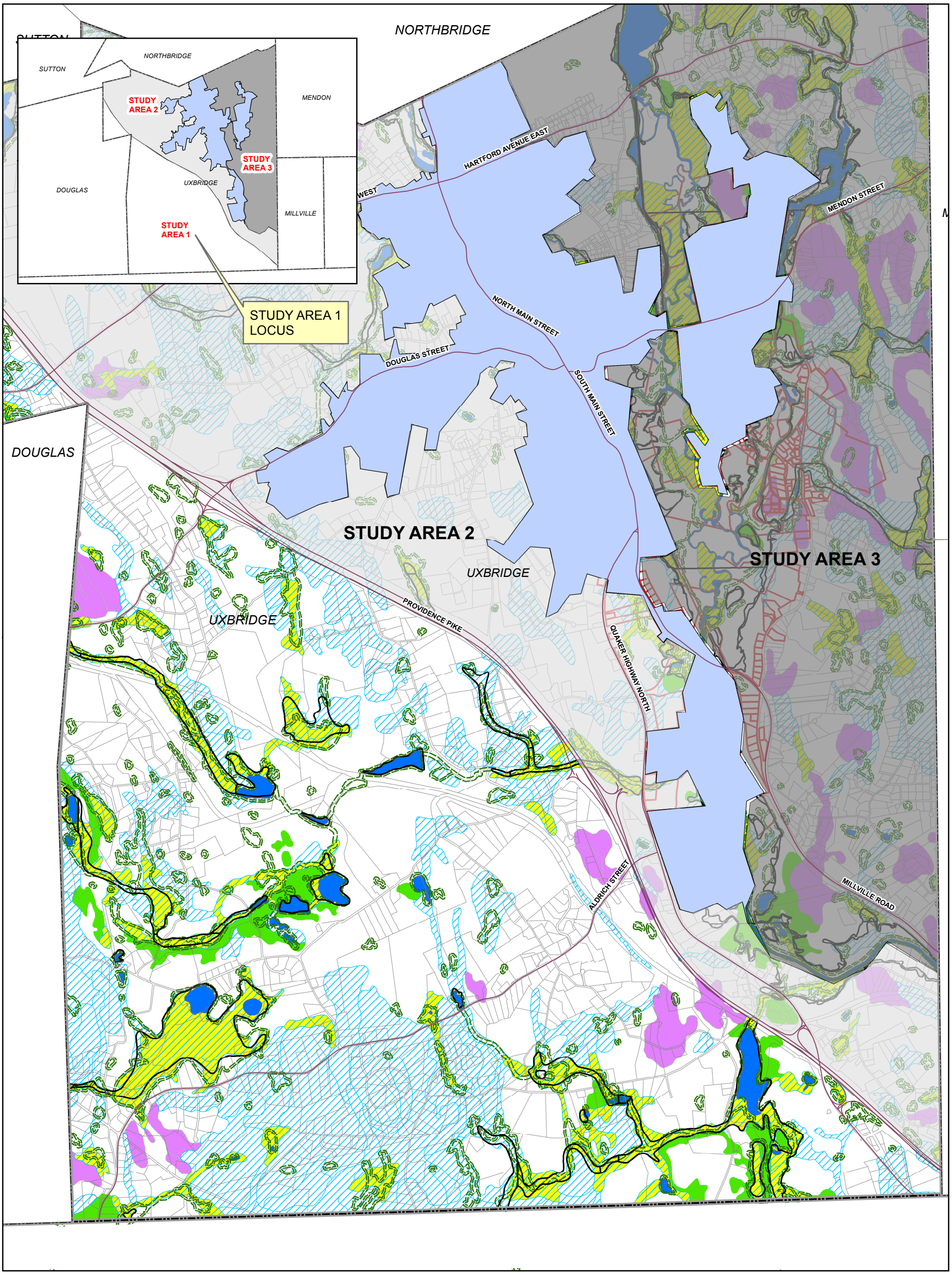

Legend

- Uxbridge Town Boundary
- Sewered Area
- 100-year Floodplain
- Title 5 Buffer Zones
- Surface Water
- Areas with High Groundwater Table
- Un-Sewered Parcels in Zone II
- Properties With Less Than Half Acre and Private Well
- Areas Where Depth to Bedrock is less than 40-inches
- Excessively Drained Soils
- Very Poorly Drained Soils

Paper Size ANSI B

0 1,750 3,500 7,000 Feet

1 inch = 3,500 feet

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

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Town of Uxbridge, Massachusetts
Comprehensive Wastewater Management Plan

STUDY AREA 1

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Revision	A
Date	11 Dec 2014

Figure 6-9

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NORTHBRIDGE

HARTFORD AVENUE EAST

HARTFORD AVENUE WEST

MENDON STREET

MENDO

NORTH MAIN STREET

DOUGLAS STREET

SOUTH MAIN STREET

STUDY AREA 3

UXBRIDGE

PROVIDENCE PIKE

QUAKER HIGHWAY NORTH

MILLV

STUDY AREA 1

ALDRICH STREET

MILLVILLE ROAD

STUDY AREA 2
LOCUS

SUTTON

NORTHBRIDGE

STUDY AREA 2

MENDON

STUDY AREA 3

UXBRIDGE

DOUGLAS

MILLVILLE

STUDY AREA 1

Legend

- Uxbridge Town Boundary
- Sewered Area
- 100-year Floodplain
- Title 5 Buffer Zones
- Surface Water
- Areas with High Groundwater Table
- Un-Sewered Parcels in Zone II
- Properties With Less Than Half Acre and Private Well
- Areas Where Depth to Bedrock is less than 40-inches
- Excessively Drained Soils
- Very Poorly Drained Soils

Paper Size ANSI B

0 2,000 4,000 8,000 Feet

1 inch = 4,000 feet

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

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STUDY AREA 2

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Date	11 Dec 2014

Figure 6-10

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NORTHBRIDGE

MENDON

MILLVILLE

UXBRIDGE

STUDY AREA 2

STUDY AREA 1

HARTFORD AVENUE EAST

HARTFORD AVENUE WEST

MENDON STREET

NORTH MAIN STREET

SOUTH MAIN STREET

DOUGLAS STREET

PROVIDENCE PIKE

QUAKER HIGHWAY NORTH

ALDRICH STREET

MILLVILLE ROAD

STUDY AREA 3 LOCUS

SUTTON

NORTHBRIDGE

MENDON

STUDY AREA 2

UXBRIDGE

STUDY AREA 3

DOUGLAS

MILLVILLE

STUDY AREA 1

Legend

- Uxbridge Town Boundary
- Sewered Area
- 100-year Floodplain
- Title 5 Buffer Zones
- Surface Water
- Areas with High Groundwater Table
- Un-Sewered Parcels in Zone II
- Properties With Less Than Half Acre and Private Well
- Areas Where Depth to Bedrock is less than 40-inches
- Excessively Drained Soils
- Very Poorly Drained Soils

Paper Size ANSI B

0 1,600 3,200 6,400 Feet

1 inch = 3,200 feet

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

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STUDY AREA 3

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Date	11 Dec 2014

Figure 6-11

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Appendices

Appendix A – 1999 and 2013 NPDES Permits for the Uxbridge WWTF

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

September 30, 1999

Mr. Charles Brundage, Chairman
Board of Selectmen
Town of Uxbridge
21 South Main Street
Uxbridge, Massachusetts 01569

Re: NPDES Reapplication No. MA0102440

Dear Mr. Brundage:

Enclosed is your final National Pollutant Discharge Elimination system (NPDES) permit issued pursuant to the Clean Water Act (the "Federal Act"), as amended, and the Massachusetts Clean Waters Act (the "State Act"), 21 M.G.L. §§43-45, as amended. The Environmental Permit Regulations, at 40 C.F.R. §124.15, 48 Fed. Reg. 14271 (April 1, 1983), require this permit to become effective on the date specified in the permit.

Also enclosed is a copy of the Massachusetts State Water Quality Certification for your final permit, the Agency's response to the comments received on the draft permit and information relative to hearing requests and stays of NPDES permits. Should you desire to request a formal hearing, your request should be submitted to the Agency as outlined in the enclosure and a similar request should also be filed with the Director of the Massachusetts Division of Water Pollution Control in accordance with the provisions of the Massachusetts Administrative Procedures Act, the Division's Rules for the Conduct of Adjudicatory Proceedings and the Timely Action Schedule and Fee Provisions (see enclosure).

We appreciate your cooperation throughout the development of this permit. Should you have any questions concerning the permit, feel free to contact George Papadopoulos of my staff at 617/918-1579.

Sincerely,

Brian Pitt, Chief
Massachusetts NPDES Permit Program Unit

Enclosures

cc: State Water Pollution Control Agency
All Interested Parties

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 Uxbridge
Sewer Commission
Uxbridge, MA 01569

is authorized to discharge from a facility located at

80 River Road
Uxbridge, MA 01569

to receiving water named

Blackstone River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective thirty (30) days after the date of 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 June 29, 1990 and modified on May 18, 1993 and on November 30, 1994.

This permit consists of 10 pages in Part I including effluent limitations, monitoring requirements, etc., and 35 pages in Part II including General Conditions and Definitions.

Signed this 30 day of September, 1999

Linda M. Murphy
Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

Glenn Haas (LL)
Director, Division of
Watershed Management
Department of Environmental
Protection
Commonwealth of Massachusetts
Boston, MA

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge treated sanitary and industrial wastewater from outfall serial number 001. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations (specify units)			Monitoring Requirement	
	Average Monthly	Average Weekly	Maximum Daily	Measurement Frequency	Sample Type
Flow, MGD	2.5	----	----	Continuous	See Footnote 1
$CBOD_5$, mg/l (June to October)	20	30	Report	3/Week[2]	24-hr comp[3]
BOD_5, mg/l (November to May)	30	45	Report	3/Week[2]	24-hr comp[3]
TSS, mg/l (June to October)	20	30	Report	3/Week[2]	24-hr comp[3]
(November to May)	30	45	Report	3/Week[2]	24-hr comp[3]
pH, S.U.	See I.A.1.b.			1/Day	Grab
Dissolved Oxygen	--- 5.0 mg/l minimum ----			1/Week	Grab
Fecal Coliform[4], #/100 ml (April 1 - October 31)	200	400	400	2/Week	Grab
Total Residual Chlorine[4,5], mg/l (April 1 - October 31)	0.24	----	0.42 [6]	1/Day	Grab
Total Ammonia Nitrogen, in mg/l of N					
(December to April)	15	Report	Report	1/Week	24-hr comp[3]
(May, November)	10	20	Report	1/Week	24-hr comp[3]
(June to October)	5	10	Report	1/Week	24-hr comp[3]
Phosphorus, Total, mg/l[7]					
April 1 - October 31	1.0	----	Report	1/Week	24-hr comp[4]
November 1 - March 31	Report	----	----	1/Month	24-hr comp[4]
Nitrate and nitrite nitrogen, mg/l		----	Report	1/Month	24-hr comp[4]
Whole Effluent Toxicity Testing					
LC_{50}, [8]	----	----	100%	2/Year[9]	24-hr comp[3]

-- Footnotes are listed on Page 4 --

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 6.0 nor greater than 8.3 at any time, unless these values are exceeded due to natural causes.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall contain neither a visible oil sheen, foam, nor 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. When the effluent discharged for a period of 90 consecutive days exceeds 80 percent of the designed flow, the permittee shall submit to the permitting authorities a projection of loadings up to the time when the design capacity of the treatment facility will be reached, and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans.

Footnotes:

1. For flow, report maximum and minimum daily rates and total flow for each operating date.
2. Sampling required for influent and effluent.
3. A 24-hour composite sample will consist of at least eight (8) flow weighted grab samples taken during one working day.
4. Fecal coliform and total residual chlorine monitoring will be conducted during the period April 1st through October 31st only, to reflect the seasonal chlorination. These are also State certification requirements.
5. Total Residual Chlorine (TRC) shall be tested using **Amperometric Titration** or the **DPD spectrophotometric** method. The EPA approved methods are found in Standard Methods for the Examination of Water and Wastewater - 18th Edition, 4500-CL E and method 4500-CL G or USEPA Manual of Methods of Analysis of Water and Wastes Method 330.5.
6. The daily maximum TRC limit is an instantaneous limit and the highest of all sample results for the month shall be reported. See Attachment 1 for the chlorination system report requirement.
7. Schedule of Compliance
   a. Starting on the effective date of the permit, the permittee shall begin operation of chemical addition capabilities necessary to remove phosphorus consistent with the effluent limitations in the permit.
   b. From the effective date of the permit to October 31, 2000 the permittee shall develop and implement operational procedures consistent with the seasonal effluent phosphorus limitation.
   c. By April 1, 2001, the permittee shall achieve compliance with the phosphorus effluent limitation.
   d. From the permit's effective date through October 31, 2000, the phosphorus limit shall not be effective. During this period, the permittee shall monitor for phosphorus at the frequency noted on Page 2. Along with a Discharge Monitoring Report and no later than October 31, 2000, the permittee shall report results of such monitoring and the status of efforts taken pursuant to 7a.and 7b.
8. The LC_{50} is the effluent concentration which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent shall cause no more than a 50% mortality rate.
9. The permittee shall conduct acute toxicity tests two times per year. The permittee shall test the daphnid, Ceriodaphnia dubia, only. Toxicity test samples shall be collected and tests completed during the quarters ending June 30 and December 31. Results are to be submitted by the 15th day of the month following the end of the quarter. See Permit Attachment A, Toxicity Test Procedure and Protocol.

Part I.A.

2. All POTWs must provide adequate notice to the Director of the following:

   a. Any new introduction of pollutants into that POTW from an indirect discharger in a primary industry category discharging process water; 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:**

   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. The total chlorine residual and/or other 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.

B. 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:

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.

2. Infiltration/Inflow

   The permittee shall eliminate excessive infiltration/inflow to the sewer system. A summary report of all actions taken to minimize infiltration/inflow during the previous twelve months shall be submitted to EPA and the MA DEP by April 1st of each year. The permittee may request a waiver of this condition if the facility does not experience excessive levels of I/I.

3. Alternate Power Source

   In order to maintain compliance with the terms and conditions of this permit, the permittee shall continue to provide an alternative power source with which to sufficiently operate its treatment works (as defined at 40 CFR §122.2).

C. SLUDGE CONDITIONS

1. GENERAL CONDITIONS

   a. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices and with the Clean Water Act (CWA) Section 405(d) technical standards. If an applicable management practice or numerical limitation for pollutants in sewage sludge more stringent than existing federal and state regulations is promulgated under Section 405(d) of the CWA, this permit shall be modified or revoked and reissued to conform to the promulgated regulations.

   b. The permittee shall give prior notice to the Director of any change(s) planned in the permittee's sludge use or disposal practice.

   c. A change in the permittee's sludge use or disposal practice is a cause for modification of this permit. It is a cause for revocation and reissuance of this permit if the permittee requests or agrees.

2. The permittee currently sends its dried sludge, about 254 dry metric tons annually, to New England Treatment Company (NETCO) in Rhode Island for incineration. NETCO's incinerator operation is permitted.

D. Best Management Practices/Pollution Prevention Plan (BMP/PPP)

The permittee shall develop and implement a BMP/PPP, the "plan" as approved and/or modified by the EPA and MA DEP, which achieves the stated objectives and conforms to the following requirements:

1. General Objectives

   (a) minimize the potential for violations of the terms of the permit, including the requirement not to discharge any pollutant, or combination of pollutants, in toxic amounts;
   (b) protect the designated and existing uses of the receiving water; and
   (c) minimize the release of metals from industrial wastewater, treatment plant operation, storm water runoff, corrosive piping and household chemical inputs.

2. Implementation

The plan shall be developed and made available at a local, publicly accessible location, for examination. The draft plan shall be submitted to EPA and MA DEP within 180 days after the effective date of this permit. The permittee shall respond to all written comments by EPA and the MA DEP and shall make any required changes to the draft plan prior to its approval. Unless otherwise notified by EPA or MA DEP, the permittee shall initiate implementation of the plan within sixty (60) days of the draft plan submittal.

March 98

April 97

3. General Requirements

The plan shall:

(a) Be documented in narrative form and shall include any necessary schedules of activities;
(b) Establish specific objectives for the control of metal loadings to and through the treatment plant;
(c) Identify and examine each type of source which contributes metals loadings to the plant (e.g. industrial, household, water supply) for its potential to cause a release of significant amounts of metals to the treatment plant and ultimately to the receiving water; and
(d) Establish specific BMPs to meet the objectives identified under Paragraph 3.b. above.

4. Minimum Components

The plan shall contain the following minimum components:

(a) A summary of industrial users (IUs) to the permittee's plant, an estimate of potential metals loadings from such sources, and a description of BMPs used by the permittee and these IUs to minimize such metal loadings;

(b) A report which outlines the actions to be taken by the permittee, in coordination with local public water suppliers, to assess and reduce the copper and lead discharges associated with corrosive piping in the water supply distribution system;

(c) A pollution prevention outreach program that enables individual homeowners and commercial operators to take steps to prevent or reduce metals from entering the wastewater collection and treatment system;

(d) A wastewater treatment optimization study which identifies ways in which metals removal through the treatment plant is optimized; and

(e) BMPs related to storm water discharges associated with industrial activities at the treatment plant. As a guide, the permittee may use the BMPs listed in Attachment B which is taken from EPA's Multi-Sector General Permit for Storm Water and would apply to storm water discharges from treatment works with a design flow of 1.0 MGD or more.

5. Plan Modification

Within sixty (60) days of a change in circumstances which results in the potential for a substantial increase of metals loadings to the treatment plant, the permittee shall:

(a) notify the EPA and MA DEP; and
(b) develop an amendment to the plan and submit it to EPA and MA DEP for approval.

6. Plan Effectiveness

If the plan proves to be ineffective in achieving the stated goals and objectives, the permit and/or the plan requirements may be modified to incorporate revised plan elements.

7. Annual Report

By April 1 of each year, the permittee shall submit a report which:

(a) describes the activities conducted in the previous 12 months;
(b) analyzes the effectiveness of such efforts;
(c) establishes recommendations for changes to the plan to improve its effectiveness; and
(d) outlines the activities and schedules to be followed over the next 12 months.

E. REOPENER CLAUSE

The EPA reserves the right to make appropriate revisions to this permit in order to establish any additional and/or modified effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA based on new information.

F. MONITORING AND REPORTING

1. Reporting

Monitoring results obtained during the previous month shall be summarized for each month and reported on separate Discharge Monitoring Report Form(s) postmarked no later than the 15th day of the month following the effective date of the permit.

Signed and dated originals of these, and all other reports required herein, shall be submitted to the Director and the State at the following addresses:

Environmental Protection Agency
Water Technical Unit (SEW)
P.O. Box 8127
Boston, Massachusetts 02114

The State Agency is:

Massachusetts Department of Environmental Protection
Central Regional Office
627 Main Street
Worcester, MA 01608

Signed and dated toxicity test reports required by this permit shall be submitted to the State at:

Massachusetts Department of Environmental Protection
Division of Watershed Management
Watershed Planning and Permitting Section
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

G. STATE PERMIT CONDITIONS

1. This Discharge Permit is issued jointly by the U. S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) under Federal and State law, respectively. As such, all the terms and conditions of this permit are hereby incorporated into and constitute a discharge permit issued by the Commissioner of the MA DEP pursuant to M.G.L. Chap.21, §43.

2. 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 an 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.

ATTACHMENT 1

Chlorination System Report

Within six (6) months of the effective date of the permit, the permittee will submit a report documenting the effectiveness of the chlorination and dechlorination systems. The report will specifically address how flow variability and chlorine demand variability affect compliance with the TRC and fecal coliform limits at all times. Sampling data shall be provided to support conclusions on how hourly and daily flow and chlorine demand variability affects permit compliance. The report will include a description of the chlorination and dechlorination systems and the methods for dosage control. The report will identify all changes necessary to ensure compliance with the TRC and fecal coliform limits at all times, including equipment modifications and upgrades, operational procedures (including calibration procedures and alarm/response procedures), and sampling protocols. The report will include a schedule for implementing all of the necessary changes. An annual report shall be submitted on September 30 of each year summarizing all exceedances of the TRC and fecal coliform effluent limits during the previous year, the estimated or measured fecal coliform and chlorine discharge levels during the exceedance, and measures taken to fix the problem and to prevent future occurrences.

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 Uxbridge
Sewer Commission

is authorized to discharge from the facility located at

Uxbridge Wastewater Treatment Facility
80 River Road
Uxbridge, MA 01569

to receiving water named

Blackstone River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall 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 last day of the month preceding the effective date.

This permit supersedes the permit issued on September 30, 1999 and effective on October 30, 1999.

This permit consists of 18 pages in Part I including effluent limitations, monitoring requirements, and state permit conditions, **Attachment A** (Freshwater Acute Toxicity Test Procedure and Protocol, February 2011), and 25 pages in Part II, Standard Conditions.

Signed this 17th day of June, 2013

/S/ SIGNATURE ON FILE
Ken Moraff, Acting Director
Office of Ecosystem Protection
Environmental Protection Agency
Region 1
Boston, MA

David Ferris, Director
Massachusetts Wastewater Management Program
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I

A.1.During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge treated wastewater from outfall **001** to the Blackstone River. Such discharge shall be limited and monitored by the permittee as specified below.

a. *Reduced Flow Limits* – the permittee's discharge shall be limited as specified below for the period in which the facility's annual average discharge is at or below an annual average flow limit of 1.25 MGD. If and when the permittee becomes aware that increased flows or planned connections/extensions of the sewer system may result in an exceedance of the 1.25 MGD average annual flow limit, the permittee shall evaluate its flow trends and estimate a projected date at which such exceedance is expected to occur. The permittee shall notify EPA in writing a minimum of 60 days prior to the date it expects to exceed the limit, identifying the date such exceedance is expected to occur. The limits in Part I.A.1.b shall go into effect on the earlier of (i) the date identified by the permittee for exceeding 1.25 MGD annual average flow limit, or (ii) 60 days after the first month in which the 1.25 MGD annual average flow limit is exceeded.

EFFLUENT CHARACTERISTIC	***REDUCED FLOW* EFFLUENT LIMITS** **Applicable at Annual Average Flows ≤ 1.25 MGD**						**MONITORING REQUIREMENTS**	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
FLOW[2]	***	***	***	1.25 MGD	***	***	Continuous	Recorder
FLOW[2]	***	***	***	Report MGD	***	Report MGD	Continuous	Recorder
BOD_5 [3] (June 1 to October 31)	*209* lbs/day	*313* lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
BOD_5 [3] (November 1 to May 31)	*313* lbs/day	*469* lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (June 1 to October 31)	*209* lbs/day	*313* lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (November 1 to May 31)	*313* lbs/day	*469* lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
Total Residual Chlorine[5,6,7]	***	***	***	0.24 mg/l	***	0.42 mg/l	2/Day[15]	Grab
Escherichia Coli[5,8] (April 1 to October 31)	***	***	***	126 cfu/100 ml	***	409 cfu/100 ml	2/Week	Grab
Enterococci[8,9]	***	***	***	73 cfu/100 ml	***	236 cfu/100 ml	1/Week	Grab
pH RANGE[5]	6.0 - 8.3 SU See Permit Page 6, Part I.A.1.b.						1/Day	Grab
DISSOLVED OXYGEN[5] (April 1 to October 31)	***	***	***	Not less than 5.0 mg/l			1/Week	Grab

EFFLUENT CHARACTERISTIC	*REDUCED FLOW* EFFLUENT LIMITS Applicable at Annual Average Flows ≤ 1.25 MGD						MONITORING REQUIREMENTS	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
TOTAL AMMONIA, as N (June 1- October 31)	*52* lbs/day	*104* lbs/day	Report lbs/day	5 mg/l	10 mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (December 1 to April 30)	*157* lbs/day	Report lbs/day	Report lbs/day	15 mg/l	Report mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (May 1-31and November 1-30)	*104* lbs/day	*209* lbs/day	Report lbs/day	10 mg/l	20 mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL PHOSPHORUS[13] (April 1- October 31)	*4.2* lbs/day	***	***	*Report* mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL PHOSPHORUS[13] (November 1- March 31)	*10* lbs/day	***	***	1.0 mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
ORTHO PHOSPHORUS, DISSOLVED, as P[13] (November 1- March 31)	Report lbs/day	***	***	Report mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
TOTAL NITROGEN[17] (May 1- October 31) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	*Report* lbs/day Report lbs/day Report lbs/day	***	***	*Report* mg/l Report mg/l Report mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL NITROGEN[17] (November 1 – April 30) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	Report lbs/day Report lbs/day Report lbs/day	***	***	Report mg/l Report mg/l Report mg/l	***	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL ALUMINUM	1.81 lbs/day	***	***	87 ug/l	***	Report ug/l	1/Month	24-Hour Composite[4]
Whole Effluent Toxicity[10,11,12]	Acute LC50 ≥ 100%						2/Year	24-Hour Composite[4]
Hardness[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Ammonia Nitrogen as N[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]

EFFLUENT CHARACTERISTIC	*REDUCED FLOW* EFFLUENT LIMITS Applicable at Annual Average Flows ≤ 1.25 MGD						MONITORING REQUIREMENTS	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
Total Recoverable Aluminum[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Cadmium[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Copper[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Nickel[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Lead[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Zinc[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]

b. *Design Flow Limits* – the permittee's discharge shall be limited as specified below for annual average discharges that exceed 1.25 MGD. The limits in this Part shall go into effect on the earlier of (i) the date identified by the permittee that it expects to exceed the 1.25 mgd annual average flow, or (ii) 60 days after the first month in which the 1.25 MGD annual average flow is exceeded.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**						**MONITORING REQUIREMENTS**	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
FLOW[2]	***	***	***	2.5 MGD	***	***	Continuous	Recorder
FLOW[2]	***	***	***	Report MGD	***	Report MGD	Continuous	Recorder
BOD_5 [3] (June 1 to October 31)	417 lbs/day	626 lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
BOD_5 [3] (November 1 to May 31)	626 lbs/day	938 lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (June 1 to October 31)	417 lbs/day	626 lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (November 1 to May 31)	626 lbs/day	938 lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
Total Residual Chlorine[5,6,7]	***	***	***	0.24 mg/l	***	0.42 mg/l	2/Day[15]	Grab
Escherichia Coli[5,8] (April 1 to October 31)	***	***	***	126 cfu/100 ml	***	409 cfu/100 ml	2/Week	Grab
Enterococci[8,9]	***	***	***	73 cfu/100 ml	***	236 cfu/100 ml	1/Week	Grab
pH RANGE[5]	6.0 - 8.3 SU See Permit Page 6, Part I.A.1.b.						1/Day	Grab
DISSOLVED OXYGEN[5] (April 1 to October 31)	***	***	***	Not less than 5.0 mg/l			1/Week	Grab
TOTAL AMMONIA, as N (June 1- October 31)	104 lbs/day	208.5 lbs/day	Report lbs/day	5 mg/l	10 mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (December 1 to April 30)	313 lbs/day	Report lbs/day	Report lbs/day	15 mg/l	Report mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (May 1-31and November 1-30)	208.5 lbs/day	417 lbs/day	Report lbs/day	10 mg/l	20 mg/l	Report mg/l	1/Week	24-Hour Composite[4]

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITS						MONITORING REQUIREMENTS	
	Mass Limits			Concentration Limits				
PARAMETER	AVERAGE MONTHLY	AVERAGE WEEKLY	MAXIMUM DAILY	AVERAGE MONTHLY	AVERAGE WEEKLY	MAXIMUM DAILY	MEASUREMENT FREQUENCY	SAMPLE TYPE[1]
TOTAL PHOSPHORUS[13] (April 1- October 31)	4.2 lbs/day	***	***	0.2 mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL PHOSPHORUS[13] (November 1- March 31)	21 lbs/day	***	***	1.0 mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
ORTHO PHOSPHORUS, DISSOLVED, as P[13] (November 1- March 31)	Report lbs/day	***	***	Report mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
TOTAL NITROGEN[14] (May 1- October 31) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	167 lbs/day Report lbs/day Report lbs/day	***	***	8 mg/l Report mg/l Report mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL NITROGEN[14] (November 1 – April 30) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	Report lbs/day Report lbs/day Report lbs/day	***	***	Report mg/l Report mg/l Report mg/l	***	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL ALUMINUM	1.81 lbs/day	***	***	87 ug/l	***	Report ug/l	1/Month	24-Hour Composite[4]
Whole Effluent Toxicity[10,11,12]	Acute LC50 ≥ 100%						2/Year	24-Hour Composite[4]
Hardness[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Ammonia Nitrogen as N[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Aluminum[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Cadmium[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Copper[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Nickel[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Lead[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Zinc[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]

Footnotes:

1. All required effluent samples shall be collected at the outlet of the chlorine contact chamber and prior to discharge to the Blackstone River. A routine sampling program shall be developed in which samples are taken at the same location, the same time and the same days each month. Any deviations from the routine sampling program shall be documented in correspondence attached to the applicable discharge monitoring report that is submitted to EPA. 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.

2. The limit is an annual average limit, which shall be reported as a rolling average. The first value will be calculated using the monthly average flow for the first full month ending after the effective date of the permit and the eleven previous monthly average flows. Each subsequent month's DMR will report the annual average flow that is calculated from that month and the previous 11 months. The monthly average and maximum daily flows for each month shall also be reported.

   The permittee shall notify EPA by letter to the OEP Director, U.S. Environmental Protection Agency, 5 Post Office Square – Suite 100 (OEP06-5), Boston, MA 02109-3912 (with an additional copy to be submitted with its monthly DMR), (i) no later than sixty days before a projected exceedance of the 1.25 MGD annual average flow limit, if and when the permittee's evaluation of flow trends indicates that flows are expected to exceed 1.25 MGD; or (ii) at the time of filing of the first DMR in which the reported annual average flow exceeds 1.25 MGD.

3. Sampling is required for the influent and effluent.

4. A 24-hour composite sample will consist of at least twenty-four (24) grab samples taken during a consecutive 24 hour period (e.g. 7:00 A.M. Monday to 7:00 A.M. Tuesday), either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

5. Required for Massachusetts State Certification.

6. The minimum level (ML) for total residual chlorine (TRC) is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G, or USEPA Manual of Methods of Analysis of Water and Wastes, Method 330.5. One of these methods must be used to determine total residual chlorine. For effluent limitations less than 20 ug/l, compliance/non-compliance will be determined based on the ML. Sample results of 20 ug/l or less shall be reported in accordance with the discharge monitoring report instructions. This monitoring shall be conducted concurrently with the fecal coliform and/or E.coli sampling described below.

7. The chlorination system shall include an alarm system within one (1) year of the effective date of the permit. Any interruption or malfunction of the chlorine dosing system that may have resulted in levels of chlorine which were inadequate for achieving effective disinfection or 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(s), and the estimated amount of time that the low or high dosage levels of chlorine chemicals occurred.

8. Bacteria samples shall be collected concurrently with a TRC sample.

9. The E. coli limits are Massachusetts State certification requirements. The enterococci limits are a requirement of the U. S. EPA permit and are not a requirement of the Massachusetts Department of Environmental Protection (MassDEP) permit.

   The enterococci sample shall be collected currently with one of the E.coli samples during the April to October period. After a minimum of one year, the permitee may request a reduction of enterococci monitoring to winter only, if the monitoring data establishes that E.coli control is adequate to ensure control of enterococcus. The request shall be made in writing to EPA and shall include all concurrent monitoring data collected by the permittee. The permittee shall continue sampling for both E.coli and enterococci between April and October until receiving written approval of its request from EPA.

10. The permittee shall conduct acute toxicity tests two times per year. The permittee shall test the daphnid, Ceriodaphnia dubia, only. Toxicity test samples shall be collected during the months of April and October. The test results shall be submitted by the last day of the month following the completion of the test. The results are due May 31st and November 30th, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit.

Test Periods	**Submit Results By:**	**Test Species**	**Acute Limit LC50**
April and October	May 31st November 30th	Ceriodaphnia dubia (Daphnid)	$\geq$ 100%

11. 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**.

    Any tests using alternate dilution water must be run with a minimum of two controls: a receiving water (Blackstone River) control and a toxicity-free alternate dilution water control. Chemical data of the receiving water, including data for all metals listed in the protocol, must be included in the whole effluent toxicity (WET) report.

12. The LC50 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.

13. The maximum daily concentration and loading values for dissolved ortho phosphorus shall be derived from sampling done concurrently with the sampling for total phosphorus.

14. The total nitrogen effluent limitations and monitoring requirements are conditions of the U.S. Environmental Protection Agency (EPA) permit and are not requirements of the MassDEP permit. Sampling must be conducted and reported as specified, beginning on the effective date of the permit. The permittee shall operate the treatment facility to reduce the discharge of total nitrogen during the months of November to April to the maximum extent possible, using all available treatment equipment in place at the facility. The total nitrogen values will be calculated by adding the results of the nitrite and nitrate nitrogen and the total Kjeldahl nitrogen sampling. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit during the months of May through October is not required during the months of November through April.

15. Two samples per day Monday to Friday; one sample per day Saturday, Sunday and holidays.

16. For each whole effluent toxicity test the permittee shall report on the appropriate discharge monitoring report, (DMR), the concentrations of the hardness, ammonia nitrogen as nitrogen, total recoverable aluminum, cadmium, copper, lead, nickel, and zinc found in the 100 percent effluent sample. All these aforementioned chemical parameters shall be determined to at least the minimum quantification level shown in **Attachment A**. Also the permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

17. The permittee shall operate the treatment facility to reduce the discharge of total nitrogen to the maximum extent possible using all available treatment equipment in place at the facility. The permittee shall submit an annual report to EPA and the MassDEP by **February 1st** of 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. The total nitrogen values will be calculated by adding the results of the nitrite and nitrate nitrogen and the total Kjeldahl nitrogen sampling.

    The total nitrogen effluent limitations and monitoring requirements are conditions of the U.S. Environmental Protection Agency (EPA) permit and are not requirements of the MassDEP permit.

Part I.A.2

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 6.0 nor greater than 8.3 at any time.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall contain neither a visible oil sheen, foam, nor floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of total suspended solids, biochemical oxygen demand and carbonaceous 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 permittee shall conduct a planning process leading to the completion of a Comprehensive Wastewater Management Plan (CWMP) that shall include consideration of whether a design flow smaller than 2.5 mgd may be appropriate within the planning horizon of the plan. The resulting CWMP shall be completed no later than four (4) years from the effective date of the permit and shall be submitted with the reapplication for the next permit reissuance.

h. The results of sampling for any parameter above its required frequency must also be reported.

3. 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.

4. Prohibitions Concerning Interference and Pass Through:

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.

5. 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.

6. 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 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 (Part II) of this permit (Twenty-four hour reporting).

Notification of Sanitary Sewer Overflows (SSOs) to MassDEP shall be made on its SSO Reporting Form (which includes MassDEP Regional Office Telephone numbers). The reporting form and instructions for its completion may be found on-line at http://www.mass.gov/eea/agencies/massdep/service/approvals/sanitary-sewer-overflow-bypass-backup-notification.html.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance (O & M) 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 submitted and implemented 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 the design flow [1.9 MGD] 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.

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:

1 As defined at 40 CFR §122.2, which references the definition at 40 CFR §403.3

- General requirements
- Pollutant limitations
- Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
- Management practices
- Record keeping
- Monitoring
- Reporting

Which of the 40 C.F.R. 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 than1,500	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

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

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:

- Name and address of contractor(s) responsible for sludge preparation, use or disposal
- 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.

E. MONITORING AND REPORTING

The permittee shall submit monitoring data and all other NPDES permit required reports to EPA 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. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

1. Submittal of Reports Using NetDMR

   NetDMR is accessed from: http://www.epa.gov/netdmr. 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. A permittee submitting reports using NetDMR is no longer required to submit hard copies of DMRs or other reports to EPA and no longer 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, Toxicity Test Results and Nutrient Optimization Reports) to MassDEP until further notice from MassDEP.

2. Submittal of Reports in Hard Copy Form

   While we do not anticipate the need for the permittee to submit hard copies of reports to EPA, any hard copies that are submitted to EPA 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 address:

Massachusetts Department of Environmental Protection
Central Regional Office
Bureau of Resource Protection
627 Main Street
Worcester, Massachusetts 01608

Toxicity test reports only shall also be submitted to the State at the following address:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd 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.

F. 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. With the exception of the nitrogen and winter fecal coliform limits, 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.

USEPA REGION 1 FRESHWATER ACUTE TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **Daphnid (Ceriodaphnia dubia) definitive 48 hour test.**
- **Fathead Minnow (Pimephales promelas) definitive 48 hour test.**

Acute toxicity test data shall be reported as outlined in Section VIII.

II. METHODS

The permittee shall use 40 CFR Part 136 methods. Methods and guidance may be found at:

http://water.epa.gov/scitech/swguidance/methods/wet/index.cfm#methods

The permittee shall also meet the sampling, analysis and reporting requirements included in this protocol. This protocol defines more specific requirements while still being consistent with the Part 136 methods. If, due to modifications of Part 136, there are conflicting requirements between the Part 136 method and this protocol, the permittee shall comply with the requirements of the Part 136 method.

III. SAMPLE COLLECTION

A discharge sample shall be collected. Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for chemical and physical analyses required. The remaining sample shall be measured for total residual chlorine and dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1.0 mg/L chlorine. If dechlorination is necessary, a thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) must also be run in the WET test.

All samples held overnight shall be refrigerated at 1- 6°C.

IV. DILUTION WATER

A grab sample of dilution water used for acute toxicity testing shall be collected from the receiving water at a point immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. In the case where an alternate dilution water has been agreed upon an additional receiving water control (0% effluent) must also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids similar to that of the receiving water may be substituted **AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S)**. Written requests for use of an alternate dilution water should be mailed with supporting documentation to the following address:

Director
Office of Ecosystem Protection (CAA)
U.S. Environmental Protection Agency-New England
5 Post Office Sq., Suite 100 (OEP06-5)
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
5 Post Office Sq., Suite 100 (OES04-4)
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcementandassistance/dmr.html for further important details on alternate dilution water substitution requests.

It may prove beneficial to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable performance as outlined in the 'test acceptability' section of the protocol.

V. TEST CONDITIONS

The following tables summarize the accepted daphnid and fathead minnow toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNID, CERIODAPHNIA DUBIA 48 HOUR ACUTE TESTS[1]

1.	Test type	Static, non-renewal
2.	Temperature (^oC)	20 ± 1° C or 25 ± 1^oC
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hour light, 8 hour dark
5.	Test chamber size	Minimum 30 ml
6.	Test solution volume	Minimum 15 ml
7.	Age of test organisms	1-24 hours (neonates)
8.	No. of daphnids per test chamber	5
9.	No. of replicate test chambers per treatment	4
10.	Total no. daphnids per test concentration	20
11.	Feeding regime	As per manual, lightly feed YCT and Selenastrum to newly released organisms while holding prior to initiating test
12.	Aeration	None
13.	Dilution water[2]	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q^R or equivalent deionized water and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	$\geq$ 0.5, must bracket the permitted RWC

15.	Number of dilutions[3]	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Effect measured	Mortality-no movement of body or appendages on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in dilution water control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must first be used within 36 hours of collection.
19.	Sample volume required	Minimum 1 liter

Footnotes:

1. Adapted from EPA-821-R-02-012.
2. Standard prepared dilution water must have hardness requirements to generally reflect the characteristics of the receiving water.

EPA NEW ENGLAND TEST CONDITIONS FOR THE FATHEAD MINNOW (PIMEPHALES PROMELAS) 48 HOUR ACUTE TEST[1]

1.	Test Type	Static, non-renewal
2.	Temperature (^{o}C):	20 $\pm$ 1 ^{o} C or 25 $\pm$ 1°C
3.	Light quality:	Ambient laboratory illumination
4.	Photoperiod:	16 hr light, 8 hr dark
5.	Size of test vessels:	250 mL minimum
6.	Volume of test solution:	Minimum 200 mL/replicate
7.	Age of fish:	1-14 days old and age within 24 hrs of each ~~the~~ other~~s~~
8.	No. of fish per chamber	10
9.	No. of replicate test vessels per treatment	4
10.	Total no. organisms per concentration:	40
11.	Feeding regime:	As per manual, lightly feed test age larvae using concentrated brine shrimp nauplii while holding prior to initiating test
12.	Aeration:	None, unless dissolved oxygen (D.O.) concentration falls below 4.0 mg/L, at which time gentle single bubble aeration should be started at a rate of less than 100 bubbles/min. (Routine D.O. check is recommended.)
13.	dilution water:[2]	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q^{R} or equivalent deionized and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	$\geq$ 0.5, must bracket the permitted RWC

15.	Number of dilutions[3]	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Effect measured	Mortality-no movement on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in dilution water control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples are used within 36 hours of collection.
19.	Sample volume required	Minimum 2 liters

Footnotes:

1. Adapted from EPA-821-R-02-012
2. Standard dilution water must have hardness requirements to generally reflect characteristics of the receiving water.

VI. CHEMICAL ANALYSIS

At the beginning of a static acute toxicity test, pH, conductivity, total residual chlorine, oxygen, hardness, alkalinity and temperature must be measured in the highest effluent concentration and the dilution water. Dissolved oxygen, pH and temperature are also measured at 24 and 48 hour

intervals in all dilutions. The following chemical analyses shall be performed on the 100 percent effluent sample and the upstream water sample for each sampling event.

Parameter	Effluent	Receiving Water	ML (mg/l)
Hardness[1,]	x	x	0.5
Total Residual Chlorine (TRC)[2, 3,]	x		0.02
Alkalinity	x	x	2.0
pH[4]	x	x	--
Specific Conductance	x	x	--
Total Solids	x		--
Total Dissolved Solids	x		--
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005
Al	x	x	0.02
Other as permit requires			

Notes:

1. Hardness may be determined by:
   - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
     -Method 2340B (hardness by calculation)
     -Method 2340C (titration)

2. Total Residual Chlorine may be performed using any of the following methods provided the required minimum limit (ML) is met.
   - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
     -Method 4500-CL E Low Level Amperometric Titration
     -Method 4500-CL G DPD Colorimetric Method

3. Required to be performed on the sample used for WET testing prior to its use for toxicity testing

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration (Determined at 48 Hours)

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See the flow chart in Figure 6 on p. 73 of EPA-821-R-02-012 for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See the flow chart in Figure 13 on p. 87 of EPA-821-R-02-012 .

VIII. TOXICITY TEST REPORTING

A report of the results will include the following:

- Description of sample collection procedures, site description
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicant test data should be included.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)
- Raw data and bench sheets.
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.

NPDES PART II STANDARD CONDITIONS
(January, 2007)

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PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

   The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

   a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

   b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

   c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

   Note: See 40 CFR §122.41(a)(2) for complete “Duty to Comply” regulations.

2. Permit Actions

   This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or notifications of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

   The permittee shall furnish to the Regional Administrator, within a reasonable time, any information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

4. Reopener Clause

The Regional Administrator reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA in order to bring all discharges into compliance with the CWA.

For any permit issued to a treatment works treating domestic sewage (including "sludge-only facilities"), the Regional Administrator or Director shall include a reopener clause to incorporate any applicable standard for sewage sludge use or disposal promulgated under Section 405 (d) of the CWA. The Regional Administrator or Director may promptly modify or revoke and reissue any permit containing the reopener clause required by this paragraph if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or contains a pollutant or practice not limited in the permit.

Federal regulations pertaining to permit modification, revocation and reissuance, and termination are found at 40 CFR §122.62, 122.63, 122.64, and 124.5.

5. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the CWA, or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

6. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges.

7. Confidentiality of Information

a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

b. Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;
(2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).

c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

8. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Regional Administrator. (The Regional Administrator shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

9. State Authorities

Nothing in Part 122, 123, or 124 precludes more stringent State regulation of any activity covered by these regulations, whether or not under an approved State program.

10. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, or local laws and regulations.

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. Bypass

a. Definitions

(1) *Bypass* means the intentional diversion of waste streams from any portion of a 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 be reasonably expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(2) 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 preventative maintenance; and
(3) i) The permittee submitted notices as required under Paragraph 4.c. of this section.
ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

5. <u>Upset</u>

a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during

administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee 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 that the permittee can identify the cause(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
(4) The permittee complied with any remedial measures required under B.3. above.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.

c. Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and
(6) The results of such analyses.

d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by

imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. Planned Changes. The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

(1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
(2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
(3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and

incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

(2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

(3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Twenty-four hour reporting.

(1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance 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 noncompliance.

(2) The following shall be included as information which must be reported within 24 hours under this paragraph.

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
(b) Any upset which exceeds any effluent limitation in the permit.
(c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

(3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.

h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)

b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Applicable standards and limitations means all, State, interstate, and Federal standards and limitations to which a “discharge”, a “sewage sludge use or disposal practice”, or a related activity is subject to, including “effluent limitations”, water quality standards, standards of performance, toxic effluent standards or prohibitions, “best management practices”, pretreatment standards, and “standards for sewage sludge use and disposal” under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the CWA.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in "approved States", including any approved modifications or revisions.

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

Average monthly discharge limitation means 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.

Average weekly discharge limitation means the highest allowable average of "daily discharges" measured during the calendar week divided by the number of "daily discharges" measured during the week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Best Professional Judgment (BPJ) means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

Coal Pile Runoff means the rainfall runoff from or through any coal storage pile.

Composite Sample means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

Construction Activities - The following definitions apply to construction activities:

(a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

(b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.

(c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

(d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

(e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

Contiguous zone means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

Continuous discharge means a "discharge" which occurs without interruption throughout the operating hours of the facility except for infrequent shutdowns for maintenance, process changes, or similar activities.

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Director normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

Discharge Monitoring Report Form (DMR) means the EPA standard national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by "approved States" as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

Discharge of a pollutant means:

(a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source", or

(b) Any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation (See "Point Source" definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead

to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any "indirect discharger."

Effluent limitation means any restriction imposed by the Regional Administrator on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States", the waters of the "contiguous zone", or the ocean.

Effluent limitation guidelines means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise "effluent limitations".

EPA means the United States "Environmental Protection Agency".

Flow-weighted composite sample means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab Sample – An individual sample collected in a period of less than 15 minutes.

Hazardous Substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

Indirect Discharger means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

(b) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

Large and Medium municipal separate storm sewer system means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized

populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

Maximum daily discharge limitation means the highest allowable "daily discharge" concentration that occurs only during a normal day (24-hour duration).

Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO) is defined as "maximum concentration" or "Instantaneous Maximum Concentration" during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean "a value that shall not be exceeded" during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of "Maximum Daily Discharge" and "Average Daily Discharge" concentrations are specifically limited to the daily (24-hour duration) values.

Municipality means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribe organization, or a designated and approved management agency under Section 208 of the CWA.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the CWA. The term includes an "approved program".

New Discharger means any building, structure, facility, or installation:

(a) From which there is or may be a "discharge of pollutants";

(b) That did not commence the "discharge of pollutants" at a particular "site" prior to August 13, 1979;

(c) Which is not a "new source"; and

(d) Which has never received a finally effective NPDES permit for discharges at that "site".

This definition includes an "indirect discharger" which commences discharging into "waters of the United States" after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore rig or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors specified in 40 CFR §§125.122 (a) (1) through (10).

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New source means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants", the construction of which commenced:

(a) After promulgation of standards of performance under Section 306 of CWA which are applicable to such source, or

(b) After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal.

NPDES means "National Pollutant Discharge Elimination System".

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES programs.

Pass through means 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 POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved" State.

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point Source means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by the authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

Privately owned treatment works means any device or system which is (a) used to treat wastes from any facility whose operation is not the operator of the treatment works or (b) not a "POTW".

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly Owned Treatment Works (POTW) means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Regional Administrator means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

Secondary Industry Category means any industry which is not a "primary industry category".

Section 313 water priority chemical means a chemical or chemical category which:

(1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);

(2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and

(3) satisfies at least one of the following criteria:

(i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
(ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
(iii) are pollutants for which EPA has published acute or chronic water quality criteria.

Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Significant materials includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

Sludge-only facility means any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

Time-weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

Toxic pollutants means any pollutant listed as toxic under Section 307 (a)(1) or, in the case of "sludge use or disposal practices" any pollutant identified in regulations implementing Section 405(d) of the CWA.

Treatment works treating domestic sewage means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a "treatment works treating domestic sewage", where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

Waste Pile means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Waters of the United States means:

(a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;

(b) All interstate waters, including interstate "wetlands";

(c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands", sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purpose;

(2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(3) Which are used or could be used for industrial purposes by industries in interstate commerce;

(d) All impoundments of waters otherwise defined as waters of the United States under this definition;

(e) Tributaries of waters identified in Paragraphs (a) through (d) of this definition;

(f) The territorial sea; and

(g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in Paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

Active sewage sludge unit is a sewage sludge unit that has not closed.

Aerobic Digestion is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

Agricultural Land is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate is the whole sludge application rate (dry weight basis) designed:

(1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

Anaerobic digestion is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

Annual pollutant loading rate is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Annual whole sludge application rate is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

Aquifer is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

Base flood is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

Contaminate an aquifer means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2,

classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

Cover is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

Cumulative pollutant loading rate is the maximum amount of inorganic pollutant that can be applied to an area of land.

Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

Displacement is the relative movement of any two sides of a fault measured in any direction.

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

Fault is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

Feed crops are crops produced primarily for consumption by animals.

Fiber crops are crops such as flax and cotton.

Final cover is the last layer of soil or other material placed on a sewage sludge unit at closure.

Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

Forest is a tract of land thick with trees and underbrush.

Ground water is water below the land surface in the saturated zone.

Holocene time is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

Hourly average is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

Incineration is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

Industrial wastewater is wastewater generated in a commercial or industrial process.

Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

Land with a high potential for public exposure is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

Land with low potential for public exposure is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

Leachate collection system is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

Liner is soil or synthetic material that has a hydraulic conductivity of 1×10^{-7} centimeters per second or less.

Lower explosive limit for methane gas is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

Monthly average (Incineration) is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

Monthly average (Land Application) is the arithmetic mean of all measurements taken during the month.

Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

Permitting authority is either EPA or a State with an EPA-approved sludge management program.

Person is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

Person who prepares sewage sludge is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

pH means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

Pollutant (as defined in sludge disposal requirements) is an organic substance, an inorganic substance, a combination or organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

Pollutant limit (for sludge disposal requirements) is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

Public contact site is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

Qualified ground water scientist is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

Range land is open land with indigenous vegetation.

Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

Runoff is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

Seismic impact zone is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

Sewage sludge is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to:, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

Sewage sludge unit is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

Sewage sludge unit boundary is the outermost perimeter of an active sewage sludge unit.

Specific oxygen uptake rate (SOUR) is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

Surface disposal site is an area of land that contains one or more active sewage sludge units.

Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

Treat or treatment of sewage sludge is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Unstable area is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl_2	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M^3/day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH_3-N	Ammonia nitrogen as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NO_3-NO_2	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	"Whole effluent toxicity" is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	"Chronic (Long-term Exposure Test) – No Observed Effect Concentration". The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	"Acute (Short-term Exposure Test) – No Observed Effect Concentration" (see C-NOEC definition).
LC_{50}	LC_{50} is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC_{50} = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 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

NPDES PERMIT NUMBER: **MA0102440**

PUBLIC NOTICE START AND END DATES: September 21, 2012 thru November 19, 2012

NAME AND MAILING ADDRESS OF APPLICANT:

Town of Uxbridge
Sewer Commission
River Road
Uxbridge, MA 01569

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Uxbridge Wastewater Treatment Facility
80 River Road
Uxbridge, MA 01569

RECEIVING WATER: **Blackstone River (MA51-05)**
USGS Hydrologic Code #01090003 – Blackstone River Watershed (51)

RECEIVING WATER CLASSIFICATION(S): **Class B – warm water fishery**

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I. Proposed Action, Type of Facility, and Discharge Location.

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 water. The facility is engaged in the collection and treatment of domestic wastewater and septage. The discharge from this secondary wastewater treatment facility is via Outfall 001 to the Blackstone River.

II. Description of Treatment System and Discharges

A quantitative description of the wastewater treatment plant discharge in terms of significant effluent parameters based on recent monitoring data is shown on **Table 1**. **Figure 1** shows the geographical location, and **Figure 2** shows the flow process diagram of the Uxbridge Wastewater Treatment Facility (WWTF).

The Uxbridge WWTF is a 2.5 million gallon per day (MGD) secondary wastewater treatment facility which serves a population of about 6618, according to the Town's permit application dated April 26, 2004. There is currently one industrial user contributing a small amount of non-contact cooling water to the WWTF. The collection system consists of separate sanitary sewers and there are no known combined sewers or combined sewer overflows. The facility accepts several thousand gallons per day of septage from within Uxbridge and may accept septage from other communities.

The WWTF's treatment process is shown in Figure 2. Influent wastewater flow is pumped to a headworks building where a mechanical bar rack and a shredder remove coarse sewage solids and other materials from the wastewater; heavier suspended solids are then removed in primary sedimentation tanks. Following primary sedimentation, sodium aluminate is added to the wastewater in a rapid mix tank to enhance phosphorus removal. The wastewater then enters aeration tanks, where it is mixed with sludge returned from the secondary sedimentation tanks, and undergoes biological treatment. Following aeration, the flow is discharged to secondary settling tanks where biological flocculant and fine solids are removed. The flow is then discharged to an effluent channel, where flow is measured with an ultrasonic Parshall flume, and then to a chlorine contact chamber, where the effluent is seasonally disinfected with liquid sodium hypochlorite, added in proportion to flow. The effluent is then discharged to the Blackstone River through a diffuser on the river bottom. The sludge handling facilities are described in Section VIII.

III. Receiving Water Description

The Uxbridge WWTF discharges to the Blackstone River in southeastern Uxbridge, MA. The Blackstone River is an interstate water which has its headwaters in Worcester. It flows south through Millbury, Sutton, Grafton, Northbridge, Uxbridge, Millville and Blackstone to the state line with Rhode Island, approximately five miles downstream of the Uxbridge discharge. The river then flows through Rhode Island to Pawtucket, where the Slater Mill Dam marks the boundary with the marine waters of the Seekonk River, the uppermost segment of Narragansett Bay. The Seekonk River joins the Providence River, which then flows into the main body of

Narragansett Bay. The Seekonk and Providence Rivers are estuaries and are classified as marine waters. The Blackstone River has a number of dams and related impoundments along its length. The closest downstream is the Tupperware Dam and associated "Millville Pond" impoundment at Blackstone, MA, approximately 3 miles downstream of the Uxbridge discharge.

Massachusetts Surface Water Quality Standards ("MA SWQS") list the Blackstone River, from its source to the Rhode Island border, as a Class B Warm Water Fishery. Its uses include habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary (e.g., swimming) and secondary (e.g., fishing and boating) contact recreation. *See* 314 CMR 4. 05(3)(b) and 4.06 (Table 11). Such waters must have consistently good aesthetic value.

Rhode Island has classified the Blackstone River as a Class B1 water from the Massachusetts border to the Central Falls CSO outfall, and as a Class B1{a} water from the CSO outfall to the Seekonk River. The Seekonk River is designated as a Class SB1 water from the Blackstone to the confluence with the Providence River. The Providence River has been designated as a Class SB1{a} water from its confluences with the Seekonk and two other tributaries until a boundary extending between Warwick and East Providence, and a Class SB{a}water from that point until it reaches the Upper Narragansett Bay segment. Rhode Island Water Quality Regulations, July 2006, amended December 2009 ("RI WQR"), Appendix A.

Rhode Island Class B1 waters' designated uses include primary and secondary recreational uses and fish and wildlife habitat, except that primary contact recreational uses may be impacted by pathogens from approved wastewater discharges. RI WQR at Rule 8.B(1)(d). Rhode Island Class SB waters' designated uses include primary and secondary contact recreation; fish and wildlife habitat; shellfish harvesting; and must have good aesthetic value. Id. at Rule 8(B)(2)(b). Class SB1 waters share the same designated uses as Class SB, with the exception of shellfish harvesting. Id. at Rule 8(B)(2)(c). The {a} designation indicates partial use due to impacts from CSOs. RI WQR, Appendix A.

The Blackstone River is listed on the *Massachusetts Year 2010 Integrated List of Waters* (the "MA 303(d) list") as a water that is impaired (not meeting water quality standards) and requiring one or more Total Maximum Daily Loads (TMDLs). The segment of the Blackstone River that the Uxbridge WWTF discharges to, Segment MA51-05, is listed for impairments caused by unknown toxicity, priority organics, metals, nutrients, pH, flow alteration, pathogens, taste/odor/color, suspended solids and turbidity. The Blackstone River in Rhode Island is listed on Rhode Island's *2010 303(d) List of Impaired Waters* for impairments caused by cadmium, lead, total phosphorus, dissolved oxygen, fecal coliform, enterococcus, mercury and PCB in fish tissue, and benthic macroinvertebrate bioassessments (as well as non-native plant impairments not caused by pollutants). The Seekonk and Providence Rivers are listed for impairments caused by total nitrogen, low dissolved oxygen, and fecal coliform.

No TMDLs have been completed for these pollutants in either Massachusetts or Rhode Island. However extensive work has been completed to document and analyze these impairments, as set forth in the discussion of effluent limits derivation below.

IV. Limitations and Conditions

The effluent limitations and all other requirements described in Part VI of this Fact Sheet may be found in the draft permit.

V. Permit Basis: Statutory and Regulatory Authority

Congress enacted the Clean Water Act (CWA) "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." CWA § 101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into the waters of the United States from any point source, except as authorized by specified permitting sections of the CWA, one of which is Section 402. *See* CWA §§ 301(a), 402(a).

Section 402(a) established one of the CWA's principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the CWA, EPA may "issue a permit for the discharge of any pollutant, or combination of pollutants" in accordance with certain conditions. *See* CWA § 402(a). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. *See* CWA § 402(a)(1)-(2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: "technology-based" limitations and "water quality-based" limitations. *See* §§ 301, 304(b); 40 CFR §§ 122, 125, 131. Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 402 and 301(b) of the Clean Water Act. For publicly owned treatment works (POTWs), technology based requirements are effluent limits based on secondary treatment as defined in 40 CFR 133.102.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where necessary to maintain or achieve federal or state water quality standards. Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts Surface Water Quality Standards (MA SWQS), 314 CMR 4.00, establish 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 a site specific criteria is established. Massachusetts regulations similarly require that its permits contain limitations which are adequate to assure the attainment and maintenance of the water quality standards of the receiving waters as assigned in the MA SWQS, 314 CMR 4.00. *See* 314 CMR 3.11(3). EPA is required to obtain certification from the state in which the discharge is located that all water quality standards or other applicable requirements of state law, in accordance with Section 301(b)(1)(C) of the CWA, are satisfied, unless the state waives certification.

Section 401(a)(2) of the CWA and 40 CFR § 122.44(d)(4) require EPA to condition NPDES permits in a manner that will ensure compliance with the applicable water quality standards of a "downstream affected state," in this case Rhode Island. The RI WQR also establish designated uses of the State's waters, criteria to protect those uses, and an antidegradation provision to ensure that existing uses and high quality waters are protected and maintained.

In addition, a permit may not be renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirements of CWA § 303(d)(4) and 40 CFR §122.44(l). States are also required to develop antidegradation policies pursuant to 40 CFR § 131.12. No lowering of water quality is allowed, except in accordance with the antidegradation policy.

VI. Explanation of Permit's Effluent Limitations

A. Basis of current permit limits

The current permit was issued on September 30, 1999, and incorporated limits based on a waste load allocation (WLA) set forth in *Blackstone River Watershed Dissolved Oxygen Waste Load Allocation for Massachusetts and Rhode Island* (November 1997). This WLA was based on a dissolved oxygen (DO) mathematical model developed by the University of Rhode Island and funded by the EPA, the MassDEP and the Rhode Island Department of Environmental Management (RIDEM) which was calibrated and verified using water quality survey data collected in 1991. The water quality data and modeling report can be found in the *Blackstone River Initiative Report* (February 1998). Modeling results formed the basis for water quality based seasonal limits on biochemical oxygen demand (BOD_5), carbonaceous oxygen demand (CBOD), total suspended solids (TSS), phosphorus and ammonia nitrogen that were found necessary to achieve the minimum dissolved oxygen criterion of 5.0 mg/l for the Blackstone River.

The draft permit maintains the existing concentration-based limits on BOD_5, TSS and ammonia nitrogen while also expressing those limits as mass load limits. The CBOD limits in the current permit have been expressed as BOD limits in the draft permit at the permittee's request, in order to conserve laboratory resources due to the greater complexity of the CBOD laboratory methods. BOD is a more conservative measure than CBOD (CBOD should always be less than BOD), and BOD is equally consistent with the approved WLA. The draft permit also sets more stringent limits on total phosphorus and additional limits for total nitrogen, metals and bacteria. These are discussed in greater detail in the pollutant-specific sections that follow.

B. Effluent Limits Derivation

The effluent limits in the draft permit are established to ensure compliance with technology-based requirements, the MA SWQS, the approved WLA for dissolved oxygen, and RI WQR. In most cases the applicable water quality criteria for Massachusetts are similar to, and in some cases more stringent than, the applicable water quality criteria for Rhode Island, so that the effluent limits designed to meet the MA SWQS also ensure compliance with the RI WQR. This is not the case for the limits on total nitrogen and on bacteria in the winter months, and those limits are established solely to ensure compliance with the RI WQR.

1. Flow

The draft permit contains an annual average flow limit of 2.5 MGD, which is the long term average design flow of the facility. The flow limit in the current permit is expressed as a monthly average flow of 2.5 MGD. This change from a monthly average to an annual average is the result of MassDEP adopting a policy establishing flow limits in POTW permits as an annual average in order to account for seasonal flow variations, particularly those associated with high flow and high groundwater which commonly occur in the spring time. *See* MassDEP-DWM, *NPDES Permit Program Policies Related to Flow and Nutrients in NPDES Permits* (2000). Uxbridge's actual flow is routinely well below its design flow, averaging 0.91 MGD in 2009-2010. See Table 1.

2. Conventional Pollutants

a. BOD and TSS

The concentration-based effluent limits for these pollutants remain the same as in the current permit with the exception of the change from CBOD to BOD. For the period of November through May, effluent limitations for monthly and weekly average BOD_5 and TSS are based on secondary treatment requirements. CWA § 301(b)(1)(B); 40 CFR § 133.102. The BOD and TSS draft permit limits for the period from June to October (20 mg/l average monthly and 30 mg/l average weekly) are water-quality based limits based on the WLA. These water quality based effluent limits are more stringent than the technology-based limits for BOD and TSS of 30 mg/l average monthly and 45 mg/l average weekly. There were no CBOD, BOD or TSS violations between 2005 and December 2010.

Mass loading effluent limits for average monthly and average weekly BOD_5, BOD and TSS are found by multiplying the allowable effluent concentration in mg/l by the design flow in MGD and converting to units of pounds per day. The calculations are shown in Attachment A. The monitoring frequency is reduced from three to two times per week based on the facility's history of compliance; long term average concentrations of these pollutants are on the order of 2 mg/l, well below the permit average monthly limits of 20 and 30 mg/l.

b. Ammonia and DO

The draft permit limits for ammonia nitrogen and dissolved oxygen are the same as in the current permit. The permit limits for ammonia nitrogen (expressed in mg/l of nitrogen) were established in order to control both in-stream oxygen demand and the degree of toxicity associated with the discharge. The May limits (10 mg/l and 20 mg/l) and the June through October limits (5 mg/l and 10 mg/l) were based on the 1997 WLA for achieving minimum DO criteria. The November limits (10 mg/l and 20 mg/l) and the December thru April limits (15 mg/l) were based on a December 1999 ammonia criteria document for preventing toxic impacts associated with in-stream ammonia concentrations. *See* EPA, *1999 Update of Ambient Water Quality Criteria for Ammonia,* 822-R-99-014 (1999). There were no violations of the ammonia nitrogen limits from 2005 to 2010.

The minimum DO requirement of 5.0 mg/l has been continued in the draft permit with weekly monitoring, consistent with the State WQS for Class B waters. There were 12 violations of the minimum DO requirement from 2005 to 2010.

c. Bacteria

Limitations for bacteria are based upon state water quality standards and differ from those in the current permit in two respects. First, during the seasonal period of April to October, this permit transitions from fecal coliform to Escherichia coli (*E. coli*) as the bacterial indicator. Second, while the expired permit has seasonal bacteria limits, this permit includes year round limits to satisfy the RI WQR, which are in terms of enterococci.

There were no violations of the existing fecal coliform limits from 2005 to 2010.

E. coli limits

The draft permit includes seasonal (April 1st – October 31st) *E. coli* limitations which are based upon the *E. coli* criteria in the revisions to the MA SWQS, 314 CMR § 4.05(3)(b), approved by EPA in 2007. The monthly average limitation in the draft permit is 126 colony forming units (cfu) per 100 ml, and shall be expressed as a monthly geometric mean. The daily maximum limitation in the draft permit is 409 cfu/100 ml. These limitations are a State certification requirement and are consistent with EPA guidance recommending that no dilution be considered in establishing permit limits for discharges to rivers designated for primary contact recreation. EPA, *Memorandum re: Initial Zones of Dilution for Bacteria in Rivers and Streams Designated for Primary Contact Recreation*,(2008).

The monitoring frequency is maintained at two times per week. In addition, all bacterial samples shall be collected concurrently with one of the daily total residual chlorine (TRC) samples.

Enterococci bacteria limits

Rhode Island's water quality standard for bacteria in Class B waters is a year round criterion for enterococci bacteria. Enterococci concentrations are not to exceed a geometric mean value of 54 colonies/100 ml, with a single sample maximum of 61 colonies/100 ml. For permitting purposes RIDEM uses the geometric mean criterion to establish monthly average permit limit, and the 90% upper confidence level value for "lightly used full body contact recreation" of 175 colonies/100ml to set daily maximum permit limits. RIDEM, *Burrillville Wastewater Treatment Facility Permit Development Document* (January 2012).

To confirm whether water quality standards are in fact violated at the state line, EPA reviewed water quality data collected by USGS at a monitoring station in Millville, MA, upstream of the Tupperware Dam (close to the Rhode Island border) between 2007 and 2009. Monitoring data from the winter months show a median enterococci count of 104 cfu/100 ml, with seven of eleven counts above the single sample maximum (high of 1,160) cfu/100 ml, violating Rhode Islands WQR. Monitoring data from between April and October show a median of 42 cfu/100 ml, with six of fifteen data points above the single sample maximum (high of 1,167 cfu/100 ml), violating the single sample maximum standard. RIDEM, data transmittal (July 9, 2012). While

Uxbridge has not been monitoring bacteria levels in the winter months, the only significant source of bacteria in the river during dry weather is the upstream POTWs. Therefore, EPA has determined that the discharge from the Massachusetts POTWs, including Uxbridge, have a reasonable potential to cause or contribute to violations of Rhode Island's WQR, and that bacteria limitations designed to meet the RI WQR are necessary for these NPDES permits.

To establish the appropriate bacteria limit to meet the RI standard at the state line, EPA has estimated the amount of bacteria die-off that is expected to occur between Uxbridge and the state line. Die-off was estimated using a first order die-off equation as shown below and derived from Crane, S.R., and Moore, J.A., "Modeling enteric bacterial die-off: a review", *Water, Air and Soil Pollution*, 27, 411-39 (1986); and Illinois state water quality standards, Title 35, Subtitle C: Water Pollution; Part 378 (Effluent Disinfection Exemptions.).

$$N(t) = \{N(o)\}e^{-kt}$$

Where:

N(t) = Predicted concentration of bacteria at travel time t, downstream, in #/100 ml
N(o) = Bacteria concentration in the effluent of the source, in #/100 ml
k = The first order die-off rate constant, in 1/day
t = travel time to the point of interest below the source, in days

Although the value of N(o) would typically be the source, or effluent concentration of bacteria, by setting this value to 1 the value that is solved for, N(t), will be a fraction of the bacteria discharged at the source. This allows estimation of the percentage of the effluent concentration that is present at the downstream point (the State line). EPA assumed a river velocity of 1.0 feet per second, which was also used in the Northbridge permit. This value was within the range that was estimated for river flows consistent with this time of year by a USGS modeling effort. A travel distance of 5 miles, or 26400 feet was used, as estimated from the *Blackstone River Initiative Report* at 5-3 and 5-4. This distance is the difference between the river mile readings at Reach 14 of the Blackstone River in Uxbridge (23.2 miles) and that of Reach 16 which crosses over into Rhode Island (18.2). Using these values results in an estimated travel time of 0.31 days. EPA selected a decay rate (k) of 1.0/day from the literature. Mancini, J.L., "Numerical estimates of coliform mortality rates under various conditions", *Journal of Water Pollution Control Federation*, 50, (1978), pp 2477 – 2484. This results in a percentage of the bacteria count at the state line, or N(t), of 74% (0.74). In other words, 74% of the bacteria that is discharged at the Uxbridge WWTF would be present at the state line.

Using the die-off estimate of 26%, EPA has set the enterococci limits for the period of November 1 to March 31 at a monthly geometric mean of 73 colonies/100 ml and a daily maximum of 175 colonies/100 ml, as calculated below. The proposed limits are consistent with Rhode Island's WQR.

$$\frac{\text{Bacteria target at State line}}{\text{percent of discharge bacteria present at state line}} = \text{maximum discharged at WWTF}$$

Monthly average: (Geometric mean)	Daily maximum:
$\frac{54}{0.74}$ = **73 colonies/100 ml**	$\frac{175}{0.74}$ = **236 colonies/100 ml**

The draft permit limit does not take into account dilution consistent with EPA policy (*see EPA Memorandum, supra*), and because of the multitude of other sources of bacteria in the river that effectively eliminate the dilution benefit of the instream flow. Blackstone River data indicate that bacteria concentrations in the river exceed the Rhode Island criteria at various times of the year and under a variety of different flow conditions. *See, e.g.*, Louis Berger Group, Inc., *Water Quality – Blackstone River, Final Report 2: Field Investigations* (2008). Consequently, allowing for dilution would not ensure that the discharge does not cause or contribute to a violation of the RI WQR at the state line.

The monitoring frequency is established at one time per week. Enterococci samples shall be collected concurrently with the E. coli sample. This is a year-round limit, consistent with Rhode Island's year-round water quality standard. However, should monitoring data from the April to October period indicate that control of *E.coli* is sufficient to ensure adequate control of enterococci, the permittee may request that enterococci monitoring be reduced to winter only. Any such request must be based on a minimum of one year of concurrent monitoring and include a side by side comparison of all concurrent bacteria monitoring data.

d. pH

Limitations for pH are based upon State Certification requirements for POTWs under Section 401(d) of the CWA, 40 CFR 124.53 and 124.55, and water quality standards. Although the lower end of the pH range in the MA SQWS is 6.5 s.u., the permit limit was established at 6.0 s.u. in the 1999 permit. The permittee's historic pH data show levels in the 6.0 to 6.5 range, although there has been only one reported pH value below 6.5 since 2005. The low pH values were likely caused by the plant's nitrification efforts. Although it was not stated in the fact sheet accompanying the 1999 permit, it is assumed that the 6.0 s.u. at the effluent was determined not to have a reasonable potential to violate the instream standard of a minimum of 6.5 s.u., since there is considerable mixing available to the effluent. In addition, adding chemical to raise the pH to 6.5 in the absence of a reasonable potential to cause an exceedance of instream water quality standards would not be environmentally justified. The permit limit is also consistent with the technology based requirements of 40 CFR § 133.102. Therefore, the pH range will remain at 6.0 to 8.3 s.u.

3. Nutrients

Nutrients, such as phosphorus and nitrogen, are necessary for the growth of aquatic plants and animals to support a healthy ecosystem. In excess, however, nutrients can contribute to fish disease, brown tide, algae blooms and low DO. Excessive nutrients, generally phosphorus in freshwater and nitrogen in salt water, stimulate the growth of algae, which can start a chain of

events detrimental to the health of an aquatic ecosystem. Algae inhibit sunlight from penetrating through the water column. Once deprived of sunlight, underwater plants cannot survive and are lost. Animals that depend on these plants for food and shelter leave the area or die. Large biomass of algae causes extreme diurnal swings in DO levels. In addition, as the algae decay, they further depress the DO levels in the water. Fish and shellfish are in turn deprived of oxygen, and fish kills can occur. Excessive algae may also cause foul smells and decreased aesthetic value, which could affect swimming and recreational uses.

a. Phosphorus

The draft permit contains a monthly average phosphorus limit of 0.2 mg/l from April to October to control this discharge's contribution to eutrophication in the Blackstone River. The current permit limit of 1.0 mg/l established through the WLA to meet minimum dissolved oxygen criteria in the Blackstone River is not sufficient to control cultural eutrophication.

i. Evidence of eutrophication and reasonable potential

The MA SWQS at 314 CMR 4.00 do not contain numerical criteria for total phosphorus. They include a narrative criterion for nutrients at 314 CMR 4.05(5)(c), which provides that "all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses." They also include a requirement that "[a]ny 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" Id. MassDEP has interpreted the "highest and best practicable treatment" requirement in its standards as requiring an effluent limit of 0.2 mg/l (200 ug/l) for phosphorus.

Numerous reports and studies have documented the existence of cultural eutrophication in the Blackstone River reaches downstream of the Uxbridge discharge and have identified wastewater treatment plant discharges of phosphorus as the major cause. The *Blackstone River 1998 Water Quality Assessment Report* found the river segment where the Uxbridge WWTF discharge is located (MA51-05) to be non-supportive of aquatic life uses based on elevated nutrient levels and an impaired benthic macroinvertebrate community. Similar impairment to the benthic community was documented in MassDEP's 2003 assessment surveys. *Blackstone River Watershed 2003 Biological Assessment* (MassDEP 2006). The *Blackstone River Initiative Report* (2001), the product of a "multi-phased, interagency, interstate project to conduct the sampling, assessment, and modeling work necessary for the restoration of the river system," stated that "[p]hosphorus and its contribution to algal blooms in the river is a serious water quality concern" and linked the problem to "the cumulative effect from the combined input of all municipal discharges." *BRI Report* at 1-3 to 4. The Army Corps of Engineers' *Phase I: Water Quality Evaluation and Modeling of the Massachusetts Blackstone River, Draft* (March 2004), a followup study intended to expand and build upon the results from the Blackstone River Initiative, concluded that the reaches of the river below Sutton to the RI state line were characterized by "high productivity" and "a consistent rise in algae" as indicated by nutrient loss ratios and profiles of chlorophyll_a (an indicator parameter for algae).

Water quality monitoring data confirms the extensive phosphorus enrichment in the area of Blackstone River affected by this discharge. In 1998 MassDEP found total phosphorus concentrations of 0.34 mg/l upstream and 0.23 mg/l downstream of the discharge. MassDEP's monthly monitoring from May to October 2003 documented total phosphorus levels ranging from 0.16 to 0.69 mg/l in Northbridge, upstream of the discharge, and ranging from 0.11 to 0.37 mg/l downstream of the discharge in Millville. *Blackstone River Watershed 2003 DWM Water Quality Monitoring Data* (MassDEP 2005). While MassDEP has not yet released the results of its 2008 water quality monitoring, data from the Blackstone River Coalition Volunteer Water Quality Monitoring Program confirms continued high concentrations of phosphorus in the vicinity of the Uxbridge discharge, with dissolved phosphorus concentrations averaging 0.41 mg/l (and as high as 0.9 mg/l) between 2005 and 2008 at their monitoring site on the Blackstone River in Uxbridge, upstream of the Uxbridge WWTF. These values far exceed the recommended values contained in EPA's national technical guidance and the peer-reviewed scientific literature pertaining to nutrients. These sources recommend protective in-stream phosphorus values ranging from 0.024 mg/l (24 ug/l) to 0.1 mg/l (100 ug/l). *1986 Quality Criteria for Water* (EPA 1986); *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion XIV,* December 2000 (EPA- 822-B-00-022).

Given the condition of the receiving water described above, EPA has determined that the discharge of phosphorus from the Uxbridge WWTF under the current permit limit "will cause, have reasonable potential to cause, or contribute to" an excursion above the narrative criterion for nutrients. The Uxbridge plant currently discharges under a seasonal monthly average effluent limit of 1.0 mg/l, with concentrations averaging 0.55 mg/l during the 2009-10 phosphorus control seasons. Concentrations outside of the treatment season (indicative of the full potential of the facility to contribute to water quality exceedances) have been as high as 2.8 mg/l. These concentrations are well above the receiving water concentrations that have already been shown to be related to eutrophication in the Blackstone River. The receiving water does not provide substantial dilution under low flow (7Q10) conditions, as receiving water concentrations are already high due to the inputs from the numerous upstream POTWs and nonpoint sources. Therefore the setting of a more stringent effluent limit is required. 40 CFR § 122.44(d)(1)(ii) and (iii).

ii. Determination of effluent limitation

As noted above, the MA SWQS require the implementation of "highest and best practical treatment," interpreted by MassDEP as an effluent limit of 0.2 mg/l for POTWs, where necessary to control cultural eutrophication. EPA is also, however, required under the Clean Water Act to determine whether such an effluent limit is sufficient to ensure that the receiving water quality complies with all applicable water quality standards. 40 CFR § 122.44(d)(vii)(A). EPA must therefore determine whether an effluent limit of 0.2 mg/l is sufficiently stringent to ensure compliance with the standard that "all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses." 314 CMR 4.05(5)(c).

To determine whether the water quality standard is met, EPA interprets the Massachusetss narrative criterion in numeric terms by looking to nationally recommended criteria and other technical guidance documents. *See* 40 CFR 122.44(d)(1)(vi)(B). EPA has previously established a numeric target of 0.1 mg/l to meet the narrative criterion in the Blackstone River, based on the *1986 Quality Criteria for Water* ("Gold Book") recommendation of in-stream phosphorus concentrations of no greater than 50 ug/l in any stream entering a lake or reservoir, 100 ug/l for any stream not discharging directly to lakes or impoundments, and 25 ug/l within a lake or reservoir. This target is consistent with criteria and guidelines adopted by other states for total phosphorus, as well as other EPA Guidance, *see, e.g., Nutrient Criteria Technical Guidance Manual: Rivers and Streams* (EPA 2000), and EPA's choice of this standard has been upheld by the Environmental Appeals Board in *In re Upper Blackstone Water Pollution Abatement District*, 14 E.A.D. __ (2010).

To determine whether a 0.2 mg/l is sufficient to ensure that the instream level of 0.1 mg/l is met under 7Q10 low flow conditions, EPA calculated the projected instream concentration assuming all the contributing point sources are discharging at their effluent limits under design flow conditions. Design flows and effluent limits for these facilities are set forth in Table 2 below. It should be noted that this does not represent the current discharge concentrations to the Blackstone River, which are significantly higher, but rather the expected discharge concentrations after the facilities are brought into compliance with their newest permit limits.[1] Phosphorus levels in the base flow in the Blackstone River is also included, with a background concentration of 0.04 mg/l based on monitoring data upstream of UBWPAD collected by MassDEP in 2002 (near 7Q10 conditions). MassDEP, *Blackstone River 2003-2007 Water Quality Assessment Report*, at F-8 (2008).[2]

Table 2. Blackstone River POTW Phosphorus Limits

Source	Flow (MGD)	P limit
UBWPAD	56.0	0.1 mg/l
Grafton	2.4	0.2 mg/l*
Northbridge	2.0	0.2 mg/l
Douglas WWTF	0.6	1.2 lbs/day
Upton WWTF	0.4	0.2 mg/l
Uxbridge	2.5	0.2 mg/l*

* proposed

Instream concentration is determined using a mass balance equation as follows:

$$Q_r C_r = \Sigma\ Q_d C_d + Pload_{\text{Douglas}} + Q_s C_s$$

[1] In the case of Grafton, a new permit limit of 0.2 mg/l has been proposed in a draft permit issued concurrently with this draft permit.

[2] While these data are several years old they are consistent with more recent monitoring data from the Blackstone Watershed Coalition's volunteer monitoring program taken upstream of POTW influence. The BWC data indicates a median orthophosphate (as P) concentration of 0.033 mg/l in the Mumford River upstream of the Douglas WWTF in the period 2005 to 2008. Blackstone Watershed Coalition, *WQM Database* (April 2008).

Where

Q_r = receiving water flow downstream of the discharge (Σ Qd + $Q_{Douglas}$ + Qs)
C_r = total phosphorus concentration in the receiving water downstream of the discharge
Q_d = design flow from each facility (excluding Douglas)
C_d = total phosphorus concentration in each discharge (assumed to be permit limit)
$Q_{Douglas}$ = design flow from Douglas
$Pload_{Douglas}$ = mass load from Douglas (assumed to be permit load limit)
Q_s = Blackstone River base flow at 7Q10 = 22.75 cfs = 14.7 MGD[3]
C_s = phosphorus concentration in baseflow, from sampling upstream of all POTWs = 0.04 mg/l

Solving for C_r yields:

$$C_r = \frac{\Sigma\ Q_d C_d + Pload_{Douglas} + Q_s C_s}{Qr}$$

$$C_r = \frac{56*0.1 + 2.4*0.2 + 2.0*0.2 + 0.4*0.2 + 2.5*0.2 + 1.2/8.34 + 14.7*0.04}{78.4}$$

$$C_r = 0.10 \text{ mg/l}$$

This calculation indicates that an effluent limit of 0.2 mg/l, consistent with the "highest and best practical treatment" mandated under the MA SWQS, is sufficient to ensure that the narrative water quality standard for nutrients is met.

In addition to the seasonal phosphorus limit of 0.2 mg/l, the permit contains a winter period total phosphorus limit of 1.0 mg/l which will be in effect from November 1 through March 31. A higher phosphorus effluent discharge limitation in the winter period is appropriate because the expected predominant form of phosphorus, the dissolved fraction, lacking plant growth to absorb it, will likely remain dissolved and flow out of the system. Imposing a limit on phosphorus during the cold weather months is, however, necessary to ensure that phosphorus discharged during the cold weather months does not result in the accumulation of phosphorus in the sediments, and subsequent release during the warm weather growing season. To confirm that EPA's assumption of the anticipated behavior of dissolved and particulate phosphorus is correct, a monitoring requirement for orthophosphorus has been included for this winter period (November 1 - March 31) in order to determine the dissolved particulate fraction of phosphorus in this discharge. If future evaluations indicate that phosphorus may be accumulating in downstream sediments, the winter period phosphorus limit may be reduced in future permitting actions.

iii. UBWPAD modeling effort

EPA also notes that the UBWPAD has funded the development of an HSPF model of the Blackstone River, conducted by CDM Smith and the University of Massachusetts. EPA has

[3] Baseflow is calculated by subtracting upstream POTW flows from the total 7Q10 at Uxbridge (82.7 cfs) that was derived from the Wasteload Allocation Model. See Attachment B.

reviewed the model (including underlying model input files provided by CDM to EPA) and results to determine whether they form a basis for a different permit limit for phosphorus for this facility. For the reasons below, EPA has concluded that they do not.

First, EPA notes that this modeling effort is funded by the UBWPAD and is specifically designed to address the impacts of UBWPAD permit limits and potential alternatives in dam management and nonpoint source reduction. It clearly does not attempt to assess impacts of changes in permit limits and discharges from any of the other Massachusetts facilities downstream on the Blackstone River, which are assumed to be at their 1997-2005[4] discharges for all the future scenarios analyzed. *Review of Scenario Results Utilizing the Blackstone River HSPF Model 2010 Calibration* at 9 (April 2011). This is unfortunate, as substantial reductions in phosphorus concentrations were achieved by these facilities between 2000 and 2007, and since that time, in connection with permit limits implemented during this period.

As CDM Smith noted in a letter to EPA dated August 9, 2012, the modeled annual average discharge from the smaller MA plants was 25,986 lbs/yr[5], 33% more than the reported discharges in 2007 (19,538 lbs/yr) and 75% more than the 2010-11 discharges (14,944 lbs/yr). The difference would be even larger for the critical summer months when more stringent permit limits are in effect, and new limits on Uxbridge and Grafton are expected to reduce current loads by more than half. In scale the load reduction being implemented from the smaller MA facilities, which discharge directly upstream of the most impacted reaches in the modeling results, is comparable to the 20% NPS reduction scenario in the model (87,400 to 69,900 lbs/yr). *Blackstone River HSPF Model 2009 Scenario Report*, Tables 15 and 16 (2010).[6] The HSPF modeling effort appears to contain an implicit assumption that reductions in discharges from the other WWTPs on the Blackstone River are irrelevant, a position with which EPA disagrees. This makes the modeling results unsuitable for setting permit limits on these facilities.

The decision to focus on 2002 for presentation of results of all scenarios, based on the hydrological conditions during that year that approached 7Q10, exacerbates this issue. Not only are the 2002 phosphorus concentrations for Northbridge, Grafton and Uxbridge far above the current levels, but the Millbury WWTP was still operating in 2002. The scenario plots show a clear spike in phosphorus concentrations at the location of the (now discontinued) Millbury outfall, as well as noticeable spikes at the locations of Grafton and Northbridge (less so Uxbridge) that represent far greater phosphorus discharges than current loads, let alone the reductions that would be seen under new permit limits for Grafton and Uxbridge. These plots therefore do not plausibly reflect what actual conditions would be under the future scenarios.

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[4] While the model extends through 2007, the modeling team used year 2003 and 2000 data in lieu of actual discharges in 2006 and 2007. *Blackstone River HSPF Water Quality Model Calibration Report* at 4-4 (August 2008). This does not appear to have been updated in later refinements of the model, based on EPA's review of the model input files provided in connection with the UBWPAD permit modification request.

[5] This is a correction of the mass balance figures contained in the *Blackstone River HSPF Model 2009 Scenario Report*, Table 15 (2010) which stated that loads from the "other PS" in Massachusetts totaled 98,000 lbs/yr.

[6] As CDM Smith did not correct these figures in its letter of August 9, 2012, EPA assumes that the reported values are correct. We note that while CDM suggests that any review of the model be based on information provided with their modification request, and not the "older, more dated 2009 Scenario report", the updated modeling reports do not contain updated mass balance tables or any other data tables showing input loads.

Moreover, there are additional questions concerning the model itself, particularly the fact that the model does not incorporate periphyton; the consistent overprediction of chlorophyll-a concentrations by the model; and the large errors and paucity of validation data in the Rhode Island reaches. As the Technical Advisory Committee assembled to review the modeling effort stated, "the current HSPF model may be used with caution (because it gives a conservative prediction [too-high] of chlorophyll-a and ammonia concentrations) for evaluating relative in-stream benefits likely to be realized from alternative nutrient reduction scenarios for the UBWPAD discharge and other point and non-point source inputs to the river. However, we believe that improvements will need to be made in the model's ability to predict algal growth dynamics and nitrogen nutrient levels during the growing season, before it is appropriate for use in more detailed applications, such as for development of a nutrient Total Maximum Daily Load (TMDL)." *Technical Advisory Committee (TAC) Review Report on The Blackstone River HSPF Water Quality Model* at 2 (April 29, 2011).

In light of the above, EPA does not believe it is appropriate to use this model in the setting of permits limits for this facility. However, EPA notes that the modeling results on a general level support EPA's position that a high level control on all sources, not just the UBWPAD, is necessary to control eutrophication in the Blackstone River. That is the basis for EPA's implementation of phosphorus limits in this permit and those of the other downstream WWTPs. In addition, EPA is addressing nonpoint source and stormwater reduction efforts through grant funding, stormwater permitting for construction, industrial and municipal separate storm sewer system (MS4) sources, and other programs. EPA believes this multi-pronged approach is consistent with all available data regarding the necessary steps to achieve water quality standards in the Blackstone River.

In summary, the draft permit total phosphorus limit for the period of April 1 to October 31 is 0.2 mg/l and for the period of November 1 to March 31 is 1.0 mg/l. The monitoring frequency for the summer is 2/week, and the winter monitoring frequency is 2/month.

b. Nitrogen

The draft permit contains an effluent limitation of 8 mg/l total nitrogen in the summer months, in order to ensure that this discharge does not contribute to eutrophication in the Seekonk and Providence River estuaries. This requirement is imposed in order to meet the water quality standards of Rhode Island, an affected downstream state under 40 CFR § 122.44(d)(vii)(b)(4).

Rhode Island like Massachusetts, does not provide numeric criteria for nutrients. The relevant narrative criterion for nutrients provides:

> Nutrients: None in such concentration that would impair any usages specifically assigned to said Class, or cause undesirable or nuisance aquatic species associated with cultural eutrophication. Shall not exceed site-specific limits if deemed necessary by the Director to prevent or minimize accelerated or cultural eutrophication. Total phosphorus, nitrates and ammonia may be assigned site-specific permit limits based on reasonable Best Available Technologies.

RI WQR, Rule 8.D(3)(10)(Table 2); *see also* Rule 8.D(1)(d). The regulations also include requirements for minimum instantaneous DO levels and cumulative DO exposure, Rule 8.D(3) Table 3, and other applicable criteria including:

> At a minimum, all waters shall be free of pollutants in concentrations or combinations or from anthropogenic activities subject to these regulations that:
>
> i. Adversely affect the composition of fish and wildlife;
> ii. Adversely affect the physical, chemical, or biological integrity of the habitat;
> iii. Interfere with the propagation of fish and wildlife;
> iv. Adversely alter the life cycle functions, uses, processes and activities of fish and wildlife . . .

Rule 8.D(1).

i. Evidence of eutrophication and link to nitrogen discharges

Narragansett Bay, and particularly the Seekonk and Providence River estuaries which form its upper reaches, has suffered severe cultural eutrophication for many years. This cultural eutrophication results in periodic phytoplankton blooms, low DO levels and associated fish kills. Numerous studies have documented hypoxic conditions in the upper bay and Seekonk and Providence Rivers, with the worst conditions found at the upper boundary of the Seekonk River where the Blackstone River discharges. RIDEM, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (2004); Deacutis, et al., "Hypoxia in the Upper Half of Narragansett Bay, RI, During August 2001 and 2002," *Northeastern Naturalist*, 13 (Special Issue 4):173-198 (2006); Bergondo, et al., "Time-series observations during the low sub-surface oxygen events in Narragansett Bay during summer 2001," *Marine Chemistry*, 97, 90-103 (2005). In addition, important habitat has been destroyed: historic estimates of eel grass in Narragansett Bay ranged from 8,000 - 16,000 acres and current estimates of eel grass indicate that less than 100 acres remain. No eel grass remains in the upper two thirds of Narragansett Bay and the Providence River. Severe eutrophication is believed to be a significant contributor to the dramatic decline in eel grass. *See Governor's Narragansett Bay and Watershed Planning Commission, Nutrient and Bacteria Pollution Panel, Initial Report* (2004); RIDEM, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (2004); RIDEM, *Plan for Managing Nutrient Loadings to Rhode Island Waters* (2005).

It is clear that eutrophication in the Seekonk and Providence Rivers and Narragansett Bay has reached levels where it is adversely affecting the composition of fish and wildlife; adversely affecting the physical, chemical, and biological integrity of the habitat; interfering with the propagation of fish and wildlife; adversely altering the activities of fish and wildlife; and causing DO to drop well below allowable levels. The effects of eutrophication, including algae blooms and fish kills, are also interfering with the designated uses of the water. Eutrophication has, therefore, reached a point where it is causing violations of water quality standards.

Excessive loadings of nitrogen have been identified as the cause of the eutrophication. This link has been demonstrated by water quality data and by various studies and reports. The RIDEM

report, titled *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (December 2004), summarizes and references many of the studies and reports. RIDEM's 2004 report analyzes both water quality data and information about major discharges to the Providence and Seekonk Rivers. The report, drawing in part on data developed in earlier studies, divides the rivers into segments and analyzes pollutant loadings and specific water quality impairments in each segment. Much of the data used in the analysis is from a 1995 - 1996 study by RIDEM's Water Resources unit that consisted of measurements of nitrogen loadings from point source discharges and the five major tributaries to the Providence/Seekonk River system. The report also includes an analysis of data produced by a physical model of the Providence/Seekonk River system. That physical model was operated by the Marine Ecosystems Research Laboratory (MERL), and was part of an experiment to evaluate the impact of various levels of nutrient loading on the rivers and Narragansett Bay. EPA's guidance document *Nutrient Criteria Technical Guidance Manual, Estuarine and Coastal Marine Waters* (2001) cites the MERL experiments as compelling evidence that nitrogen criteria are necessary to control enrichment of estuaries.

The predominant sources of nitrogen loading in the Providence and Seekonk Rivers are municipal wastewater treatment facilities in Rhode Island and in Massachusetts. In 2006, the State of Rhode Island reissued several Rhode Island Pollutant Discharge Elimination System (RIPDES) permits for POTWs which discharge to the Providence and Seekonk Rivers and Narragansett Bay. These permits include limitations on the discharge of total nitrogen for a number of facilities, in order to address the cultural eutrophication in these waters and Narragansett Bay, consistent with the targets identified in the 2004 RIDEM Report. RIDEM, *Response to Public Comments Received on Proposed Permit Modification for the Fields Point, Bucklin Point, Woonsocket and East Providence WWTFs* (2006) In addition smaller Rhode Island facilities, not identified in the 2004 RIDEM Report, have had nitrogen optimization and other requirements placed in their permits as they have been (re)issued. *See* RIPDES Permit No. RI0100455, Burrillville WTP (2006).

The 2004 RIDEM Report also concluded that substantial reductions in loadings from the three largest Massachusetts POTWs on the Blackstone and Ten Mile Rivers would be necessary to achieve water quality standards in the Seekonk River and Upper Narragansett Bay. After reviewing the RIDEM studies and other relevant material and performing its own analysis, EPA agreed that nitrogen discharges from the Upper Blackstone Water Pollution Abatement District (UBWPAD) facility (on the Blackstone River) and the Attleboro and North Attleboro WWTFs (on the Ten Mile River) are contributing to impairments in Rhode Island. EPA therefore imposed effluent limits on those facilities that are designed to ensure attainment of water quality standards and are consistent with the 2004 RIDEM Report and Rhode Island's regulation of its in-state facilities. RIDEM updated this analysis to include other Massachusetts POTWs on these rivers, including the Uxbridge WWTF, in 2005 (see section 3(b)(ii)(a)(1) below); limits for these facilities are being analyzed as their permits are reissued. Requirements on these facilities will be implemented in order to achieve equitable regulation of WWTF discharges across the region, to reduce nutrient impacts and achieve acceptable levels of dissolved oxygen.

Monitoring reports submitted by the Uxbridge WWTF confirm that the facility discharges nitrogen to the Blackstone River, which flows into the Seekonk River where the greatest

impairments in the Narragansett Bay Basin have been measured. Therefore EPA must determine whether the Uxbridge discharge "will cause, have reasonable potential to cause, or contribute to" a violation of water quality standards. 40 CFR §122.44(d)(1)(i). In doing so, EPA considers "existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, . . . and where appropriate, the dilution of the effluent in the receiving water." 40 CFR §122.44(d)(1)(ii).

Under the current permit the Uxbridge WWTF reports its discharges of ammonia and of "NO2 + NO3". Together these represent the dissolved inorganic nitrogen ("DIN") component of the facilities nitrogen discharges. While effluent limits are generally set in terms of total nitrogen, DIN was in fact the parameter used for analysis of the impact of nitrogen loadings in the RIDEM studies, and can be used to assess the facility's contribution to effects in the Seekonk River. The average DIN concentration in the Uxbridge discharge from 2005 through 2010, based on the DMRs, was 11.1 mg/l, giving a total load at design flow of 105 kg/day (231 lbs/day).

The Uxbridge discharge is located approximately 21 miles upstream of the impaired reaches in the Seekonk River, so EPA considered whether its nitrogen loading is significantly reduced by in-stream attenuation. There is conflicting evidence concerning the extent of attenuation, if any, within the Blackstone River, with estimates ranging from zero to 23%. *See* Nixon, et al., "Investigation of the Possible Attenuation of Dissolved Inorganic Nitrogen and Phosphorus in the Lower Blackstone River," *Anthropogenic Nutrient Inputs to Narragansett Bay – A Twenty-Five Year Perspective*, Appendix B (2005)); RIDEM, *Nutrient Permit Modifications – Response to Comments* (2005). For this analysis, EPA is applying the 13% attenuation rate used for UBWPAD discharges in the RIDEM 2004 Report based on 1995-96 monitoring data, adjusted proportional to the relative distance along the Blackstone River. This results in an attenuation rate of 6% for the Uxbridge discharge. Based on the studies and analyses previously referenced, EPA believes that this rate is a reasonable estimate. At this attenuation rate, the effective loading from the Uxbridge discharge to the Seekonk River is 99 kg/day (218 lbs/day).

To determine the impact of this loading on the Seekonk River, EPA considers the areally distributed load (load divided by area) in order to allow comparison to the results of the MERL experiment applied in the RIDEM 2004 Report. The MERL enrichment gradient experiment included a study of the impact of different loadings of nutrients on dissolved oxygen and chlorophyll a. *See* Oviatt, et al., "Patterns of Productivity During Eutrophication: A Mesocosm Experiment", *Marine Ecology* (1986); 2004 RIDEM Load Reduction Evaluation. The MERL enrichment gradient experiments consisted of 9 tanks (mesocosms). Three tanks were used as controls, and were designed to have regimes of temperature, mixing, turnover, and light similar to a relatively clean Northeast estuary with no major sewage inputs. The remaining six mesocosms had the same regimes, but were fed reagent grade inorganic nutrients (nitrogen, phosphorus and silica) in ratios found in POTW effluent discharged to the Providence River. The six mesocosms were fed nutrients in multiples of the estimated average sewage inorganic effluent nutrient loading to Narragansett Bay. For example the 1X mesocosm nitrogen loading was 40.3 $mg/m^2/day$, representing the average nutrient loading in the Narragansett Bay as a whole. The 2X was twice that (80.6 $mg/m^2/day$) and so on (4X, 8X, 16X) up to a maximum load of 32X. During the study, dissolved oxygen, chlorophyll, and dissolved inorganic nutrients were measured in the water column and benthic respiration was also measured. Id. From the collected

data the investigators produced times series for oxygen, pH, temperature, nutrients, chlorophyll and system metabolism. Id. The study documented precipitous drops in dissolved oxygen levels with loadings above the 4X gradient, along with increasing and highly variable chlorophyll levels indicative of eutrophic conditions.

The areally distributed loading to the Seekonk River from the Uxbridge discharge alone is 35.2 $mg/m^2/day$. This compares to a "1X" loading in the MERL experiments of 40.3 $mg/m^2/day$, and indicates that even as one of the smaller wastewater plants discharging to this reach, the Uxbridge WWTF alone has the potential to contribute nitrogen levels to the Seekonk nearly matching the background areally distributed load to the bay as a whole. The Seekonk River is already the most enriched portion of the Narragansett Bay under natural conditions, with estimated natural background nitrogen inputs at the 4X level. RIDEM 2004. This makes this area especially vulnerable to overenrichment from wastewater treatment plant sources, and indeed the addition of the Uxbridge to background sources alone would be expected to reduce minimum DO levels from 3.0 mg/l to 2.75 mg/l under MERL experiment conditions. *See* RIDEM 2005 (Figure 4). Of course, the Seekonk River is far from background levels, with loadings as of 2005 estimated at the 24X level, indicating extreme over-enrichment. Effluent limits that have been placed on other wastewater treatments plants in Rhode Island and Massachusetts are expected to achieve an areal load equivalent to the 6.5X condition at current flows, and 10X at 90% design flows. However, this goal will not be reached if the Uxbridge discharge is not controlled.

Based on the available evidence, the Uxbridge discharge "will cause, have reasonable potential to cause, or contribute to" a violation of water quality standards in the Seekonk River and an effluent limit must be set.

ii. Nitrogen Effluent Limit

Having found that the discharge has a reasonable potential to cause an excursion over Rhode Island's narrative standard for the nutrient nitrogen, EPA is required to set an effluent limit for this pollutant. 40 CFR § 122.44(d)(vi). In setting a limit, EPA must ensure that:

> (A) The level of water quality to be achieved by limits on point sources established under this paragraph is derived from, and complies with all applicable water quality standards; and
>
> (B) Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the State and approved by EPA pursuant to 40 CFR 130.7.

40 CFR § 122.44d(vii).

While Rhode Island DEM has not developed a TMDL or other wasteload allocation that has been approved pursuant to 40 CFR 130.7, RIDEM has performed a load allocation analysis that incorporates the Grafton and Uxbridge discharges and has proposed an effluent limit (8 mg/l)

based on that analysis. While EPA is not bound by this analysis, EPA has reviewed the technical basis and allocation method applied in the RIDEM analysis and has determined that it generally represents a sound and technically valid approach. EPA has therefore agreed to process Massachusetts permits in a manner consistent with the RIDEM analysis. *See* EPA and RIDEM, *Performance Partnership Agreement Between the Rhode Island Department of Environmental Management and US Environmental Protection Agency Region 1* (2006), Appendix B. In doing so, however, EPA has an independent obligation both to ensure that the load allocation analysis remains valid, particularly in light of changes in circumstances since the initial analysis was developed five years ago, and to ensure that the level of water quality that will be achieved complies with the applicable water quality standards. We consider these questions in turn below.

a. RIDEM load allocation analysis and EPA Update

(1) RIDEM analysis

RIDEM's approach to allocating nitrogen loads has been to require higher removal rates from larger facilities than from smaller facilities (e.g. 5 mg/l for NBC Bucklin Point and UBWPAD; 8 mg/l for Attleboro and North Attleboro). RIDEM, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (2004) ("2004 RIDEM Report"). This is an accepted approach under EPA guidance for wasteload allocations. *See* EPA, *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001, at 69. In RIDEM's initial analysis of nitrogen loads, facilities as small as Grafton and Uxbridge were not considered in the analysis, with North Attleboro (at 4.6 MGD) the smallest facility included. *See* 2004 RIDEM Report. Subsequently, in 2005, RIDEM updated its analysis to incorporate three additional facilities on the Blackstone River – the Uxbridge, Grafton and Millbury WWTFs – based on a calibrated/validated Qual2e model. This analysis is summarized in the 2005 *Response to Comments Received on Proposed Permit Modifications for the Fields Point, Bucklin Point, Woonsocket and East Providence WWTFs*, Appendix A ("2005 RIDEM RTC"). *See* Michaelis, B., *Dissolved Oxygen Dynamics in a Shallow Stream System,* Dissertation in Civil and Environmental Engineering at the University of Rhode Island (URI 2005). That analysis indicated that under design flows and 2005 permit limits for ammonia and phosphorus, the load at the MA/RI state line from the MA POTWs discharging to the Blackstone was expected to be 4,319 lbs/day. Figure 3. Uxbridge contributes 295 lbs/day (7% of the total) of this load.

The 2005 RIDEM RTC does not specifically set forth the loading target in the Seekonk River to be achieved at the proposed permit limits, but this can be calculated from the proposed effluent limits and design flows as shown in Table 3 below, giving a target load allocation to Massachusetts facilities of 1488 lbs/day DIN at the MA/RI state line. This represents a 65% reduction in loads at design flow from the Massachusetts facilities on the Blackstone River (e.g. 4319 to 1488 lbs/day), consistent with the RIDEM assertion in the 2005 RIDEM RTC that the proposed limits will reduce the total loading to the Seekonk River by 62%.

Figure 3: Table from Rhode Island load analysis

Table 3. Percent delivery and percent contribution of MA WWTF to the MA/RI state line under DWS3 at design flows and currently required permit limits for ammonia and phosphorus.

			At MA/RI state line	
Point Source	Initial Load at end of pipe (lb/day)	Final Load at MA/RI state line (lb/day)	Delivery (%)	Contribution (%)
UBWPAD	3780	3493	92	79
Millbury WWTF	336	312	93	7
Grafton WWTF	239	219	92	5
Uxbridge WWTF	300	295	98	7
Total WWTF	4655	4319	93	98

* Note "DWS3" indicates the model run under flow conditions from August 2005 ("dry weather survey 3").

Table 3. Load Allocation at State Line per RIDEM Analysis

						At MA/RI State Line	
Point Source	Design flow (MGD)	90% of Design Flow (MGD)[1]	Proposed total N permit limit (mg/l)	DIN component of permit limit (mg/l)[2]	DIN load discharged at limit (lb/day)	DIN load at MA/RI state line	Delivery Factor (%)[3]
UBWPAD	56	50.4	5	3	1261	1165	92%
Millbury WWTF	2.7	2.43	8	6	122	113	93%
Grafton WWTF	2.4	2.16	8	6	108	99	92%
Uxbridge WWTF	2.5	2.25	8	6	113	111	98%
Total WWTF					1603	1488	93%

[1] Loads are calculated using 90% of design flow consistent with RIDEM's methodology in the 2004 RIDEM Report

[2] Non-DIN component of total N assumed to be 2 mg/l per the 2004 RIDEM Report.

[3] Delivery factors from the 2005 RIDEM RTC; for discussion of delivery factors see Attachment C.

(2) EPA Update of RI analysis

In applying this load allocation analysis to the reissuance of permits to the Grafton and Uxbridge WWTFs, EPA notes that (1) several other facilities on the Blackstone River and its tributaries were not explicitly considered by RIDEM in its analysis; and (2) the Millbury WWTF is no longer discharging, having tied into UBWPAD. Table 4 shows the current MA dischargers to the Blackstone River system and their seasonal loads based on monitoring data from 2007-09.

Table 4. Current DIN Loadings to Blackstone River from WWTFs

	May-Oct, 2007 to 2009 DMR data		
POTW	Flow (MGD)	DIN (mg/l)	DIN load discharged (lb/day)
UBWPAD	33.5	7.35	1995
Douglas	0.3	5.5	15
Grafton	1.8	10.5	186
Hopedale[1]	0.4	10.7	32
Northbridge	0.9	11.3	75
Upton	0.19	14.9	24
Uxbridge	0.8	10.9	67
		TOTAL:	2,394

[1] The Hopedale facility monitors total N only; DIN calculated by subtracting 2 mg/l from total N per 2004 RIDEM Report.

The omission of Douglas, Hopedale, Northbridge and Upton from RIDEM's analysis was presumably based RIDEM's conclusion that these contributions are *de minimis*, based on the size of the discharger and/or location of the discharger on a tributary to the Blackstone River. While EPA agrees with this determination with respect to Douglas, Hopedale and Upton, we note that it does not appear that the Northbridge WWTF contribution is negligible. Northbridge's current flow, effluent DIN concentration and DIN loads are higher than those of Uxbridge, and while Northbridge discharges to a tributary it is less than 200 yards from the mainstem Blackstone River, unlikely to substantially reduce the delivery of nitrogen to the Blackstone River. For these reasons EPA is including Northbridge in its updated load allocation analysis. The revised load analysis, excluding Millbury WWTF but including Northbridge, is set forth in Table 5.

Table 5. Updated Load Analysis at State Line Using RIDEM Methodology

						At MA/RI State Line	
Point Source	Design flow (MGD)	90% of Design Flow (MGD)[1]	Proposed total N permit limit (mg/l)	DIN component of permit limit (mg/l)[2]	Initial DIN load (lb/day)	Final DIN load at MA/RI state line	Delivery (%)[3]
UBWPAD	56	50.4	5	3	1261	1165	92%
Grafton WWTF	2.4	2.16	8	6	108	99	92%
Uxbridge WWTF	2.5	2.25	8	6	113	111	98%
Alternatives for Northbridge discharge:							
1. Northbridge at current concentration				Current DIN from DMR			
Northbridge	2	1.8	--	11.3	170	155	92%
Total WWTF						1530	
2. Northbridge with permit limit of 8 mg/l			N limit	DIN component			
Northbridge	2	1.8	8	6	90	83	92%
Total WWTF						1458	

[1] Loads are calculated using 90% of design flow consistent with RIDEM's methodology in the *2004 RIDEM Report*

[2] Non-DIN component of total N assumed to be 2 mg/l per the *2004 RIDEM Report*.

[3]Delivery factors from the 2005 RIDEM RTC; for further discussion of delivery factors see Attach. C

As shown in Table 5, the load allocation target is not met if Northbridge discharges at design flow at its current DIN levels, but would be met if Northbridge had an effluent limit similar to that proposed for Grafton and Uxbridge. EPA will consider whether to impose a limit on Northbridge, including conducting further analysis of the appropriate delivery factor, upon reissuance of the Northbridge WWTF permit.

For the purposes of the Grafton and Uxbridge permits, the analysis shows that the RIDEM load allocation can be met and that effluent limits on these discharges consistent with the RIDEM proposal are necessary in order to meet that load allocation. While the Millbury discharge has been tied into UBWPAD and therefore is accounted for in the UBWPAD load allocation, the need to account for the Northbridge discharge eliminates any load reduction that might be achieved eliminating an allocation for Millbury. Therefore it is EPA's intent that the permit limits in the Grafton and Uxbridge reissued permits will be consistent with the load allocation analysis above.

b. Water Quality Analysis

EPA is also obligated to ensure that the proposed effluent limits will achieve a level of water quality that complies with the applicable water quality standards. Since the load allocation analysis discussed above is not from an approved TMDL or waste load allocation, EPA as the permitting authority must independently demonstrate that this standard is met. In doing so, EPA draws from the analysis set forth in connection with the issuance of the UBWPAD permit. *See* EPA, *Fact Sheet, Upper Blackstone Water Pollution Abatement District*, NPDES No. MA0102369 (2006); EPA, *Response to Comments, Upper Blackstone Water Pollution Abatement District*, NPDES No. MA010 (2008); *In re Upper Blackstone Water Pollution Abatement District*, 14 E.A.D. __ (2010).

(1) Loading rate to meet water quality standards

In the UBWPAD permit issuance, EPA concluded that an overall loading rate from all facilities (MA and RI) equivalent to the "6.5X" MERL experiment gradient under current flows, or 1,624 lbs/day[7] was appropriate to ensure that water quality standards in the Seekonk River were met. This conclusion was based on guidance documents, studies of the Seekonk and Providence Rivers and Narragansett Bay, and on an analysis of the application of the MERL experiment results to the Seekonk River. *See* EPA, *Response to Comments, UBWPAD*, at 28-29 and documents cited. It should be noted that the effluent limit established to meet that water quality target was challenged by both the UBWPAD (as too stringent) and by the Conservation Law Foundation (as too lenient) and was upheld on appeal by the Environmental Appeals Board. 14 E.A.D __ (slip op. at 23).

EPA's application of the MERL experiments to determine an acceptable loading for the Seekonk River is based on its conclusion that those experiments provide a suitable analog to the actual river system. As EPA noted in the UBWPAD Response to Comments:

[7] Calculated from the 1X MERL load of 4.032×10^{-5} kg/m^2/day, times the area of the Seekonk River ($2.81 * 10^6$ m^2), times the conversion factor (2.2046 lbs/kg), times 6.5. See 2004 RIDEM Report.

> The basic relationship demonstrated by the MERL tank experiments between the primary causal and response variables relative to eutrophication corresponds to what is actually occurring in the Providence/Seekonk River system. Both the MERL tank experiments and the data from the Providence/Seekonk River system indicate a clear correlation between nitrogen loadings, dissolved oxygen impairment and chlorophyll *a* levels.

Response to Comments, UBWPAD at 29; *see also id*. at 47-49.

EPA has also noted that the MERL experiments do not perfectly replicate the physical system, and accounted for that fact in applying the MERL loading analysis to determine a water quality target. This also was discussed in connection with the UBWPAD permit:

> EPA recognized, however, that the MERL tank experiments cannot completely simulate the response of chlorophyll *a* and dissolved oxygen to nitrogen loadings in a complex, natural setting such as the Providence/Seekonk River system, and thus does not yield a precise level of nitrogen control required to restore uses in the system. For example, dissolved oxygen in Narragansett Bay is influenced by stratification, which was not simulated in the MERL tank experiment, in which waters were routinely mixed. In a stratified system there is little vertical mixing of water, so sediment oxygen deficits are exacerbated, due to the lack of mixing with higher DO waters above. In addition, the flushing rate used in the MERL tanks is not the same as seen in the Bay. Because the physical model does not generate a definitive level of nitrogen control that can be applied to a real world discharge, but instead a range of loading scenarios which are subject to some scientific uncertainty, EPA was required to exercise its technical expertise and scientific judgment based on the available evidence when translating these laboratory results and establishing the permit limit.

Response to Comments, UBWPAD at 49. Thus, while RIDEM has suggested that the MERL experiments might indicate a 4X condition as a goal for the Seekonk River, 2004 RIDEM Report at 25, EPA concluded that the differences between the MERL experiments and the actual physical system, particularly the difference in flushing rates, indicated that the 6.5X target was appropriate.

EPA continues to believe that the water quality target established in the UBWPAD permit development represents an appropriate level of water quality to ensure that standards are met in the Seekonk and Providence River, based on the best available current information. Therefore, EPA applies the 6.5X load target to determine whether the load allocation will comply with water quality standards.

(2) Effluent limits required to meet water quality standards

To determine whether the proposed effluent limits will meet the 6.5X target under current flows, EPA calculates the total load to the Seekonk River assuming that effluent concentrations are at the permit limits and flows are equal to the 2007 to 2009 May to October flows from the facilities' DMR submissions. Current flows are used in this analysis consistent with the analysis of the UBWPAD permit limit that has been upheld on appeal. *See In re Upper Blackstone Water*

Pollution Abatement District, 14 E.A.D. __(2010). A delivery factor is applied to account for attenuation in the Blackstone River (and the Ten Mile River for Attleboro and North Attleboro) before discharge to the Seekonk River; the derivation of these delivery factors is discussed in Attachment C. The contribution of each facility and the total load to the Blackstone River is shown in Table 6. Consistent with Table 5 showing the RIDEM load analysis update, totals are shown both with and without limits on Northbridge since Northbridge was originally omitted from the RIDEM analysis.

Table 6. Effluent limits to meet water quality standard

Source	Current Flow (MGD)	Limit (mg/l)	DIN component (mg/l)	DIN (lbs/day)	Delivery factor[1]	DIN load to Seekonk River (lbs/day)
UBWPAD	33.5	5	3	838	87%	729
Woonsocket	6.3	3	1	53	96%	50
Bucklin	17.9	5	3	448	100%	448
Attleboro	3.8	8	6	190	61%	116
North Attleboro	3.42	8	6	171	61%	104
Grafton WWTF	1.74	8	6	87	90%	78
Uxbridge WWTF	0.8	8	6	40	94%	38
Alternatives for Northbridge Discharge						
1. Northbridge at current concentration			Current DIN from DMR			
Northbridge	0.88	---	11.3	83	91%	75
			Total DIN load at mouth of Blackstone:			**1639**
2. Northbridge with permit limit of 8 mg/l			DIN component of limit			
Northbridge	0.88	8	6	44	91%	40
			Total DIN load at mouth of Blackstone:			**1604**

[1] For Blackstone River delivery factors, see Appendix A; Attleboro and North Attleboro delivery factors from 2004 RIDEM Report

Given the water quality target loading of 1,624 pounds per day, this analysis indicates that effluent limits on Uxbridge, Grafton and Northbridge are necessary to meet the water quality target at current flows.

c. Nitrogen Effluent Limit

As demonstrated above, an effluent limit of 8 mg/l on the Grafton and Uxbridge discharges satisfies both the RIDEM load allocation and the water quality target identified by EPA in the UBWPAD permit proceedings. Therefore, the draft permit includes a limit of 8 mg/l total nitrogen for the period May to October. The draft permit for Grafton WWTF, which is being issued concurrently with this draft permit, also establishes total nitrogen limit of 8 mg/l.

4. Total Residual Chlorine

Chlorine and chlorine compounds produced by the chlorination of wastewater can be extremely toxic to aquatic life. Effluent limits are based on water quality criteria for total residual chlorine (TRC) which are specified in EPA water quality criteria established pursuant to Section 304(a) of the Clean Water Act. The most recent EPA recommended criteria are found in National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047). The fresh water aquatic life criteria for TRC are 11 ug/l for protection from chronic toxicity and 19 ug/l for protection from acute toxicity.

The 1999 Fact Sheet, issued in connection with the existing permit, lists the 7Q10 flow of the Blackstone River at the Uxbridge WWTF as 53.3 MGD, or 82.7 cfs. This figure was based on the Waste Load Allocation model, as shown in the Response to Comments issued in connection with the current permit. See Attachment B. EPA will continue to use a 7Q10 Flow of 53.3 MGD to calculate the dilution factor for this facility. The dilution factor is calculated as follows:

$$\frac{\text{plant design flow + 7Q10 river flow}}{\text{plant design flow}} = \frac{\text{2.5 MGD + 53.3 MGD}}{\text{2.5 MGD}} = 22$$

The 7Q10 dilution multiplied by the chronic and acute criteria provides the appropriate TRC limits. Thus:

11 ug/l(chronic criterion) * 22 (dilution factor) = 242 ug/l or **0.24 mg**/l (avg mnthly limit)
19 ug/l (acute criterion) * 22 (dilution factor) = 418 ug/l or **0.42 mg/l** (max daily limit)

These are the same as the effluent limits contained in the current permit.

EPA and MassDEP recognize that there are limitations in using grab sampling for determining compliance with the chlorine limit. There are complexities and variability associated with the chlorine demand of wastewater as well as the complexities associated with controlling and coordinating the dosing of chlorine and dechlorination chemicals. Therefore, an alarm requirement has been established in this draft permit to assure that a proper range of chlorination is maintained at all times. See footnote 7 on Page 4 of the draft permit.

5. Whole Effluent Toxicity

National studies conducted by EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents and aromatic hydrocarbons among others. The Region's current policy is to include toxicity testing requirements in all municipal permits, while Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts.

Based on the potential for toxicity resulting from domestic and industrial contributions, the low level of dilution at the discharge location, water quality standards, and in accordance with EPA regulation and policy, the draft permit includes acute toxicity limitations and monitoring requirements. (*See, e.g.*, "Policy for the Development of Water Quality-Based Permit

Limitations for Toxic Pollutants", 50 Fed. Reg. 30,784 (July 24, 1985); *see also*, EPA, *Technical Support Document for Water Quality-Based Toxics Control*). EPA Region I has developed a toxicity control policy. The policy requires wastewater treatment facilities to perform toxicity bioassays on their effluents. The MassDEP requires bioassay toxicity testing for state certification.

Pursuant to EPA Region 1 policy, discharges having a dilution ratio of between 20:1 and 100:1 are required to perform acute toxicity testing. The principal advantages of biological techniques are: (1) the effects of complex discharges of many known and unknown constituents can be measured only by biological analyses; (2) bioavailability of pollutants after discharge is best measured by toxicity testing including any synergistic effects of pollutants; and (3) pollutants for which there are inadequate chemical analytical methods or criteria can be addressed. Therefore, toxicity testing is being used in conjunction with pollutant specific control procedures to control the discharge of toxic pollutants.

Semiannual whole effluent toxicity (WET) testing has been conducted during the past five years. Results during the monitoring period have consistently shown an LC50 of 100%. The requirement to test the vertebrate species, *Pimephales promelas* was removed with the permit modification of May 18, 1993. The testing frequency was reduced with this modification from four to two tests per year due to past results which met the permit limits. The draft permit requires that the Town continue to conduct WET testing for Outfall 001 effluent two times per year and that each test include the use of the daphnid, *Ceriodaphnia dubia*, in accordance with EPA Region I protocol found in **Attachment A**.

By letter of October 18, 1990, the EPA granted the Town of Uxbridge the authorization to use an alternate dilution water to the Blackstone River water for its WET testing. The Blackstone River water was found to be unreliable for use as a dilution water for WET testing. In recent WET testing where receiving water controls were carried out, the receiving water has met test acceptability criteria for use as a dilution water. Therefore the draft permit requires the use of the receiving water for dilution. Procedures for substituting an alternate dilution water are available should toxicity issue arise again, as discussed in Footnote 11 on Page 5 of the permit. If alternate dilution water tests are conducted, the permittee must use a minimum of two controls, one of which must be Blackstone River water. Chemical analyses must be provided for the Blackstone River water as well as the effluent.

6. Other Toxic Pollutants

The draft permit includes a new monthly average effluent limit for aluminum.

The segment of the Blackstone River to which the Uxbridge WWTF discharges is listed on the Massachusetts 303(d) list for an impairment caused by “metals.” Examination of effluent analysis conducted in connection with WET testing in the past five years indicates that the Uxbridge WWTP discharges have included detectable levels of the metals aluminum, copper, lead and zinc. EPA therefore analyzed the available data on effluent and receiving water concentrations to determine whether these pollutants “are or may be discharged at a level that causes, has reasonable potential to cause, or contributes to an excursion above” the water quality

standard. 40 CFR 122.44(d)(1)(i). Since there have been no discharges of cadmium above the detection limit, and the single lead result above the detection limit was below the water quality criteria, there is no reasonable potential for the Uxbridge effluent to contribute to excursion above the water quality criteria for cadmium and lead.

Table 5 shows the concentrations of metals in the Uxbridge effluent from April 2005 through April 2011, along with receiving water analyses beginning November 2009. Prior to 2010, Uxbridge's analyses were performed using insufficiently sensitive methods for metals, especially a concern with respect to cadmium and lead. Upon notice from EPA, Uxbridge corrected the issue with their contract laboratory. EPA has concluded that the data provided is sufficient for its analysis of effluent limits for this permit reissuance.

Table 7. Whole Effluent Testing Analytical Data and Water Quality Criteria

	Effluent Analytical Data[1]					Receiving Water Analytical Data[1]				
	Al	Cd	Cu	Pb	Zn	Al	Cd	Cu	Pb	Zn
	ug/l	ug/l *total recoverable*[2]				ug/l	ug/l *total recoverable*[2]			
4/26/2005	240	ND-5	13	ND-10	50					
11/15/2005	120	ND-5	20	ND-10	ND-50					
5/9/2006	198	ND-5	17	ND-10	74					
11/14/2006	210	ND-5	16	ND-10	ND-50					
5/15/2007	ND-100	ND-5	ND-10	ND-10	ND-50					
12/12/2007	120	ND-5	ND-10	ND-10	ND-50					
12/16/2008	270	ND-5	10.2	ND-10	ND-50					
1/23/2009	ND-100	ND-5	ND-10	ND-10	ND-50					
5/5/2009	120	ND-5	10	ND-10	ND-50					
11/3/2009	170	ND-5	12	ND-10	ND-50	120	ND-0.5	ND-10	ND-10	ND-50
5/11/2010	73	ND-0.2	10.9	ND-0.5	37.9	172	0.6	18.4	5.9	2.8
11/16/2010[2]	98	ND-0.5	10.6	ND-0.5	40	124	ND-0.5	8	2.2	19.7
4/26/2011	50	ND-0.2	6.4	ND-0.5	35	114	0.3	1.7	2.5	32
10/25/2011	76	ND-0.5	10.6	0.3	37.8	122	0.3	9.8	2.8	25.7
5/1/2012	32	ND-0.2	5	ND-1.0	37	324	0.6	13	6	24
Median	120	ND	10.6	ND	50	123	0.50	9.9	4.4	24.9
Max	270	ND	20	ND	74					

	Water Quality Criteria				
	ug/l	ug/l *dissolved*[3]			
Chronic Criterion[4]	87	0.2	18.1	1.6	82.4
Acute Criterion[4]	750	1.3	27.2	41.0	83.0

[1] Non-detects noted as " ND - [minimum detection level]"

[2] Samples for effluent and receiving water were switched in initially submitted reports; these are corrected data

[2] Water quality criteria are expressed in terms of the dissolved fraction, while analytical results and permit effluent limits are expressed in terms of total recoverable metal; these are related by a conversion factor as set forth in EPA, National Recommended Water Quality Criteria 2002 ("NRWQC 2002")

[3] Criteria for Cd, Pb and Zn are hardness dependent and calculated using the formulas set forth in the NRWQC 2002 at a hardness of 66 (based on minimum hardness at low flow in Millville, MA from Louis Berger Report).

For aluminum, the effluent and receiving water monitoring data clearly indicate the need for an effluent limit. More than half of the effluent monitoring results indicate aluminum levels above the chronic water quality criterion of 87 ug/l. The receiving water is also above the chronic water quality criterion, as all of the receiving water samples were above 87 ug/l.

The receiving water does not provide dilution for discharges of aluminum, so the draft permit includes monthly average effluent limits set at the chronic criterion of 87 ug/l. The data does not indicate a reasonable potential to exceed the acute criterion for aluminum, so no maximum daily limit is set.

For copper and zinc, a more detailed analysis must be performed to determine the upper bound expected concentration and determine if the discharge has a reasonable potential to cause a violation. EPA bases its determination of "reasonable potential" on a characterization of the upper bound of expected effluent concentrations based on a statistical analysis of the available monitoring data. As noted in the *Technical Support Document for Water Quality Based Toxics Control* (EPA 1991) ("TSD"), "[a]ll monitoring data, including results for concentrations of individual chemicals, have some degree of uncertainty associated with them. The more limited the amount of test data available, the larger the uncertainty." Thus with a limited data set, the maximum concentration that has been found in the samples may not reflect the full range of effluent concentration. On the other hand, individual high data points may be outliers or otherwise not indicative of the normal range of effluent concentrations.

To account for this, EPA has developed a statistical approach to characterizing effluent variability in order to reduce uncertainty in the process. As "experience has shown that daily pollutant discharges are generally lognormally distributed," *TSD* at App. E, EPA uses a lognormal distribution to model the shape of the observed data, unless analysis indicated a different distributional model provides a better fit to the data. The model parameters (mean and variance) are derived from the monitoring data.

The lognormal distribution generally provides a good fit to environmental data because it is bounded on the lower end (i.e. you cannot have pollutant concentrations less than zero) and is positively skewed. It also has the practical benefit that if an original lognormal data set X is logarithmically transformed (i.e. Y = ln[X]) the resulting variable Y will be normally distributed. Then the upper percentile expected values of X can be calculated using the z-score of the standardized normal distribution (i.e. the normal distribution with mean = 0 and variance = 1), a common and relatively simple statistical calculation. The pth percentile of X is estimated by

$$X_p = \exp(\mu_y + z_p \sigma_y),$$

where μ_y = mean of Y
σ_y = standard deviation of Y
Y = ln[X]

For the 95th and 99th percentiles, $z_{95} = 1.645$ and $z_{99} = 2.326$, so that

$$X_{95} = \mu_y + 1.645\ \sigma_y$$
$$X_{99} = \mu_y + 2.326\ \sigma_y$$

These upper percentile values are used to determine whether a discharge has a reasonable potential to cause or contribute to an exceedance of a water quality standard. For reasonable potential to exceed the acute criterion, which is based on acute effects with one hour of exposure to the pollutant, the 99th percentile is used to represent the maximum expected pollutant level. For the chronic criterion, representing a four day exposure, the 95th percentile value is used. The combination of these upper bound effluent concentrations with dilution in the receiving water is calculated to determine whether the water quality criteria will be exceeded. The *TSD* also includes a procedure for determine such percentiles when the dataset includes non-detect results, as is the case for Uxbridge, based on a delta-lognormal distribution.

The statistical analyses for copper and zinc in Uxbridge's discharges are set forth in Attachment D. For copper, the 95th percentile expected concentration is 20.1.8 ug/l, while the 99th percentile is 26.4 ug/l. For zinc, the 95th percentile expected concentration is 59.8 ug/l, while the 99th percentile is 73.6 ug/l.

The receiving water concentration is calculated taking into account dilution at 7Q10 conditions, through a mass balance equation that accounts for concentrations in the Blackstone River upstream of the discharge as reported in the facility's WET test reports:

$$\text{Receiving water concentration } (C_r) = \frac{(C_d * Q_d + C_s * Q_s)}{(Q_d + Q_s)} \quad \text{; where}$$

C_d = upper bound effluent concentration data (99th percentile for acute criteria; 95th percentile for chronic criteria)
Q_d = Design flow of facility
C_s = Median concentration in Blackstone River upstream of discharge
Q_s = 7Q10 streamflow in Blackstone River upstream of discharge

Table 8 shows the result of the mass balance equations. The predicted receiving water concentration ($Cr_{dissolved}$) is less than the relevant criterion for each of these metals. Therefore the Uxbridge discharge does not present a reasonable potential to exceed water quality standards for these pollutants, and no effluent limits are required.

Table 8. Mass Balance calculations

	Qd	Cd	Qs	Cs	Qr = Qd+Qs	Cr_{tr}= (QdCd+QsCs)/Qr	$Cr_{dissolved}$	Criterion
Cu chronic	2.5	20.07	53.3	9.9	55.8	10.4	9.9	18.1
Cu acute		26.41		9.9		10.6	10.2	25.7
Zn chronic		59.82		24.9		26.5	26.1	79.9
Zn acute		73.59		24.9		27.1	26.5	79.2

VII. Sewer System Operation 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[8]). 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. MassDEP has stated that the inclusion in NPDES permits of I/I control conditions is a standard State Certification requirement under Section 401 of the CWA and 40 CFR § 124.55(b).

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.

Several of the requirements in the draft permit are not included in the current permit, including collection system mapping, and preparation of a collection system operation and maintenance plan. EPA has determined that these additional requirements are necessary to ensure the proper operation and maintenance of the collection system and has included schedules for completing these requirements in the draft permit.

VIII. Sewage Sludge Information and Requirements

According to its permit application, the Uxbridge WWTF generates about 262 dry metric tons of sludge per year. The sludge is aerated and then sent through a gravity thickener. This processed sludge is hauled to the Synagro site in Woonsocket, Rhode Island where it is dewatered and

[8] "Infiltration" is groundwater that enters the collection system through physical defects such as cracked pipes, or deteriorated joints. "Inflow" is extraneous flow entering the collection system through point sources such as roof leaders, yard and area drains, sump pumps, manhole covers, tide gates, and cross connections from storm water systems.

incinerated. In February 1993, (EPA promulgated standards for the use and disposal of sewage sludge. The regulations were promulgated under the authority of §405(d) of the (CWA. Section §405(f) of the CWA requires that these regulations be implemented through permits. This permit is intended to implement the requirements set forth in the technical standards for the use and disposal of sewage sludge, commonly referred to as the Part 503 regulations. Section 405(d) of the CWA requires that sludge conditions be included in all municipal permits. The sludge conditions in the draft permit satisfy this requirement and are taken from EPA's Standards for the Disposal of Sewage Sludge at 40 CFR Part 503. These conditions are outlined in the draft permit.

IX. Essential Fish Habitat Determination (EFH)

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 EFH such 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 C.F.R. § 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.

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. A review of the relevant essential fish habitat information provided by NMFS indicates that EFH has been designated for 33 managed species within the NMFS boundaries encompassing Narragansett Bay, which the Blackstone River discharges to, via the Seekonk River and the Providence River. *See* NOAA, Summary of Essential Fish Habitat, Narragansett Bay, RI (http://www.nero.noaa.gov/hcd/ri1.html). It is possible that a number of these species utilize the downstream Rhode Island waters for spawning, while others are present seasonally.

Based on the relevant information examined, EPA finds that the reissuance of this permit will adequately protect EFH for the following reasons:

- The Uxbridge discharge is located more than 20 miles upstream of designated EFH habitat;
- The dilution factor at the point of discharge is 22:1, and effective dilution in the area of EFH designated habitat will be significantly greater;
- The draft permit contains new nitrogen limits to ensure that the discharge does not contribute to nutrient-related water quality violations in the Seekonk and Providence River;
- The permit is designed to ensure that all water quality standards are met in the receiving water, both in Massachusetts and Rhode Island.

EPA believes that the draft permit limits adequately protect all designated EFH, and therefore additional mitigation is not warranted. If adverse impacts to EFH are detected as a result of this

permit action, or if new information is received that changes the basis for our conclusion, NOAA Fisheries will be notified and an EFH consultation will be initiated.

X. Endangered Species Act

Section 7(a) of the Endangered Species Act (ESA) of 1973, 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 U.S. Fish and Wildlife Service (USFWS) typically administers Section 7 consultations for bird, terrestrial, and freshwater aquatic species. NMFS typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the list of federal endangered or threatened species of fish, wildlife, and plants to see if any such listed species might potentially be impacted by the reissuance of this NPDES permit and has not found any such listed species in the vicinity of the discharge. Therefore, EPA does not need to formally consult with NMFS or USFWS in regard to the provisions of the ESA.

XI. Monitoring and Reporting

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 requires that the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR. NetDMR is a national web-based tool for regulated CWA permittees to submit 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.

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. Permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

XII. State Certification Requirements

EPA may not issue a permit unless MassDEP certifies that the effluent limitations included in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State water quality standards, or waives certification. EPA has requested permit

certification by the State pursuant to 40 CFR §124.53 and expects the draft permit will be certified.

XIII. Comment Period, Public Hearing, and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the 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 Susan Murphy, U.S. Environmental Protection Agency, 5 Post Office Square, Suite 100 (OEP06-1), Boston, MA 02109. At the request of the applicant, the Regional Administrator finds significant public interest for the holding of a public hearing on this permit, scheduled for October 25, 2012 at the Uxbridge Senior Center. 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 the public hearing, if held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and to each person who has submitted written comments or requested notice.

XIV. EPA and MassDEP Contacts

Requests for additional information or questions concerning the draft permit may be addressed Monday through Friday, between the hours of 9:00 a.m. and 5:00 p.m., to :

Susan Murphy
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109
Telephone: (617) 918-1534 Fax: (617) 918-0534
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627 Main Street, 2nd Floor
Worcester, MA 01608
Telephone: (508)-767-2856 Fax: (508) 791-4131
Email: Kathleen.Keohane@state.ma.us

September 2012
Date

Stephen Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

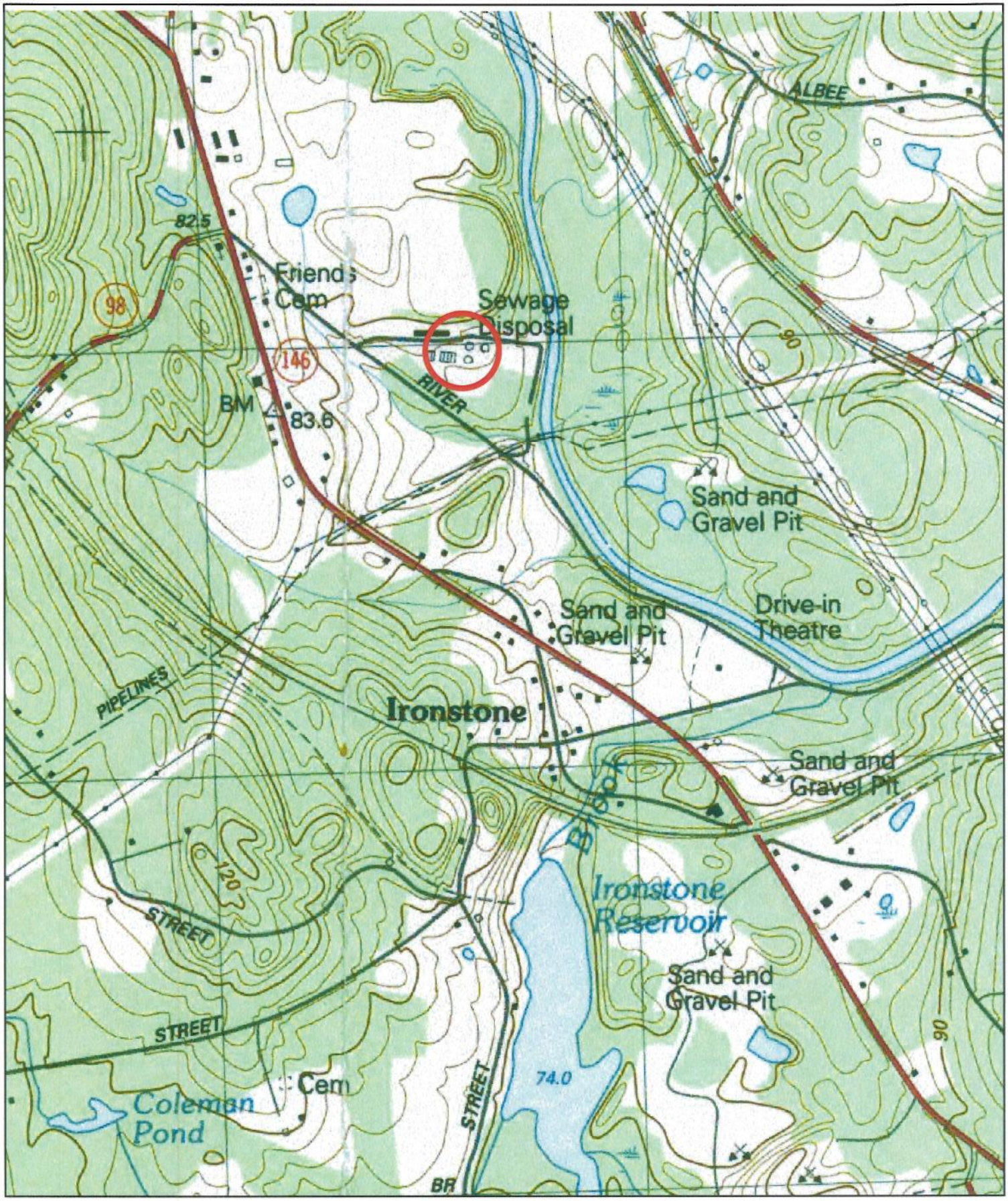

Figure 1. Location Map
Uxbridge WWTF
NPDES No. MA0102440

N
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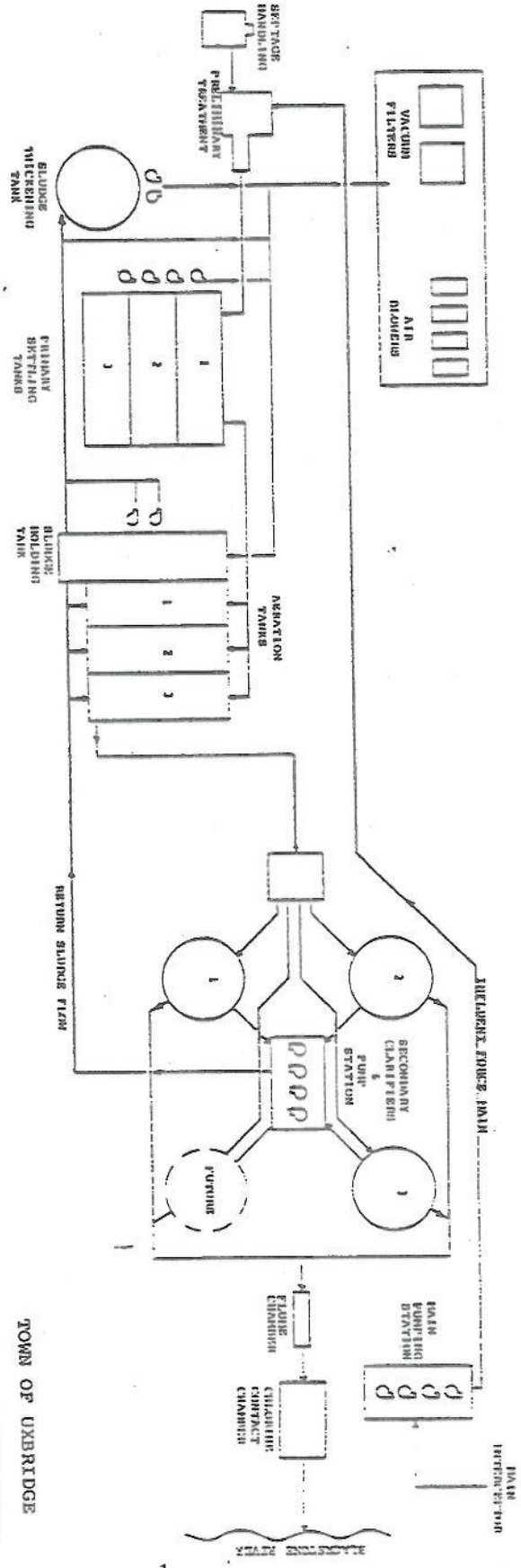
1,000 500 0 1,000 Feet

Facility Location

Uxbridge WWTF
Fact Sheet NPDES MA 0102440
Figure 2



1-4

TOWN OF UXBRIDGE
WASTEWATER TREATMENT
FACILITY
SYSTEM SCHEMATIC
FIGURE 1-1

Uxbridge Wastewater Treatment Facility
NPDES Permit No. MA0102440

Table 1 (page 2 of 2)
Two year facility DMR Data

	pH		NH3	NO2 + NO3	DO	Total P	TRC		fecal coliform	
	min (SU)	max (SU)	mo avg (mg/l)	mo avg (mg/l)	min (mg/l)	avg (mg/l)	avg (mg/l)	max (mg/l)	mo avg (cfu/100 ml)	max (cfl/100 ml)
	6	8.3	5/10/15 (seasonal)	Report	5	1.0 (seasonal)	0.24	0.42	200	400
January 2009	7.19	7.47	0.03	10.1	6.2					
February	7.16	7.47	0.04	10.4	5.84					
March	7.1	7.4	0.04	10.1	7					
April	7.15	7.5	0.04	10	7.09	0.53	0.2	0.75	8.6	373.3
May	7.15	7.68	0.04	10.3	6	0.37	0.15	0.23	14.58	160
June	7.3	7.6	0.03	10.7	5.4	0.6	0.16	0.32	25.2	193.3
July	7.3	7.8	0.15	10.3	5.2	0.5	0.18	0.4	12.7	53.3
August	7.37	7.78	0.04	1	4.4	0.5	0.13	0.2	90.4	393.3
September	7.3	7.8	0.04	15.1	4.8	0.7	0.11	0.27	139.5	353.3
October	7.49	7.81	0.04	12.21	5.02	0.53	0.15	0.26	27.9	346.7
November	7.2	7.6	0.03	7.4	5.26					
December	7.1	7.5	0.04	7.6	5.6					
January 2010	7.1	7.6	0.04	6.9	6.1					
February	7.1	7.5	0.05	6.7	6.58					
March	7	7.5	0.64	6.5	6					
April	7.1	7.5	0.1	7.2	6.5	0.54	0.17	0.34	8.6	360
May	7.2	7.7	0.03	10.9	5.2	0.8	0.16	0.27	3.7	20
June	7.18	7.68	0.04	9.92	5.12	0.69	0.11	0.14	5.38	43
July	7.59	7.76	0.07	7.8	4.04	0.54	0.12	0.2	7.12	30
August	7.18	7.8	0.05	8.17	4.37	0.47	0.13	0.28	4.1	26.7
September	7.38	7.74	0.05	9.61	4.47	0.56	0.12	0.29	8.5	305
October	7.46	7.73	0.05	9.21	4.74	0.43	0.15	0.39	51.12	335
November	7.24	7.57	0.34	11.61	5.94					
December	7.05	7.39	0.4	14.5	6.6					
Average:			0.10	9.34		0.55	0.15		29.10	
Maximum:	7.0 (min)	7.81 (max)			4.04 (min)			0.75		393.30

Uxbridge Wastewater Treatment Facility
NPDES Permit No. MA0102440

Table 1 (page 1 of 2)
Two year facility DMR Data

	Flow	BOD			CBOD		TSS		
	12mo avg (MGD)	mo avg (mg/l)	avg wkly (mg/l)	% rem	mo avg (mg/l)	avg wkly (mg/l)	mo avg (mg/l)	avg wkly (mg/l)	% rem
Effluent Limit	2.5	30	45	85	20	30	30	45	85
January 2009	1.06	2	2	99.1			1.1	2.4	99.8
February	1	2.2	2.5	99			2.1	2.9	99.7
March	1.08	2.3	2.9	98.9			2.2	3.2	99.7
April	1.05	3.5	4	98.4			3.3	3.9	99.4
May	0.89	2.4	3	99.2			2.4	3.4	99.6
June	0.78			99.2	2.1	2.3	1.9	2.6	99.7
July	0.86			99	2.2	2.8	2.2	2.9	99.4
August	0.8			99.2	2.1	2.2	2.4	5.1	99.5
September	0.73			99.4	2	2	1.7	2.6	99.6
October	0.78			99.64	1.18	1.63	1.38	1.93	99.99
November	0.86	2	2.8	99.4			1.1	2.2	99.8
December	0.96	1.3	1.6	99.5			1.1	2	99.9
January 2010	0.92	1.2	1.6	99.5			1.1	1.8	99.8
February	0.96	2.2	3.4	99.1			2.1	3.6	99.6
March	1.44	4	7.2	97.6			2.2	4.2	99.3
April	1.53	1.7	2.3	99.1			1.4	1.9	99.6
May	0.96	1.4	2.1	99.4			1	1.6	99.9
June	0.86			99.44	1.24	2.7	1.11	1.77	99.7
July	0.71			99.9	0.47	0.97	0.89	1.44	99.9
August	0.68			99.9	0.56	0.9	0.52	0.93	99.9
September	0.67			99.9	0.4	0.6	0.51	1.1	99.9
October	0.73			99.78	0.98	1.75	1.03	1.55	99.87
November	0.77	3.47	7.25	99.07			2.24	4.63	99.66
December	0.83	1.1	1.7	99.9			0.9	1.6	99.7
Average:	0.91	2.2		99.3	1.3		1.6		99.7
Maximum:			7.25			2.80		5.10	

ATTACHMENT A

CALCULATION OF MAXIMUM ALLOWABLE LOADS FROM CONCENTRATION-BASED LIMITS

Calculations of maximum allowable loads for average monthly and average weekly $CBOD_5$, BOD_5, TSS, ammonia, phosphorus, nitrogen and metals were calculated based on the following equation:

$L = C \times Q_D \times 8.34$ where:

L = Maximum allowable load in lbs/day
C = Maximum allowable effluent concentration for reporting period in mg/l
(Reporting periods are average monthly, average weekly, and daily maximum.)
Q_D = Design flow of facility in MGD = 2.5 MGD
8.34 = Factor to convert effluent concentration in mg/l and design flow in MGD to lbs/day

Therefore:

BOD, TSS (Nov-May):
(Concentration limit) [45] X 8.34 (Constant) X 2.5 (design flow) = 938 lbs/day
(Concentration limit) [30] X 8.34 (Constant) X 2.5 (design flow) = 626 lbs/day
CBOD, TSS (June-Oct):
(Concentration limit) [30] X 8.34 (Constant) X 2.5 (design flow) = 626 lbs/day
(Concentration limit) [20] X 8.34 (Constant) X 2.5 (design flow) = 417 lbs/day
Ammonia:
(Concentration limit) [5] X 8.34 (Constant) X 2.5 (design flow) = 104 lbs/day
(Concentration limit) [10] X 8.34 (Constant) X 2.5 (design flow) = 208.5 lbs/day
(Concentration limit) [15] X 8.34 (Constant) X 2.6 (design flow) = 313 lbs/day
Total phosphorus:
(Concentration limit) [.2] X 8.34 (Constant) X 2.5 (design flow) = 4.2 lbs/day
(Concentration limit) [1] X 8.34 (Constant) X 2.5 (design flow) = 21 lbs/day
Total nitrogen:
(Concentration limit) [8] X 8.34 (Constant) X 2.5 (design flow) = 167 lbs/day

Attachment B: 7Q10 and baseflow calculations

The 7Q10 flow in the Blackstone River was calculated based on the modeling study performed in connection with the Blackstone River Initiative, which was calibrated and validated using data from July and August of 1991 that were at near-7Q10 flows. The model generated a 7Q10 flow at Uxbridge of 117.15 cfs that included all upstream POTWs operating at design flow. The boundary conditions for the 7Q10 conditions of the model-generated flow are as follows:

Sources	Flow (cfs)
Headwaters	6.53
Quinsigamond R	3.03
Mumford R	5.89
West R	3.22
UBWPAD	86.6
Millbury	1.85
Grafton	2.46
Northbridge	2.77

Blackstone River Initiative, Table 5-18.

Calculating dilution factor

The model results were used in the 1999 permit issuance to determine dilution in the Blackstone River at Uxbridge for purposes of determining total residual chlorine limits and appropriate whole effluent toxicity testing requirements. As actual flows are not at design, the design flow from each facility was subtracted from the model-generated total flow to determine the base flow under 7Q10 conditions. Then, dry weather flows from each facility were calculated and added to the baseflow to determine current receiving water flow. The calculation was set forth in the Response to Comments in connection with the current permit as follows:

7Q10 @ Blackstone River near Uxbridge =

Blackstone River upstream flow –

(UBWPAD permitted flow – UBWPAD summer flow) –

(Milbury permitted WTP flow – Milbury summer flow) –

(Grafton permitted WTP flow – Grafton summer flow) –

(Northbridge WPCF permitted flow – Northbridge summer flow)

= 117.15 cfs – 32.35 cfs – 0.76 cfs – 0.13 cfs – 1.22 cfs

= **82.7 cfs (53.3 MGD)**

In table format this calculation can be displayed as below:

	Design Flow (cfs)	Summer Flow (cfs)	(Design Flow-Summer Flow)
7Q10 from WLA model at design flow	117.15	82.69	---
UBWPAD	86.6	54.25	32.35
Millbury	1.85	1.09	0.76
Grafton	2.46	2.33	0.13
Northbridge	2.77	1.55	1.22
Remaining flow at 7Q10	23.47	23.47	---

The resulting 7Q10 flow upstream of Uxbridge, including the existing upstream POTW flows, is 82.7 cfs. This value was used to calculate the dilution factor and the chlorine effluent limit. During the time period since the current permit was issued, the Millbury WWTP discharge was terminated and its flows were tied into UBWPAD. For purposes of determining the dilution factor for this permit it is assumed that these flows are now simply added to the UBWPAD flow and the dilution factor remains the same as in the current permit.

The calculations also indicate that 7Q10 flow in the Blackstone River, when the four major treatment plants are excluded, equals 23.47 cfs. This figure includes flows from two smaller treatment plants, Upton and Douglas, that are also upstream of Uxbridge. For purposes of calculating instream phosphorus concentrations, in which loads from the smaller treatment plants are specifically included based on their permit limits, a 7Q10 baseflow was calculated by subtracting the summer flow from Upton and Douglas. The resulting "Blackstone River baseflow" is 22.75 cfs, or 14.7 MGD.

ATTACHMENT C. Delivery Factors

In order to determine the appropriate delivery factors in the Blackstone River, EPA reviewed the available evidence from the RIDEM studies and other sources. In the 2004 RIDEM Report, RIDEM applied a delivery factor of 87% (i.e. 13% of the nitrogen is removed by uptake or denitrification) to both the UBWPAD and Woonsocket nitrogen loadings in calculating the resulting loads in the Seekonk River. This figure was based on RIDEM sampling in 1995 and 1996 as compared to monthly average WWTF monitoring data. 2004 RIDEM Report at 18.

Subsequent studies have produced conflicting evidence as to the extent of attenuation in the Blackstone River. A URI study based on biweekly sampling in the lower Blackstone River between April and August 2004 found "no direct evidence of DIN attenuation or removal in the lower Blackstone," with about a 20% increase in DIN that was not accounted for by WWTF discharges. The team also concluded that "[n]or can the results of a mass balance analysis unequivocally exclude DIN removal processes in the river itself," as non-WWTF inputs such as atmospheric deposition, individual septic system inputs or other sources could be in excess of the 20% increase and mask in-stream removal processes. Nixon, et al., "Investigation of the Possible Attenuation of Dissolved Inorganic Nitrogen and Phosphorus in the Lower Blackstone River" (April 2005), in *Anthropogenic Nutrient Inputs to Narragansett Bay - A Twenty Five Year Perspective* (2005), Appendix B. In contrast, the 2005 RIDEM RTC reported attenuation rates derived from a Qual2E water quality model, modified as part of a dissertation project at URI, that predicted an attenuation rate of 8% from the UBWPAD discharge to the state line, and an additional 21% from the state line to the mouth of the river, for a combined 27% attenuation. Total attenuation of the Woonsocket discharge was predicted to be 14%. 2005 RIDEM RTC, citing Michaelis, *Dissolve Oxygen Dynamics in a Shallow Stream System*, Dissertation in Civil and Environmental Engineering at the University of Rhode Island (2005).

Additional insight into the issue is provided in a regional study conducted by the U.S. Geological Service, which indicates that there is no significant attenuation of nitrogen in New England rivers with discharges greater than 2.83 m^3/s (100 cfs) or in reservoirs. Moore, et al., *Estimation of Total Nitrogen and Phosphorus in New England Streams Using Spatially Referenced Regression Models*, USGS Scientific Investigations Report 2004-5012. This study applied a water-quality model called SPARROW (Spatially Referenced Regressions on Watershed Attributes), a "spatially detailed, statistical model that uses regression equations to relate total nitrogen and phosphorus (nutrient) stream loads to nutrient sources and watershed characteristics." The regression analysis utilized a wide array of data sources, including nitrogen monitoring data from 65 sites, to derive coefficients in-stream loss as well as for source loading from particular land uses, point and atmospheric sources and for land-to-water delivery. As applied to the Blackstone River, the SPARROW model predicts no attenuation on an annual average basis based on its average annual flow.

The UBWPAD permit analysis was based on an estimated attenuation rate for the UBWPAD discharge of 13%, and EPA continues to believe that this represents the most reasonable and appropriate estimate of attenuation in the Blackstone River. While the 2005 RIDEM RTC suggests a higher rate, that modeling indicated that uptake of nitrogen decreased as phosphorus to the system are reduced. This would indicate that attenuation rates will be lower under the new

UBWPAD permit limit of 0.1 mg/l total P (as well as new limits on other WWTFs), as opposed to the limit of 0.75 mg/l total P that was used in the model. On the other hand, while the Nixon and USGS studies indicate there may be less than 13% attenuation even under current conditions, both studies leave open the possibility that some level of attenuation is occurring. The Nixon Report specifically notes that the results do not exclude the existence of in-stream removal processes, while the USGS study does not specifically address the potential for attenuation during occasional periods when river flow falls below the 100 cfs threshold (in the Blackstone, this occurs approximately 20% of the time at Northbridge and less than 3% of the time at Woonsocket, based on USGS gage data from those locations). The attenuation rate of 13% is thus squarely within the range of the possible values based on currently available information.

For these reasons, EPA has applied delivery factors to each discharge that are consistent with 13% attenuation of the UBWPAD discharge. In the absence of other information, we assume that attenuation is proportional to the distance traveled, as calculated in Table B.1. The resulting delivery factors are applied to determine the load to the Seekonk River.

Table B.1. Delivery Factors

Calculated from: $A_i = A_{UB} * Rm_i/RM_{UB}$

Source	River Mile	Attenuation	Delivery Factor
UBWPAD	44.4	13.0%	87%
Millbury	40.6	11.9%	88%
Grafton	35.4	10.4%	90%
Northbridge	29.2	8.5%	91%
Uxbridge	22.0	6.4%	94%
Woonsocket	12.4	3.6%	96%

Date	Cu* (ug/l)	lnCu (ug/l)	$(y_i - u_y)^2$	# samples per month
4/26/2005	13	2.5649	0.0109962	1
11/15/2005	20	2.9957	0.2869163	1
5/9/2006	17	2.8332	0.1392236	1
11/14/2006	16	2.7726	0.0976576	1
5/15/2007	ND-10			1
12/12/2007	ND-10			1
12/16/2008	10.2	2.3224	0.018961	1
1/23/2009	ND-10			1
5/5/2009	10	2.3026	0.0248067	1
11/3/2009	12	2.4849	0.000616	1
5/11/2010	10.9	2.3888	0.0050871	1
11/16/2010	8	2.0794	0.1448906	1
4/26/2011	6.4	1.8563	0.3645606	1

Daily Maximum Concentration - 99th percentile (some measurements < detection limit)

Detection Limit** =		10.000
u_y = Avg of Nat. Log of daily Discharge (mg/L) =		2.46009
$\Sigma (y_i - u)^2$ =		1.09372
k = number of daily samples =		13
r = number of non-detects =		3
σ_y^2 = estimated variance = $(\Sigma[(y_i - u_y)^2]) / (k-r-1)$ =		0.12152
σ_y = standard deviation = square root σ_y^2 =		0.34860
δ = number of nondetect values/number of samples =		0.23077
z=z-score[$(0.99-\delta)/(1-\delta)$] =	z-score of	0.98700
	=	2.226211769

RP analysis/Limit calculation:

99th percentile daily max limit = exp (u_y + z-score*σ_y)

Daily Max Limit* = 25.44 ug/l

TSD-Table E-1, 99th percentile with ND

Average Monthly Concentration - 95th percentile (some measurements < detection limit)

Number of samples per month, n =		1
E(x) = Daily Avg = $\delta D + (1-\delta) \exp(u_y + 0.5\,\sigma_y^2)$ =		11.87627
V(x) = Daily Variance = $(1-\delta)\exp(2u_y + \sigma_y^2)[\exp(\sigma_y^2)-(1-\delta)] + \delta(1-\delta)D[D-2\exp(u_y + 0.5\sigma_y^2)]$ =		16.43609
A = $V(x)/[n(E(x)-\delta^n D)^2]$ =		0.179516334
B = $-[\delta^n D^2(1-\delta^n)]/(E(x)-\delta^n D)^2$ =		-0.193883136
C = $(2\delta^n D)/(E(x)-\delta^n D)$		0.482348176
σ_n^2 = Monthly Average variance = $\ln\{(1-\delta^n)[1+A+B+C]\}$		0.12152
σ_n = Monthly Average standard deviation = σ_n^2^(0.5) =		0.34860
u_n = n-day monthly average = $\ln[(E(x)-\delta^n D)/(1-\delta^n)] - 0.5\sigma_n^2$ =		2.46009
z=z-score[$(0.95-\delta)/(1-\delta)$] =	z-score of	0.93500
	=	1.514101888

RP analysis/Limit calculation:

95th percentile monthly average limit = exp (u_n + z-score*σ_n)

Monthly Avg Limit* = 19.84 ug/l

TSD-Table E-2, 95th percentile with ND

Date	Zn* (ug/l)	lnZn (ug/l)	$(y_i - u_y)^2$	# samples per month
4/26/2005	50	3.9120	0.0550474	1
11/15/2005	ND-50			1
5/9/2006	74	4.3041	0.3927077	1
11/14/2006	ND-50			1
5/15/2007	ND-50			1
12/12/2007	ND-50			1
12/16/2008	ND-50			1
1/23/2009	ND-50			1
5/5/2009	ND-50			1
11/3/2009	ND-50			1
5/11/2010	37.9	3.6350	0.001802	1
11/16/2010	19.7	2.9806	0.4855059	1
4/26/2011	35	3.5553	0.014897	1

Daily Maximum Concentration - 99th percentile (some measurements < detection limit)

Detection Limit** =		10.000
u_y = Avg of Nat. Log of daily Discharge (mg/L) =		3.67740
$\Sigma (y_i - u)^2$ =		0.94996
k = number of daily samples =		13
r = number of non-detects =		8
σ_y^2 = estimated variance = $(\Sigma[(y_i - u_y)^2]) / (k-r-1)$ =		0.23749
σ_y = standard deviation = square root σ_y^2 =		0.48733
δ = number of nondetect values/number of samples =		0.61538
z=z-score[(0.99-δ)/(1-δ)] =	z-score of	0.97400
	=	1.943133751

RP analysis/Limit calculation:

99th percentile daily max limit = exp (u_y + z-score*σ_y)

Daily Max Limit* = **101.94 ug/l**

TSD-Table E-1, 99th percentile with ND

Average Monthly Concentration - 95th percentile (some measurements < detection limit)

Number of samples per month, n =		1
E(x) = Daily Avg = δD + (1-δ) exp(u_y + 0.5 σ_y^2) =		23.28048
V(x) = Daily Variance = (1-δ)exp(2u_y + σ_y^2)[exp(σ_y^2)-(1-δ)] + δ(1-δ)D[D-2exp(u_y + 0.5σ_y^2)] =		486.62777
A = V(x)/[n(E(x)-δ^nD)^2] =		1.659024921
B = -[δ^nD^2(1-δ^n)]/(E(x)-δ^nD)^2 =		-0.080691783
C = (2δ^nD)/(E(x)-δ^nD)		0.71862884
σ_n^2 = Monthly Average variance = ln{(1-δ^n)[1+A+B+C]}		0.23749
σ_n = Monthly Average standard deviation = σ_n^2^(0.5) =		0.48733
u_n = n-day monthly average = ln[(E(x)-δ^nD)/(1-δ^n)] - 0.5σ_n^2 =		3.67740
z=z-score[(0.95-δ)/(1-δ)] =	z-score of	0.87000
	=	1.126391129

RP analysis/Limit calculation:

95th percentile monthly average limit = exp (u_n + z-score*σ_n)

Monthly Avg Limit* = **68.47 ug/l**

TSD-Table E-2, 95th percentile with ND

***Take dilution and ambient conc into consideration to determine potential conc after mix, if conc after mix > criteria, then RP exists**

**detection limit =0.003

***TSD Table 3-1

****TSD Table 3-2

Uxbridge Wastewater Treatment Facility - Response To Comments

On September 21, 2012, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) public noticed a Draft Permit (MA0102440) for the Uxbridge Wastewater Treatment Facility.

EPA received written comments from the Town of Uxbridge, the Blackstone River Coalition and the Rhode Island Department of Environmental Management (RIDEM). At the request of the applicant, EPA determined to hold a public hearing on the draft permit based on substantial public interest in the permit. The hearing took place on October 25, 2012, at the Uxbridge Senior Center. At the public hearing, the following individuals made oral comments:

State Senator Richard T. Moore
Peter Baghdasarian, Town of Uxbridge Selectman and Water/Sewer Commission
Mark Andrews
Joseph Curran
Peter Coffin, Blackstone River Coalition
Donna Williams, Blackstone River Valley National Heritage Corridor Inc.
Michael Potaski, Town of Uxbridge Conservation Commission member

The following are responses to all significant comments received and descriptions of any changes made to the public-noticed permit as a result of those comments. Additional changes to clarify permit language have also been made and are summarized at the end of this document.

A. The following comments were received from the Town of Uxbridge in a letter dated November 16, 2012:

Comment A1. At the time of the issuance of the draft permit, the Town was in the middle of conducting a wastewater facilities planning project. As the agency responsible for the implementation of the regulations, the DPW respectfully submits the following comments on this draft permit:

1. There are several new parameters in the permit that the existing wastewater treatment facility either cannot meet at current flows, cannot meet at the design flow, was not designed to meet and/or has no long term data to show it can meet. These are as follows:

a. The existing facility was not designed to treat to the bacteria levels contained in the new permit (E. coli and Enterococci) nor is there any data to demonstrate the facility is capable of achieving these new limits.

b. The existing facility was not designed to treat to the total phosphorus levels contained in the new permit nor is there any data to demonstrate the facility is capable of achieving these new limits.

c. The existing facility was not designed to treat to the total nitrogen levels contained in the new permit nor is there any data to demonstrate the facility is capable of achieving these new limits.

d. At the very least, the Town will need time to complete the planning process, design, bid and construct necessary improvements to meet these new limits.

> **Response to Comment A1.** EPA recognizes that the existing facility was not designed to meet the referenced permit limits. With respect to the bacteria limit, EPA expects that the existing facility will be able to meet the new limits based on the experience of other facilities in Massachusetts. EPA does not expect that the existing facility can meet the new limits for total phosphorus or total nitrogen. EPA has provided for tiering of the permit limits based on the facility's flow that should provide some relief from the need for immediate upgrades while the planning process proceeds, see Response to Comment A9. However, to the extent that new permit limits cannot be met by the existing facility EPA understands that the Town will need time to complete the planning process, design, bid and construct necessary improvements to meet the new limits, and expects that a reasonable compliance schedule will be developed and incorporated into an EPA enforcement order after issuance of the permit. This schedule would address any permit limit that cannot be met by the existing facility (including bacteria if necessary). Such a compliance schedule is not included within the permit because the permit is designed in part to meet Rhode Island's water quality standards, which do not provide for permit compliance schedules.
>
> *Changes to permit: See Response to Comment A9 with respect to tiered limits.*

Comment A2. With regard to pH, the former permit contained a clause after the permit range as follows "unless these values are exceeded due to natural causes." Can this be added into the new permit?

> **Response to Comment A2.** EPA is no longer including a blanket statement permitting pH exceedances that are "due to natural causes" in POTW permits. That language is vague and on its face would allow excursions from the technology-based secondary treatment pH range of 6.0 to 9.0 s.u. that are not permissible under 40 C.F.R. § 133.102. Rather, individual treatment plants are being considered on a case-by-case basis to determine whether "natural causes" are present that would support a relaxation of the permit range, and if so to determine a specific alternative pH limit for the facility. In doing so, EPA must ensure that the pH limit complies with both the technology-based standard for secondary treatment of 6.0 to 9.0 s.u.,[1] and water quality requirements based on the Massachusetts SWQS for pH requiring that the receiving water: "[s]hall be in the range of 6.5 through 8.3 standard units and not more than 0.5 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class." 314 CMR

[1] The secondary treatment standard does not apply if the POTW "demonstrates that (1) Inorganic chemicals are not added to the waste stream as part of the treatment process; and (2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0." The Uxbridge WWTF adds inorganic chemicals as part of its treatment process so this exception is inapplicable here.

4.05(b)(3). In most cases, MassDEP requires a permit range of 6.5 to 8.3 s.u. as a condition of state certification.

In the case of the Uxbridge WWTF, the facility has had no excursions from the limit in the past seven years. This indicates an ability to comply with the limit over a large range of natural conditions and no basis for expanding the permit limit range. Therefore no change will be made to the draft permit language.

Changes to permit: none.

Comment A3. With regard to residual chlorine, the former permit contained different sampling requirements. Can the permit be worded as follows: "two samples per day Monday to Friday, one sample per day Saturday and Sunday and holidays"?

Response to Comment A3. The draft permit footnote 15 to the total residual chlorine sampling requirement states "two samples per day Monday to Friday, one sample per day Saturday and Sunday." EPA agrees that the addition of holidays is consistent with the intent of this language and has revised the requirement as requested.

Changes to permit: Footnote 15 has been revised to state: "Two samples per day Monday to Friday, one sample per day Saturday, Sunday and holidays."

Comment A4. With regard to aluminum, this limit is unreasonable given the phosphorus limit and the prevalence of aluminum in phosphorus removal chemicals. It is unclear from the information provided in the Fact Sheet if a determination has been made as to what levels of aluminum may be naturally occurring in the receiving waters. It should be noted that bioassays conducted by the Town are always successful indicating the aluminum that is being discharged is non-toxic. Thus, the Town requests to have aluminum limit reduced to "reporting" status only. Further, the Town supports the Commonwealth in its establishment of a statewide site specific aluminum criterion.

Response to Comment A4. EPA's regulations require that NPDES permits contain limitations on any pollutant which it "determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard," and to make that assessment based on the approved state water quality criteria. 40 C.F.R. § 122.44(d)(1). EPA conducted an analysis of the "reasonable potential" of Uxbridge's discharge (Fact Sheet at 28-30) and determined that there was reasonable potential for the discharge to cause an excursion over the Massachusetts chronic water quality criterion for aluminum of 87 ug/l. Therefore a limit on aluminum is required.

EPA recognizes the challenges presented by aluminum limits given the widespread use of aluminum compounds for phosphorus removal. However, the need to remove phosphorus is not a justification for exceeding water quality criteria based on the toxic effects of aluminum on aquatic life, just as the need for disinfection does not obviate the

requirement for permit limits on toxic chlorine discharges. The problem is inherent in the selection of a toxic pollutant as a treatment compound. A permit limit on such a toxic pollutant is both reasonable and necessary.

EPA agrees that there has not been a determination as to what level of aluminum may be "naturally occurring" in the Blackstone River. However, high aluminum concentrations upstream of Uxbridge do not appear to be "natural." There are numerous potential sources of aluminum to the Blackstone River upstream of the discharge, including POTWs and urban and industrial stormwater discharges. Furthermore, aluminum impairments in receiving waters that are not influenced by point sources have been linked to acid rain, which is due to human activity and therefore does not constitute a naturally occurring condition. See, e.g., ENSR, *Evaluation of potential causes of aluminum-impairment in 21 New Hampshire Ponds* (2007) (Appendix E to *Determination of Total Maximum Daily Load (TMDL) for 158 Acid Impaired and 21 Aluminum Impaired New Hampshire Ponds*).

The MA SWQS do permit MassDEP to make a "determination" that a higher concentration than the adopted criterion is "naturally occurring" in a particular receiving water, and identify an alternate naturally occurring concentration. Any such determination would be part of a Water Quality Standards process, not an individual permit issuance. No such determination has been made by MassDEP for the Blackstone River, and no evidence has been provided that would indicate that the aluminum concentrations currently found in the Blackstone River at Uxbridge are naturally occurring. The available information therefore does not support application of a higher "naturally occurring" criterion, and the 87 ug/l criterion must be used. EPA is aware that MassDEP has indicated its intent to develop site specific criteria for aluminum, and a change in the water quality standards during the permit term would be grounds to request a permit modification pursuant to 40 CFR § 122.62(a)(3)(i)(B).

With respect to the bioassays cited in the comment, these permit limits are independent and whole effluent toxicity testing is not an allowable substitute for limits on specific pollutants that contribute to exceedances of a numeric criterion. It should also be noted that the permit limit is designed to meet the **chronic** aluminum criterion of 87 ug/l, while the facility performs only **acute** Whole Effluent Toxicity testing. EPA's analysis did not indicate a reasonable potential to exceed the acute criterion for aluminum. Therefore the lack of toxicity in the facility's bioassays is not inconsistent with the permit limit analysis.

Changes to permit: none.

Comment A5. Regarding Footnote No. 7, with the Town in the middle of a planning process, it is requested that any modifications should be incorporated into the overall plan for the plant and implemented as determined by the schedule in this plan.

Response to Comment A5. Footnote 7 concerns implementation of a chlorination system alarm, required within 6 months of permit effective date. EPA is not opposed to a

reasonable extension of time, but is not willing to defer it indefinitely while the Town completes its planning process. Further, as the Final Permit provides for a tiered flow structure, a major upgrade may be deferred for a number of years, a delay that is not appropriate for this requirement. The Final Permit provides a one year period for completion of this requirement.

Changes to permit: The timeframe in footnote 7 is modified from "six (6) months" to "one (1) year."

Comment A6. With regard to the dates for the toxicity tests, the new dates may cause an issue with the limited number of laboratories who perform this type of testing. The Town requests that the language from the 1999 permit be maintained in the new permit.

Response to Comment A6. The reissued permit identifies specific months for toxicity testing (April and October), as opposed to the 1999 permit which allowed the test to take place any time in the quarters ending June 30 and December 31. EPA and MassDEP's current policy is to provide for a consistent time frame for all toxicity testing in a particular watershed, to allow for better comparability among test results from multiple facilities. EPA and MassDEP are aware of the need to distribute workload for the laboratories and for that reason has identified different months for different watersheds. The requirement to conduct toxicity testing in April and October is consistent with the other POTW permits in the Blackstone River watershed and remains in the Final Permit.

Changes to permit: none.

Comment A7. Article C.5.a requires a submittal within 6 months of the effective date of the permit. This information is currently being collected as part of the planning process the Town has initiated. It is requested that the submission be tied to the completion of the planning document and not the effective date of the permit.

Response to Comment A7. The requirement for submittal within 6 months is limited to (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. While EPA recognizes that the Town is conducting a planning process, this information does not require the completion of an entire planning document and is not contingent upon any planning decisions. EPA believes these items are appropriately considered at the outset of the planning process and that 6 months is a reasonable time frame for this submittal.

Changes to permit: none.

Comment A8. With regard to articles C.5.b and c, it is requested that the Town be granted more time to complete since they are in a planning process. The Town requests that these time

frames be tied to the completion of the planning process and not to the effective date of the permit or that the submissions are a requirement of the final year of the permit.

> **Response to Comment A8.** Part C.5.b of the permit concerns submittal and implementation of the full Collection System O & M Plan, to be completed within 24 months of the permit effective date. There is no permit part C.5.c. This plan also does not require the completion of an entire planning document and is not contingent upon final plan decisions. The Town already has substantially completed mapping of the collection system, providing the basic information necessary for proceeding with this document. It is not clear what further relevant information would be provided by the planning process and in what time frame that information would be developed; the fact of a planning process alone is not a sufficient basis for deferring this requirement. The timeframe remains the same in the Final Permit.
>
> *Changes to permit: none.*

Comment A9. This permit, if issued, will lead to significant costs to upgrade the existing facility. Some of these costs may be controlled by recognizing that the ultimate design flow of the plant (2.5 mgd) would not be achieved for up to twenty years while the flows for the plant for at least the next two permit cycles are expected to fall far short of the design flow. In an attempt to mitigate these upgrade costs and not overdesign an upgrade to the facility, can EPA issue a permit that has two tiers for flows with the understanding that once the plant flow approaches the first flow tier, additional plant accommodations would be needed for the second and ultimate plant design flow? The Town is in the middle of a planning process which may demonstrate a lower design flow would be adequate for the short-term.

> **Response to Comment A9.** EPA recognizes that the permit limits for nutrients are based in large part on the design flow of the facility of 2.5 mgd, and that the facility is currently discharging less than 1.0 mgd. While in terms of design flow Uxbridge is the largest of the three remaining POTWs on the Blackstone River to receive nitrogen limits (Uxbridge, Grafton, and Northbridge), at its current level of operation it has the lowest actual flows, lowest effluent DIN concentration, and lowest nitrogen loads of the three. This is in large part a credit to the operators of the facility, who have achieved DIN reductions of approximately 65 percent (26.4 mg/l to approximately 9 mg/l) since 2004 on an entirely voluntary basis. At its current flows, the Uxbridge WWTF is comparable in size to the Burrillville, RI plant, a 1.5 mgd design flow (< 1.0 mgd current flows) for which RIDEM has required nitrogen reduction "to the maximum extent practicable" rather than including a numeric effluent limit. EPA also recognizes that the Town is engaged in a planning process and that it may determine that a 2.5 mgd design flow is unnecessary (the current design flow was based on several large industrial dischargers that have long since ceased operation). A tiered flow structure would also provide incentives for planning decisions, water conservation and other approaches that would reduce or defer effluent flow increases, an outcome EPA encourages given the large total volume of effluent that is permitted for discharge to the Blackstone River.

While the Town has suggested two tiers for flows, it has not suggested a figure for the lower flow. However, MassDEP has suggested that a lower tier of flow be established at 1.5 MGD, and that while the facility remains below that flow the permit contain only load limits for nutrients (set equal to those in the draft permit). While EPA does not accept this proposal in full, EPA agrees that it is reasonable to implement a tiered approach for a facility that is so substantially below its design flow, where (1) the facility's treatment in terms of allocating load among facilities is premised on its design flow, (2) water quality requirements can be met with modified limits at its existing flows, and (3) while the Town is actively engaged in a planning process that includes consideration of whether the current design flow is necessary to maintain in the planned facility upgrade.

The load allocation performed by RIDEM is based on design flow. The Fact Sheet also uses Uxbridge's design flow in discussing the potential downstream impacts, see Fact Sheet at 22-26, including comparison of Uxbridge's potential delivered DIN load to the Seekonk River at design flow (218 lb/day) with the MERL tank 1X loading rate, Fact Sheet at 20. Uxbridge's actual DIN loads to the Seekonk River over the past three summers (May through October 2010-12) have been much less than 218 lb/day, averaging approximately 60 lb/day. As noted above, this is less than the load for Grafton or Northbridge (which have lower design flows). It is sufficiently low that the target load at the mouth of the Blackstone, shown in Table 6 of the Fact Sheet, can essentially be met with Uxbridge at its current loading[2]; this is not the case for any of the other facilities included in the analysis. Similarly, the actual TP load from the Uxbridge facility over the past three summers has averaged 4.8 lb/day, within 15% of the permit load limit of 4.2 lb/day and far less than the 20.9 lb/d that the facility would discharge at design flow and its current permit limit of 1 mg/l.

In evaluating a proposed tiered flow structure, EPA must consider the appropriate reduced flow and the potential water quality-based limits applicable to that reduced flow. MassDEP has suggested setting a tier of limits based on a flow of 1.5 mgd, equivalent to the design flow of the Burrillville, RI facility. However, that value would allow the Uxbridge WWTF to increase its flows over 50% over current levels before more stringent permit limits would be triggered. EPA believes this is too great a scope for increase for the follow reasons:

(1) While the Burrillville, RI facility has a 1.5 mgd design flow, it is a more modern facility that is currently achieving close to 8 mg/l TN concentrations;
(2) The Uxbridge's facility's success in achieving substantial nitrogen reductions is in part due to the large amount of excess capacity at the treatment plant, which allows for creation of anoxic zones for dentrification -- it is not clear at what flow capacity will no longer be sufficient for effective denitrification; and
(3) This tiered structure is specifically designed to allow the Town to move forward with its planning process – it is not EPA's intent to provide unlimited scope for a 50%

[2] With a delivered load of 60 lb/day from Uxbridge, the total delivered load is 1,626 lb/day, compared to the water quality target of 1,624 lb/day – approximately one-tenth of one percent difference.

expansion of the existing system under reduced flow permit limits, in the absence of completed planning to identify short and medium-term, as well as long-term, needs.

Therefore, EPA has implemented a tiered approach based on a 1.25 mgd flow, or 50% of the facility design flow. EPA also notes that the Final Permit requires completion of the planning process during the permit term; this has been included as a change to Part 1.A.2.g in the Final Permit.

At flows up to 1.25 mgd, reduced flow effluent limits will be in place. The reduced flow limits have been calculated as follows:

Effluent limits carried over from previous permit: With respect to permit limits carried over from the previous permit, including BOD5, TSS, Ammonia, pH, DO and Total Residual Chlorine, concentration limits remain the same as in the prior permit in order to meet anti-backsliding requirements. Load limits, where applicable, are recalculated based on the reduced flow of 1.25 mgd. Whole effluent toxicity testing requirements and limits remain the same.

Aluminum and bacteria limits: These are not based on flow or dilution and are unchanged under the lower flow.

Nutrient limits: The new nutrient limits in the reissued permit are modified as follows:

(1) Nitrogen: Uxbridge's current nitrogen reduction practices are consistent with the water quality target for the Blackstone River at current flows. Therefore for the reduced flow of 1.25 mgd the nitrogen limit of 8 mg/l is replaced with a requirement that "the permittee shall operate the treatment facility to reduce the discharge of total nitrogen to the maximum extent possible using all available treatment equipment in place at the facility," equivalent to the requirement in the Burrilville, RI discharge permit. The Final Permit also requires annual reports that summarize activities related to optimizing nitrogen removal efficiencies, document the annual nitrogen discharge load from the facility, and track trends relative to the previous year.

(2) Phosphorus: The water quality-based calculation of the impact of Uxbridge's phosphorus load is set forth in the Fact Sheet at pages 12-13 for the design flow condition. The same calculation is set forth below based on a load limit of 4.2 lb/day (the same as that in the Draft Permit), but subtracting Uxbridge's design flow from the total flow in the river in order to ensure that the load limit alone is sufficiently protective at lower flows.

Instream concentration is determined using a mass balance equation as follows:

$$Q_r C_r = \Sigma\ Q_d C_d + Pload_{\text{Douglas}} + Q_s C_s$$

Where

Q_r = receiving water flow downstream of the discharge (Σ Qd + Q_{Douglas} + Qs)
C_r = total phosphorus concentration in the receiving water downstream of the discharge
Q_d = design flow from each facility (excluding Douglas)
C_d = total phosphorus concentration in each discharge (assumed to be permit limit)
Q_{Douglas} = design flow from Douglas
$Pload_{\text{Douglas}}$ = mass load from Douglas (assumed to be permit load limit)
Q_s = Blackstone River base flow at 7Q10 = 22.75 cfs = 14.7 MGD[1]
C_s = phosphorus concentration in baseflow, from sampling upstream of all POTWs = 0.04 mg/l

Solving for C_r yields:

$$C_r = \frac{\Sigma\ Q_d C_d + Pload_{\text{Douglas}} + Q_s C_s}{Qr}$$

$$C_r = \frac{56*\ 0.1 + 2.4*0.2 + 2.0*0.2 + 0.4*0.2 + \mathbf{4.2/8.34} + 1.2/8.34 + 14.7*0.04}{(78.4-2.5)}$$

$$C_r = 0.10 \text{ mg/l}$$

This indicates that a load-only permit limit, equivalent to that based on a design flow of 2.5 mgd and concentration of 0.2 mg/l, is sufficiently protective at the reduced flow of 1.25 mgd. The 1.0 mg/l winter limit remains in the final permit; at the lower tier flow a load limit of 10 lb/day applies.

The Final Permit also establishes a procedure for triggering the design flow-based permit limits. The Final Permit requires the permittee to evaluate their flow trends if and when the permittee becomes aware that increased flows or planned connections/extensions of the sewer system may result in an exceedance of the 1.25 MGD average annual flow limit, and estimate a projected date that the exceedance is expected to occur. The permittee must notify EPA – Office of Ecosystem Protection in writing a minimum of 60 days before that projected date, and the design flow-based permit limits will go into effect on the date identified by the permittee. If annual average flows exceed 1.25 MGD in any DMR, the design flow limits will go into effect 60 days thereafter. The permittee must notify notify EPA – Office of Ecosystem Protection in writing upon such occurrence. EPA encourages the permittee to closely track flow trends to avoid violations of the flow limit that will occur if the facility exceeds 1.25 MGD without prior notice to EPA.

Changes to permit: The permit limits at Part I.A.1. of the Draft Permit have been moved to a new Part I.A.1.b. and a new Part I.A.1.a. has been added with permit limits for flows up to 1.25 mgd as described above.

Footnote 2 to Part I.A.1. has been revised to add the following:

The permittee shall notify EPA by letter to the OEP Director, U.S. Environmental Protection Agency, 5 Post Office Square – Suite 100 (OEP06-5), Boston, MA 02109-3912, with a copy to be submitted with its monthly DMR, (i) no later than sixty days before a projected exceedance of 1.25 MGD annual average flow, if and when the permittee's evaluation of flow trends indicates that flows are expected to exceed 1.25 MGD; or (ii) at the time of filing of the first DMR in which the reported annual average flow exceeds 1.25 MGD.

Paragraph I.A.2.g. has been revised as follows:

The permittee shall conduct a planning process leading to the completion of a Comprehensive Wastewater Management Plan (CWMP) that shall include consideration of whether a design flow smaller than 2.5 mgd may be appropriate within the planning horizon of the plan. The resulting CWMP shall be completed no later than four (4) years from the effective date of the permit and shall be submitted with the reapplication for the next permit reissuance.

Comment A10. The draft permit contains load limits and concentration limits for nutrients (total nitrogen and total phosphorus). Why can't the permit contain just load limits? If the load is acceptable at 2.5 mgd, why is the same load not acceptable at a lower effluent flow rate?

Response to Comment A10. In general, both load limits and concentration limits serve important and complementary purposes in NPDES permits. As load limits are based on an annual average design flow and that flow may be exceeded in some seasons, load limits serve to ensure that the permit is protective under high flow conditions. In converse, the concentration limits serve to protect water quality under low flow conditions and to ensure that the treatment facility is being operated to its capabilities. In this case EPA has incorporated a load-only permit limit for total phosphorus under reduced flows up to 1.25 MGD. As discussed in Response to Comment A9, the load limit is sufficiently protective under the reduced flow.

Changes to permit: See Response to Comment A9 with respect to tiered limits.

Comment A11. With respect to the phosphorus limit, the incremental cost to remove an additional 0.8 mg/L (a decrease in the limit from 1 to 0.2 mg/L) is astounding. In fact, the facility is currently able to achieve an average effluent phosphorus level of less than 0.6 mg/L now, but will need to add a treatment process to reliably reduce phosphorus levels by 0.4 mg/L to 0.2 mg/L. For a facility of this size, the cost to remove a pound of phosphorus at such low limits is

extremely high when compared to larger facilities with much higher discharges of phosphorus. If 4.2 lb/d is an acceptable discharge at 2.5 mgd, why can the Town not be allowed to manage the cost of their upgrade by being allowed to meet a load limit – why is that same load not acceptable at any flow rate?

> **Response to Comment A11.** EPA recognizes the increased cost involved in meeting the permit limits, but cost is not a consideration in setting water quality-based effluent limits in NPDES permits. *Upper Blackstone Water Pollution Abatement District v. U.S. EPA*, __ F.3d __ (August 3, 2012); *United States Steel Corp. v. Train*, 556 F. 2d 822, 838 (7th Cir. 1977); *see also In re City of Moscow*, 10 E.A.D. 135, 168 (EAB 2001). As stated in the Response to Comment A10, both load and concentration limits serve important and complementary purposes in NPDES permits. In addition, the permit limit of 0.2 mg/l has been established as representing "highest and best practical treatment" under the MA SWQS and is defined as a concentration limit. As noted in Response to Comment A9, EPA recognizes that the facility is operating substantially below its design flow and has provided tiered limits to allow the facility time to plan for an upgrade, including consideration of appropriate design flow. Under the reduced flow a load limit of 4.2 lb/day is in effect, as requested by the permittee. The permittee should assume that any upgraded facility must be capable of achieving a 0.2 mg/l monthly average total phosphorus limit.
>
> *Changes to permit: see Response to Comment A9.*

Comment A12. The recent draft permit issued for Burrillville, RI contains no nitrogen limits and that facility is located further downstream and closer to Narragansett Bay. Uxbridge, like Burrillville, represents one of the smallest nitrogen loads from a wastewater treatment facility on the Blackstone River. Uxbridge has reduced its nitrogen levels to 11 mg/L as noted in the Fact Sheet. It should be noted that this reduction was done voluntarily. If required to further reduce nitrogen levels, small wastewater treatment facilities like Uxbridge will pay much more per pound removed than larger facilities which are able to remove nitrogen far more cost effectively. It would seem that this was recognized when the Burrillville permit was issued. But then, why would Burrillville have no limit while our facility has a limit? Since the Town has demonstrated a capability to voluntarily maximize nitrogen removal at the facility, the Town requests terminology in their permit that is similar to that which is in the Burrillville permit: "The permittee shall operate the treatment facility to reduce the discharge of Total Nitrogen to the maximum extent possible using all available treatment equipment in place at the facility."

> **Response to Comment A12.** According to RIDEM, the basis for the permit conditions on the Burrillville POTW is its lower design flow of 1.5 mgd (operating at 0.85 mgd at last reissuance). RIDEM's position is that at that small flow, a reduction in nitrogen would not be that significant in pounds per day. (*Personal communication, Joseph Haberak, RIDEM, March 4, 2013*). Based on the Burrillville DMR data this appears to be the case. Burrillville's average total nitrogen concentration in the summers of 2010 to 2012 was 9 mg/l. (The DIN concentration, which is what Uxbridge has reported, averaged 6.9 mg/l). An equivalent permit limit of 8 mg/l TN would achieve a 1 mg/l reduction, or 12.5 lb/day at Burrillville's design flow. In comparison, Uxbridge is

achieving a DIN concentration of approximately 9 mg/l (TN 11 mg/l). At design flow the load reduction from an 8 mg/l permit limit would be 62.5 lb/day. This is five times the potential reduction from the Burrillville facility.

EPA recognizes that Uxbridge has achieved substantial reductions in nitrogen discharges using its current facility and that it is operating well under design flow, and therefore has included tiered limits to allow the Town time for its planning process, including consideration of the necessary design flow. See Response to Comment A9. The permittee should, however, expect to implement an 8 mg/l TN limit in its upgraded facility for any projected design flow greater than 1.5 mgd.

Changes to permit: See Response to Comment A9.

Comment A13. The Town has very limited property for additional facilities and if required to meet these new permit conditions will need to wisely chose how best to use remaining property. And, given the limited funds available to address this permit, it is imperative that any work that is put into the existing facility would not be undone by a short-term change in the permit. What permit limits are expected to be in the next two permit cycles? Can EPA make a commitment with regard to how long these proposed limits will be in effect?

Response to Comment A13. EPA recognizes the space constraints at the facility and the objective to ensure that upgrades implemented to meet this permit are not undone by changes in future permit reissuances. While the permit limits are based on the best available current information, EPA notes that permit limits would be subject to change in connection with a duly issued and approved TMDL containing different load allocations. There is also the potential for long-term monitoring, subsequent to the implementation of facility improvements at all the facilities in the watershed, to indicate the need for additional reductions. Therefore, while EPA can commit that these limits are unlikely to become less stringent (due to anti-backsliding requirements), EPA cannot make a firm commitment that the permit limits will not become more stringent in future permit cycles, particularly if those permit cycles extend longer than five years, as was the case with this reissuance. As with all permits containing nutrient limits, particularly those where the watershed-scale and long range impacts of nutrients may create uncertainty as to the response of the system to loading reductions, EPA encourages facility designers to attempt to maximize the flexibility of their designs to allow for accommodating future process changes.

Changes to permit: None.

B. The following comments were received from the Blackstone River Coalition in a letter dated November 16, 2012:

Comment B1. The Blackstone River Coalition strongly supports the recently proposed draft permit limits for the Uxbridge Sewage Treatment Plant. The new nutrient limits will provide significant water quality improvements for the Blackstone River, its downstream impoundments and ultimately the Narragansett Bay.

Uxbridge is not alone in facing new limits for nitrogen and phosphorous. Every treatment plant along the river in both Massachusetts and Rhode Island is, or soon will be, forced to upgrade the quality of their discharges. Detailed scientific studies and years of citizen monitoring all report excessive nutrient levels that continue to plague the Blackstone. It is not EPA that tells us there are too many nutrients in the River; it is our noses. It is not arcane scientific models, but our eyes that can see excessive vegetation smothering downstream impoundments, and have witnessed fish kills in the Narragansett Bay.

Unfortunately, much like global warming, scientists can argue interminably as to what sources contribute how much, or how long it will take to achieve critical levels, or even what those levels are; but no one can disagree that there are simply way too many nutrients in the Blackstone River. Yes, regulators need to consider the effects of stormwater runoff and the existence of historic sediments; but at times of critical low flows in the summer, sewage treatment plants are the dominating factor affecting water quality.

Treatment at the end of the pipe is critical and necessary, but in all likelihood even the proposed limits will not be sufficient to achieve a "Fishable/Swimmable Blackstone". The Blackstone River Coalition is committed to work with homeowners and businesses, cities and towns, federal and state agencies to restore a river we can be proud to call our home.

> **Response to Comment B1.** EPA notes the support of the Blackstone River Coalition for the nutrient limits. EPA appreciates the commitment of the Blackstone River Coalition to work with stakeholders for the restoration of the Blackstone River. As discussed above, the tiered limits provided in the Final Permit will ensure that the facility maintains the nutrient reductions it has achieved, provides an incentive to avoid increasing flows, and allows the facility to meet water quality standards at its current flow, while the Town engages in planning for an upgrade and further treatment for such time as flows increase.
>
> *Changes to permit: See Response to Comment A9 with respect to tiered limits .*

C. The following comments were received from the RIDEM in a letter dated November 13, 2012:

Comment C1. The draft permit includes summer e-coli limits, to meet the Massachusetts water quality standards, and year round enterococci limits, to meet the Rhode Island water quality standards. The enterococci limits account for die-off when assigning permits limits that will meet the Rhode Island standards at the state line. These permit also include a condition that, after a minimum of 1 year, the permittee may request a reduction to only require enterococci monitoring in the winter if it is determined that "e.coli control is adequate to ensure control of enterococcus". Although RIDEM is willing to accept the reduction to the enterococci monitoring, this reduction should only be made if it is demonstrated that compliance with the e.coli limit will also ensure compliance with the enterococci limit. Therefore, RIDEM is requesting that the following change be made to footnote 8 of the permit:

8. *The E. coli limits are State certification requirements. The enterococci limits are a requirement of the EPA permit and are not a requirement of the Massachusetts Department of Environmental Protection (MassDEP) permit.*

   The enterococci sample shall be collected concurrently with one of the E.coli samples during the April to October period. After a minimum of one year, the permitee may request reduction of enterococci monitoring to winter only, if the monitoring data demonstrates that compliance with the E.coli limit is adequate to ensure compliance with the enterococcus limit. The request shall be made in writing to EPA and shall include all concurrent monitoring data collected by the permittee. The permittee shall continue sampling for both E.coli and enterococci between April and October until receiving written approval of its request from EPA.

Response to Comment C1. EPA agrees that the revised language is consistent with the intent of the original language in the Draft Permit and more clearly states the showing that is required for EPA approval of a reduction in monitoring. The Final Permit has been modified accordingly.

Changes to permit: Footnote 8 has been modified as set forth in the comment above.

D. The following comments were made orally at the Public Hearing on October 25, 2012:

Comment D1 from Senator Richard T. Moore: Thank you, Mr. Chairman. For the record, Richard T. Moore. I am a Senator in the General Court, and a resident of the Town of Uxbridge.

I have several comments. I will provide to the agencies more detailed written comments before the November 19th deadline.

But, the observations that I have first is that, I know this effort has been going on for some time, and particularly, the last year or so beginning in Worcester and then in the upper Blackstone and other communities.

And I'm somewhat concerned about the timing of it. And I know that might come in to -- at the end, once the permit is granted and the effort is -- with the Town is scoped out as far as the compliance requirement. But, given the state of the economy, and given the current condition of the Federal Treasury, I'm concerned that neither the Federal government nor the communities along the river have the resources necessary to do all that might be required by the permit, certainly within a short period of time.

And even though I don't know anyone who is probably opposed to clean water, or cleaner water, that the economics of it and the impact -- not just here, this is -- I know this is a national activity and a lot of places are subject to this. Some probably worse off than -- than we may be economically.

But, nevertheless, it is a -- it does constitute adding an additional significant economic burden to the users of the system, whether they be individual homeowners or commercial entities or industrial entities. And I would imagine, some of the entities that might have to do pre-treatment, potentially as well, in order to comply with the permit.

So, it is an additional burden to the -- the larger users potentially of the system.

The -- there is, I think it is important for the agencies to respond to the degree that the science on which -- on what it is based on, on what the numbers that have been selected, and even if they are numbers that have been in place for some period of time and yet, not achieved in many places, what is the science behind that, and will, whatever the permit calls for, will it actually make a difference in the body of water of both the Blackstone River and the Narragansett Bay.

And so, will we, if we spend $20,000,000 or $30,000,000 upgrading the plant, what is the assurance that it will, in fact, make a difference in the quality of the river. I'm not sure that -- at least in the discussions I've had with EPA on another issue, the storm water runoff issue in Bellingham and Norfolk and Franklin, they -- I still haven't heard a good answer for that.

And so, I would be hopeful that, in this case, where it is utilizing a treatment plant that perhaps, there is better science behind it. I would hope that there is. I don't know that that's the case but -- on which these regulations are based.

The other activity is relative to the financing and the cost of the actual compliance that we are complying with a Federal statute, a State statute, I guess, and State regulations on which they are based.

The benefit of compliance is a benefit that all citizens, residents of the United States will realize and why the users pay the sole cost of that compliance is a concern. It seems to me that the Federal Treasury, and perhaps that means borrowing more from China. But, the Federal Treasury ought to be more involved in this than it is. A low interest or even if it is a zero interest loan, but a low interest loan isn't the same as at least some more significant participation by those who will be the ultimate, both immediate and long term beneficiaries of cleaner rivers ought to share in that burden, not only the users, who I could conceive of the users, because they have the immediate benefit, potentially -- or at least, are -- might be considered to be the immediate contributors to the -- to the pollution have a heavy burden, the responsibility. But, so does the population as a whole, as represented through the government of the United States.

So, I think, how -- how quickly the permit gets developed, on what it is based is important, how it is funded and how it's -- how the funding that's used to comply with the permit, I think are all matters that need to be discussed by the agencies involved in the -- in the enforcement and certainly will be by the communities involved.

I would hope that there is some assistance from the EPA, perhaps the DEP, but certainly the EPA, with assisting the community to do some of the things that I mentioned during the informal part of the discussion and that is, are there things that the community can do, or the users of the system can do that would reduce the impact on the plant itself and the operations of the plant as far as what they put into it. And -- and so that the cost is spread out much more and perhaps is reduced at the plant level because of the -- those contributing to it have to take whatever action might be appropriate.

And so, some technical assistance to the community, I think, would be beneficial in that regard, assuming there is -- there are steps that could be taken.

So, those are my -- my initial comments to you. And I will provide more details to that in writing.

Response to Comment D1. EPA recognizes the concern about the timing of new permit limits in an economically weak time. EPA does not expect compliance immediately but expects to develop a reasonable compliance schedule based on affordability that takes

into account current economic conditions, and moreover has provided for tiered limits that allow the Town of Uxbridge additional time if its flows remain at a low level.

EPA also recognizes that where pollutant sources are dispersed and the impacts are felt downstream, such as with nitrogen impacts on Narragansett Bay, it is often impossible to quantify the incremental benefit associated with reductions from an individual source. This is not an indication that the science is inadequate but is simply inherent in the nature of a watershed-scale, dynamic system. The science is compelling that large reductions in discharges from POTWs are essential to achieving water quality goals, and that while the biggest treatment plants are most important (and have been treated as such), controls on smaller facilities are necessary as well.

The construction cost of the current Uxbridge WWTF was widely distributed, as it was funded with federal taxpayer money through the construction grants program. Federal grant funding is no longer available, but construction of upgrades is still eligible for low interest loans from the SRF program. EPA recognizes that funding mechanisms have shifted to greater user funding. This is not in EPA's control but it is not inherently inequitable. With respect to technical assistance, EPA has published technical assistance documents with respect to nutrient control technologies and both EPA and MassDEP are prepared to work with the Town of Uxbridge on its technical challenges.[3]

Changes to permit: See Response to Comment A9 with respect to tiered limits.

Comment D2 from Peter Baghdasarian: Thank you. As you can see, I'm a member of the Board of Selectmen and a member of the Board of Health.

And by virtue of being a Selectmen, Selectmen are also Water Sewer Commissioners in the Town of Uxbridge.

I heard the word feasibility used a little earlier in the -- in the commentary. There are two kinds of feasibilities. Scientific feasibility and financial feasibility.

And my concern is, when I look at regulations from the EEP -- the EPA, and the DEP, I see a diversion between substance and form. And we don't mind spending money for environmental protection, if a dollar spent produces a dollar's worth of actual protection of the environment.

But, where $10 is required to be spent to get a $1 or $2 benefit for the environment, that degrades the environment. Because, it takes -- consumes money, resources, otherwise available to put into areas that will produce a better return. Just a simple economic reality.

The term used was, you want to eliminate pollutants in the downstream. Well, of course, that's not possible. But yet, we see that word all the time. Eliminate.

So, there seems to be a greater emphasis on form over substance. And I would like to see a much greater emphasis on the substance.

To the extent that the DPW in Uxbridge is required to expend a certain amount of money, that money is not available to buy newer equipment. And newer equipment provides a better environmental benefit than the equipment we have today.

[3] EPA notes that it did not receive written comments from Senator Moore.

So, it's not a question of spending money to help the environment or not. When we spend resources, that are not completely justified by good science, it also degrades the environment.

And I think that part of it needs to be understood more. When I go on the DEP website -- I've been on the EPA website, but not as much, you see -- I find more attorneys than I find scientists. And I think, somewhere along the line, we have to shift the balance of responsibility.

In the case right here, we have two agencies basically doing the same thing which doesn't seem to be economically the best way to spend the governmental resources.

I know there is always a tendency for every agency to hone in on its own mission. And I understand that. But, there needs to be, and that has to come from the legislature, both the State and Federal, that everything should have a strong scientific basis and be economically feasible.

We have to look at the economic cost, because everything we do to generate economic funds has an environmental impact.

So, efficiency in regulation is an absolute must.

Thank you very much.

Response to Comment D2. Water quality-based limits in NPDES program are required to be sufficiently stringent to attain water quality standards. Under the applicable law and regulations there is no allowance for cost-benefit analysis in this process. See Response to Comment A11. This is not an issue of form over substance; the substance of water quality-based permit limit development is simply limited to water quality concerns, not cost. To the extent that cost can be considered, adjustments to water quality standards can be made, pursuant to 40 CFR 131.10 (g)(6) if necessary controls would result in substantial and widespread economic and social impact. Such an adjustment has not been proposed or approved for this receiving water

EPA does not concede that water quality benefits are such a small fraction of costs, although such an analysis is not a permissible basis for NPDES permit and no cost benefit analysis of the permit limit has been performed. EPA also disagrees with the suggestion that the permit limits are not supported by "good science." Further, upgrades to meet the permit limits are generally a portion of a larger project to upgrade outdated facilities: Uxbridge's existing plant is over 30 years old.

Neither EPA nor MassDEP employ more lawyers than scientists and engineers, and coordination between state and federal agencies is both necessary and more efficient than each agency writing independent permits to satisfy state and federal statutory requirements. EPA agrees that permit limits should have a sound scientific basis; water quality based permit limits are not based on cost. See Response to Comment A11.

Changes to permit: none.

Comment D3 from Mark Andrews: Hello. Thank you for coming tonight. My name is Mark Andrews.

I'm not -- I don't have town sewer. So, theoretically, I'm not affected by this. However, I do pay attention to the town finances and stuff like this. And I know that this will affect the school budgets, the municipal budgets because they all use town sewer.

So, I have a couple of questions. First of all, the jump of 5X sensitivity in the phosphorus, is it your history that you say, okay, that's a very tremendous jump.

So, you would ease it in over time? Is that what you expect to do? Is that what you have been doing with the permits to date?

It's very hard scientifically to make that huge jump without actually going through a process.

Now, we've been told that this -- potential changes could result. And the studies haven't been done to determine the plant and that type of thing. But, it could be up to a $30,000,000 charge.

And you have a specification that says this wouldn't -- this wouldn't respond back to any person or person over the -- less than 3 percent of the annual income of the average person in Uxbridge.

And I think you might have a tough time with that because only -- I think it was mentioned only 52 percent of the people are on town sewer. Okay. So, that's something that you need to take a look at. Will we able to meet that criteria over time?

The other thing is that you have to understand to us, is we always have a very tight school budget and municipal budget. They will be charged these fees.

That's why I asked the question is, do you guys have a funding source? Because, if it's a very, very important thing to do, I think, the Federal government should act in collaboration with the local Towns and help that process happen.

Because it's not only Uxbridge. It's Grafton before us. Worcester before us. Okay. We may do a great job, but if they don't do a great job, then -- then, we're sort of like losing the whole system of why we're trying to accomplish this.

So, my thought process, back to you guys is, can we think this out? I know we have to come up with a permit pretty quickly.

The other thing that concerned me was, when I asked a question about how long would the existing regulations last, and the response back was, well, for this permit, we think it will last longer but, maybe it won't.

And I think, we need to think about this more long-term. Because, if you -- if we make changes today that are useless for the next version that may come out, you've just wasted our money. And that will reflect back negatively on the entire process.

Thank you.

Response to Comment D3. The comment appears to reflect some uncertainty as to the basis for the phosphorus limits. The analysis underlying the permit is set forth in detail in the Fact Sheet. With respect to "eas[ing] it in over time," EPA expects that a compliance schedule will be developed providing time to come into compliance with the permit limits. See Response to Comment A1. In addition, based on the current flow level significantly below design flow, the Final Permit contains alternative limits reflecting the lower flow. See Response to Comment A9.

Regarding the comment on the economic impact being borne by sewered residents (versus the entire Town population), EPA's affordability guidance states that, "In order to evaluate substantial impacts . . . the analysis must establish which households will actually pay for pollution control as well as what proportion of the costs will be borne by households.. ." *Interim Economic Guidance for Water Quality Standards,* EPA-823-B-

95-002 (March 1995). EPA does not have information regarding the MHI for sewered versus non-sewered households nor do we have detailed information regarding how wastewater costs are apportioned by the Town, but EPA will consider such information in determining the projected financial impacts if it is presented by the Town.

EPA also notes that the reference to a "3 percent of the annual income of the average person" does not accurately reflect the financial capability analysis. Under EPA's current guidance, two percent of MHI (not three percent) is considered a threshold at which "the project may place an unreasonable financial burden on many of the households within the community," but the analysis is not limited to MHI. (EPA, 1995). As recently noted by EPA Headquarters as part of its ongoing dialogue with local governments on this issue:

> The MHI indicator presents only one of many considerations that should be evaluated in determining the most appropriate schedule. EPA expects that the full range of financial indicators as well as municipal-specific information will be considered when developing schedules. A common misconception is that the EPA requires communities to spend to a level of 2% of MHI to meet CWA obligations. Rather, the percent MHI calculation is guidance, and is considered along with a suite of other financial indicators to assess the overall burden on a community.

Stoner, N., *Memorandum, Assessing Financial Capability for Municipal Clean Water Act Requirements*, EPA (January 13, 2013).

EPA funding is through the SRF program and consists of low income loans. EPA recognizes concerns about long term uncertainty but is constrained by statutory requirements that permits be issued for five year terms. See Response to Comment A13.

Changes to permit: none.

Comment D4 from Joseph Curran: I'm Joseph Curran, resident of Uxbridge.

I would say that I really focus on the total cost. We are a town of about 14,000. And initially, I looked upon that as representing a cost of about $2000 for every man, woman and child.

If we're talking about 52 percent of the town on the sewerage, well, now, that changes those numbers. And we're talking probably in the vicinity of $4000 to $5000 for the people who are on the town sewerage system. And I think it's going -- that's going to be found to be very objectionable.

There is really nothing for us as a town. It would be one thing if the effluent was discharged into a recreational lake or a source of drinking water. I could see some real stringent things put in place.

Also true, we checked the effluent at the point of discharge. Maybe we should be looking at the discharge 100 feet or so, or whatever the distance might be, from its point of entry to see how it is diluted by the flow of water in a particular river, lake or what have you.

Some of these things were given in terms of milligrams per liter. I prefer to change them into parts per million.

So, the objections of the phosphorus comes down to .2 particles per million and the nitrogen 8 parts per million.

Our own drinking water consists of a nitrate concentration of 1.5 parts per million, copper .4 parts per million.

So, we start with our own drinking water which is coming from a well. Therefore, you will have naturally occurring materials in there that could possibly contribute to what is being processed through the sewerage treatment plant.

Our effluent is within range right now. And I can't -- I don't see the real benefit of changing some of this drastically, particularly so is the fact that too many communities are really a part of the final outcome of how this is going to be. And we're coming back to a price tag on this that is extremely high and the possible results from this are questionable at best.

Thank you.

Response to Comment D5. Costs will be taken into account in determining compliance schedules, see Response to Comment D3. Dilution is taken into account in the analysis of water quality-based limits. Human wastes are a clear and significant source of nutrients well above naturally occurring materials.

EPA also recognizes that where pollutant sources are dispersed and the impacts are felt downstream, such as with nitrogen impacts on Narragansett Bay, it is often impossible to quantify the incremental benefit associated with reductions from an individual source. This is not an indication that the science is inadequate but is simply inherent in the nature of a watershed-scale, dynamic system. The science is compelling that large reductions in discharges from POTWs are essential to achieving water quality goals, and that while the biggest treatment plants are most important (and have been treated as such), controls on smaller facilities are necessary as well.

Changes to permit: none.

Comment D5 from Peter Coffin: Peter Coffin with the Blackstone River Coalition. I reside in Mendon, Massachusetts. I'm on the Con Comm there.

Our board has not taken a vote on our stance on this permit. But, I feel comfortable that they will most likely take the same stance that they took on the Worcester permit, which is to support the EPA's stringent limits recognizing that there are physical impacts on the communities.

But, as a previous speaker noted, it all works together. And if we want this river to be fishable and swimable, like I'm sure we all do, and it is used for recreation a great deal, the plan is to work on all the permits and the treatment plants together.

Worcester is at .1 and they've been screaming. Grafton is at .2 and Uxbridge -- all of them consistent. If you look down stream, Woonsocket, an environmental justice community with even less financial resources, is stepping up and designing their plant to meet their new permit limits with nitrate of down to .3 I think, or 3 parts. They went even beyond, because they're developing a new system.

And each -- each plant is different and has different needs.

But, it is one river and it reacts to the phosphorus all together.

So, some would argue, why -- why do small treatments get .2, and the big ones have to do .1. Where -- where's the fairness in that?

I -- I don't understand all the complicated nature. And I understand, okay, bigger systems can achieve greater efficiencies. So, it makes sense, bang for the buck, to focus our -- the efforts there.

Just along those lines though, when the -- when the Worcester permit came out, I think, the Draft Permit was in 2008, 2009, there was public hearings. And at that time, the State of Massachusetts said, well, you know, we know the phosphorus is good. Let's do a TMDL. Let's do a scientific study and get a real justification of how much we're going to have to do. And get it done by 2013.

My board -- and we felt back in 2009, no, 2013 was too far away, that we had to start working on now on nutrients. So, maybe I regret that position because, 2013 is looking pretty close. And if we had a TMDL in place, we'd be in a lot better position in getting these permits out.

And that brings up the larger issue that yes, these permits are tough. And they're going to get us a lot closer to where we want to go.

But, it's not going to get us where we need to go, because we all have to work on other sources of phosphorus, non-point source. And we have to work together. And there are many ways that Towns can work together on new development and retrofitting old development and homeowners, what they can do.

And thanks to the legislature getting the phosphorus out of the fertilizer. There was a lot of education. And we all need to do a better job on that.

So, I look forward to working with the Town and all the Towns. The Blackstone River Coalition is committed to helping out the Towns do the education and the outreach to the general populace and the people understanding that there is too many nutrients and we all have to work together on it.

So, we will follow up with formal comments later. But, thank you.

Response to Comment D5. EPA acknowledges the support for the nutrient limits in the permit. EPA notes that the different wastewater treatment plants mentioned in the comment receive different permit limits and conditions based on both their size and the location of their discharge (which effects both the dilution and the potential attenuation of the discharge). The Worcester facility referred to (the Upper Blackstone Water Pollution Abatement District) is both the largest facility in the watershed (56 mgd) and receives the least dilution, as it is located in the upper portion of the watershed where very little dilution is available. It has therefore received the most stringent limit (0.1 mg/l) for phosphorus, which has direct water quality impacts at the point of the discharge, and relatively stringent (5 mg/l) total nitrogen limits to prevent downstream impacts in the Providence/Seekonk Rivers. Woonsocket has the second largest facility (16 mgd) and discharges just upstream of the nitrogen-impaired area, and therefore has received the most stringent limit for both phosphorus (0.1 mg/l) and nitrogen (3 mg/l). Uxbridge, as well as Grafton and Northbridge, receive some dilution from baseflow in the Blackstone River and therefore receive somewhat higher phosphorus limits (0.2 mg/l at design flow), as well as somewhat higher nitrogen limits reflecting the size of the facility (8 mg/l at

design flow), with Uxbridge receiving an additional tier of limits at its reduced flow. This approach is consistent with EPA guidance on load allocation approaches in TMDLs and other contexts.

With respect to the 2013 schedule for TMDLs, unfortunately there is no realistic prospect of a TMDL for the Blackstone River being completed in 2013. Despite the projected date stated in the 2012 303(d) list, MassDEP has informed EPA that the TMDL will not be completed in 2013. Nor has MassDEP provided a projected timeframe for completion, stating that the TMDL is not actively being worked on. However where a TMDL has not been completed for an impaired water and a permit to the affected receiving water has expired, EPA must proceed with permit issuance nonetheless. EPA's regulations are quite clear: where a discharge plant "will cause, have reasonable potential to cause, or contribute to' a water quality violation, EPA must include effluent limits designed to ensure that the discharge does not cause or contribute to water quality violations. When developing and issuing an NPDES permit, EPA cannot postpone reasonable potential determination and limit setting for a pollutant on the basis that there may be a TMDL for that pollutant sometime in the future.

Changes to permit: none.

Comment D6 from Donna Williams: Thank you for the opportunity to comment.

I'm Donna Williams. I'm a Grafton resident up river. We're going through the same thing. We have a permit with the same -- a Draft Permit with the same limits as Uxbridge.

Our plant is just about the same size as Uxbridge's and the same age. I believe, they were both built around 1979.

They are old plants. They are really aging. I know they have been maintained. But, they -- they do need upgrades.

I would like to speak on behalf of the Blackstone River Valley National Heritage Corridor Incorporated. This is the new management entity, the new nonprofit that is taking the place of the Federal commission for the Blackstone Heritage Corridor. Senator Moore is a fellow director with me on -- on this board.

And this board, this Blackstone River Heritage Corridor Incorporated strongly supports EPA's limits on nutrients.

The Blackstone River is a river of national significance. And that is proven by the fact that we have the Blackstone River Valley National Heritage Corridor. 24 communities have been named part of a National Heritage Corridor.

And the river is the lifeblood that runs through this entire corridor and obviously through our watershed. It is the basis of our watershed.

And perhaps you know that there is a proposal for a new national historical park within the Blackstone Heritage Corridor. So, we have the opportunity to help make this river -- to help restore it and make it much more appropriate for that kind of national status.

We know it is an old industrial river. And we all live in towns that have been industrial towns and villages and have contributed to the degradation of the river over time.

The river is much better than it has been for decades, for centuries. But, it's not anywhere near where it needs to be in order to meet class B standards of fishable, swimable.

So, by reducing these nutrients, then, we will help get to that goal.

The Blackstone River Coalition has a very admirable volunteer water quality monitoring program. Tammy Gilpatrick is here. She is the coordinator of the program and an Uxbridge resident.

So, we have 80 monitors monitoring it at 79 sites. I always get those confused -- 79 sites throughout the watershed from Worcester to Pawtucket. And they monitor on the second Saturday of every month from April through November.

That's a lot of data. It's much more data than the sparse resources of the State can use to provide that kind of data. This data is reliable. It has a quality assurance project plan that has been approved by EPA, MassDEP and Rhode Island DEM. The data is reliable.

What the data shows is that the main stem of the river is overwhelmed with nutrients, with phosphorus and nitrogen. And most of that -- much of that is coming from the wastewater treatment plants. Principally Worcester.

It's a huge plant at the head of a river that is small at the beginning of the river. It's much smaller up there certainly than it is down here or in Pawtucket.

So, Worcester is going appeal, after appeal, after appeal, after appeal, to no avail. So far, they have spent hundreds of thousands of dollars on lawyers and consultants. I would hate to see Uxbridge get into that cycle and spend very scarce dollars on an appeal to only enrich the lawyers and the consultants, because eventually, all of these Towns are going to have to meet these standards.

So, why waste that money on an appeal.

I know that under the Clean Water Act, cost cannot be a consideration for setting the limits -- for setting the limits, the standards. However, cost is -- can be and is a consideration in the implementation and the schedule for achieving those limits.

So, EPA does take affordability into account.

So, I know it sounds daunting. We don't know for sure if these estimates are accurate. Often they're way overblown. There are new technologies that can be used for these aging plants.

So, I would -- I would hesitate to say absolutely that this is going to cost $30,000,000. It might not.

So, I would just urge you to keep an open mind and really think about the river as a resource that is so important to all of us. It might not be a drinking water. It might not be our swimming hole.

But, it certainly is a major -- as I say, it's a river of national significance and it really deserves to be as clean as we can possibly make it. Thank you.

Response to Comment D6. EPA acknowledges the support for the nutrient limits in the permit. With respect to affordability see Response to Comment D3.

Comment D7 from Michael Potaski: Thank you. Michael Potaski of Uxbridge, a member of the Conservation Commission here in town.

I wasn't going to speak tonight, but, I sort of object to the idea of a previous speaker telling us we should just suck it up and not appeal or try to find some common sense in this process.

There are problems in what you've presented to us. They were brought forward by a previous speaker. I think they need to be emphasized in terms of the cost of this.

2 percent of median household income, 2 percent of the median household income of the community at large or of the 52 percent that are using the sewer facility.

I think you will find, if you examine the town, the majority of the sewer service is in the old part of town where the median income is much lower than that of the town at large.

So, to say the town at large has a median income, which should be the basis of your calculation, is a flawed approach to it. Be reasonable. Take the median income of those people who are on the sewer system and who will pay for these upgrades.

I'm also concerned about the reasonable schedule for implementation. Who defines what is reasonable? Is it a collaborative effort on the part of DEP and EPA working with the Town authorities to determine what is reasonable?

Or does the DEP and EPA say, this is what we consider reasonable, you will comply? What's it going to be?

That's not here in your presentation. Define reasonable for us, and we might be a little bit more comfortable with what's going on here.

Yes. I see the problem in Worcester. Worcester tried to be reasonable, thinking that EPA and DEP was staffed with reasonable people. And because they missed some arbitrary deadline to respond, the Courts are now telling them, well, too bad, suck it up, pay it.

I don't think that's being reasonable on the part of EPA and DEP. If a community misses a deadline, work with the community, don't shove it down people's throats.

Thank you.

Response to Comment D7. Median household income is appropriately based on the households that will bear the cost of upgrades. See Response to Comment D3. EPA expects a reasonable schedule to be developed, and that it will be consistent with national guidance regarding affordability. See Response to Comment A1. EPA disagrees with the characterization of the proceedings in Worcester.

Changes to permit: none.

APPEALING NPDES PERMITS

If you wish to contest any of the provisions of this permit, you must petition the Environmental Appeals Board (EAB), within thirty (30) days. The EAB of the U.S. Environmental Protection Agency is the final Agency decisionmaker on administrative appeals of NPDES permits. If you received notice of this permit via certified mail, the 30-day period begins on the day after the date of receipt. If you were served by regular mail, the 30-day period begins on the day after the date of receipt, and an additional three days are added to the period within which to appeal in order to compensate for mail delay.

In order to be eligible to file a petition for review, you must have filed comments on the draft permit or participated in any public hearing that may have been held pertaining to this permit. In addition, the issues raised in the appeal must have been raised during the public comment period so long as they were reasonably ascertainable. Any person who failed to file comments or failed to participate in any public hearing on the draft permit may file a petition for review of permit conditions, but only to the extent that such permit conditions reflect changes from the draft permit.

Procedures for appealing permits can be found at 40 C.F.R. § 124.19. Related provisions can be found at 40 C.F.R. § 124.16 (stays of permit conditions), 40 C.F.R. § 124.20 (computation of time), and 40 C.F.R. § 124.60 (issuance and effective date and stays of NPDES permits).

Please note: Section 124.19 has been revised, and the changes take effect on March 26, 2013. (See 17 Fed. Reg. 5281, 5285-5288 (Jan. 25, 2013)). All permit appeals filed on or after that date must conform to the revised regulation. Set forth on the following pages is the revised version of § 124.19. More information on the appeals process and the EAB can be found on the Internet at http://www.epa.gov/eab.

ENVIRONMENTAL APPEALS BOARD (EAB) CONTACT INFORMATION

The EAB's telephone number is (202) 233-0122. The EAB's fax number is (202) 233-0121. The EAB's website is at http://www.epa.gov/eab

The EAB's mailing address is:

Clerk of the Board
U.S. Environmental Protection Agency
Environmental Appeals Board
1200 Pennsylvania Avenue, N.W.
(Mail Code 1103M)
Washington, D.C. 20460-0001

40 CFR Part 124, Section 124.19(a) - (p) is revised, effective March 26, 2013, as set forth on the following pages:

issues a subsequent "final permit decision" under section 124.19 *after* administrative review proceedings are exhausted. This revised text now appears in section 124.19(l)(2).

B. What is the Agency's authority for taking this action?

EPA is issuing this document under its general rulemaking authority, Reorganization Plan No. 3 of 1970 (5 U.S.C. app.).

Section 553 of the Administrative Procedure Act (APA), 5 U.S.C. § 553(b)(3)(A), provides that "rules of agency organization, procedure, or practice" are exempt from notice and comment requirements. The action the Agency is taking today involves revisions to the Environmental Appeals Board's procedural rules to clarify existing practices and procedures that are applicable in permit appeals filed with the Environmental Appeals Board. These revisions fall under the exemption provided in APA § 553(b)(3)(A). Accordingly, EPA is not taking comment on this action.

III. Statutory and Executive Order Reviews

This action involves revisions to the Environmental Appeals Board's procedural rules to clarify existing practices and procedures that are applicable in permit appeals filed with the Environmental Appeals Board. This type of action is exempt from review under Executive Orders 12866 (58 FR 51735, October 4, 1993) and 13563 (76 FR 3821, January 21, 2011). Because this action is not subject to notice and comment requirements under the Administrative Procedures Act or any other statute, it is not subject to the Regulatory Flexibility Act (5 U.S.C. 601 *et. seq.*) or sections 202 and 205 of the Unfunded Mandates Reform Act of 1999 (UMRA) (Pub. L. 104–4). In addition, this action does not significantly or uniquely affect small governments. This action does not create new binding legal requirements that substantially and directly affect Tribes under Executive Order 13175 (63 FR 67249, November 9, 2000). This action does not have significant Federalism implications under Executive Order 13132 (64 FR 43255, August 10, 1999). This rule also is not subject to Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," (62 FR 19885, April 23, 1997), because it is not economically significant. This action is not subject to Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355, May 22, 2001), because it is not a significant regulatory action under Executive Order 12866. This action does not involve technical standards; thus the requirements of § 12(d) of the National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) do not apply. This action does not impose an information collection burden under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). The Congressional Review Act, 5 U.S.C 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. Section 804 exempts from section 801 the following types of rules (1) rules of particular applicability; (2) rules relating to agency management or personnel; and (3) rules of agency organization, procedure, or practice that do not substantially affect the rights or obligations of non-agency parties. 5 U.S.C. 804(3). EPA is not required to submit a rule report regarding today's action under section 801 because this is a rule of agency organization, procedure, or practice that does not substantially affect the rights or obligations of non-agency parties.

List of Subjects

40 CFR Part 124

Administrative Practice and Procedures.

40 CFR Part 270

Environmental Protection, Hazardous Waste.

Dated: January 14, 2013.

Lisa P. Jackson,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency amends title 40 parts 124 and 270 of the Code of Federal Regulations as follows:

PART 124—PROCEDURES FOR DECISIONMAKING

■ 1. The authority citation for part 124 continues to read as follows:

Authority: Resource Conservation and Recovery Act, 42 U.S.C. 6901 *et seq.;* Safe Drinking Water Act, 42 U.S.C. 300f *et seq.;* Clean Water Act, 33 U.S.C. 1251 *et seq.;* Clean Air Act, 42 U.S.C. 7401 *et seq.*

■ 2. Section 124.10 is amended by removing paragraph (a)(1)(iv) and redesignating paragraphs (a)(1)(v) through (a)(1)(vi) as paragraphs (a)(1)(iv) through paragraphs (a)(1)(v), respectively.

■ 3. Paragraph (b)(1) of § 124.16 is revised to read as follows:

§ 124.16 Stays of contested permit conditions.

* * * * *

(b) *Stays based on cross effects.* (1) A stay may be granted based on the grounds that an appeal to the Administrator under § 124.19 of one permit may result in changes to another EPA-issued permit only when each of the permits involved has been appealed to the Administrator.

* * * * *

■ 4. Section 124.19 is revised to read as follows:

§ 124.19 Appeal of RCRA, UIC, NPDES and PSD Permits.

(a) *Petitioning for review of a permit decision.* (1) *Initiating an appeal.* Appeal from a RCRA, UIC, NPDES, or PSD final permit decision issued under § 124.15 of this part, or a decision to deny a permit for the active life of a RCRA hazardous waste management facility or unit under § 270.29 of this chapter, is commenced by filing a petition for review with the Clerk of the Environmental Appeals Board within the time prescribed in paragraph (a)(3) of this section.

(2) *Who may file?* Any person who filed comments on the draft permit or participated in a public hearing on the draft permit may file a petition for review as provided in this section. Additionally, any person who failed to file comments or failed to participate in the public hearing on the draft permit may petition for administrative review of any permit conditions set forth in the final permit decision, but only to the extent that those final permit conditions reflect changes from the proposed draft permit.

(3) *Filing deadline.* A petition for review must be filed with the Clerk of the Environmental Appeals Board within 30 days after the Regional Administrator serves notice of the issuance of a RCRA, UIC, NPDES, or PSD final permit decision under § 124.15 or a decision to deny a permit for the active life of a RCRA hazardous waste management facility or unit under § 270.29 of this chapter. A petition is filed when it is received by the Clerk of the Environmental Appeals Board at the address specified for the appropriate method of delivery as provided in paragraph (i)(2) of this section.

(4) *Petition contents.* (i) In addition to meeting the requirements in paragraph (d), a petition for review must identify the contested permit condition or other

specific challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions for why the permit decision should be reviewed. The petition must demonstrate that each challenge to the permit decision is based on:

(A) A finding of fact or conclusion of law that is clearly erroneous, or

(B) An exercise of discretion or an important policy consideration that the Environmental Appeals Board should, in its discretion, review.

(ii) Petitioners must demonstrate, by providing specific citation to the administrative record, including the document name and page number, that each issue being raised in the petition was raised during the public comment period (including any public hearing) to the extent required by § 124.13. For each issue raised that was not raised previously, the petition must explain why such issues were not required to be raised during the public comment period as provided in § 124.13. Additionally, if the petition raises an issue that the Regional Administrator addressed in the response to comments document issued pursuant to § 124.17, then petitioner must provide a citation to the relevant comment and response and explain why the Regional Administrator's response to the comment was clearly erroneous or otherwise warrants review.

(b) *Response(s) to a petition for review.* (1) In a PSD or other new source permit appeal, the Regional Administrator must file a response to the petition for review, a certified index of the administrative record, and the relevant portions of the administrative record within 21 days after the filing of the petition.

(2) In all other permit appeals under this section, the Regional Administrator must file a response to the petition, a certified index of the administrative record, and the relevant portions of the administrative record within 30 days after the filing of a petition.

(3) A permit applicant who did not file a petition but who wishes to participate in the appeal process must file a notice of appearance and a response to the petition. Such documents must be filed by the deadlines provided in paragraph (b)(1) or (2) of this section, as appropriate.

(4) The State or Tribal authority where the permitted facility or site is or is proposed to be located (if that authority is not the permit issuer) must also file a notice of appearance and a response if it wishes to participate in the appeal. Such response must be filed by the deadlines provided in paragraph (b)(1) or (2) of this section, as appropriate.

(c) *Replies.* (1) In PSD and other new source permit appeals, the Environmental Appeals Board will apply a presumption against the filing of a reply brief. By motion, petitioner may seek leave of the Environmental Appeals Board to file a reply to the response, which the Environmental Appeals Board, in its discretion, may grant. The motion must be filed simultaneously with the proposed reply within 10 days after service of the response. In its motion, petitioner must specify those arguments in the response to which petitioner seeks to reply and the reasons petitioner believes it is necessary to file a reply to those arguments. Petitioner may not raise new issues or arguments in the motion or in the reply.

(2) In all other permit appeals under this section, petitioner may file a reply within 15 days after service of the response. Petitioner may not raise new issues or arguments in the reply.

(d) *Content and form of briefs.* (1) *Content requirements.* All briefs filed under this section must contain, under appropriate headings:

(i) A table of contents, with page references;

(ii) A table of authorities with references to the pages of the brief where they are cited;

(iii) A table of attachments, if required under paragraph (d)(2) of this section; and

(iv) A statement of compliance with the word limitation.

(2) *Attachments.* Parts of the record to which the parties wish to direct the Environmental Appeals Board's attention may be appended to the brief submitted. If the brief includes attachments, a table must be included that provides the title of each appended document and assigns a label identifying where it may be found (e.g., Excerpts from the Response to Comments Document * * * Attachment 1).

(3) *Length.* Unless otherwise ordered by the Environmental Appeals Board, petitions and response briefs may not exceed 14,000 words, and all other briefs may not exceed 7,000 words. Filers may rely on the word-processing system used to determine the word count. In lieu of a word limitation, filers may comply with a 30-page limit for petitions and response briefs, or a 15-page limit for replies. Headings, footnotes, and quotations count toward the word limitation. The table of contents, table of authorities, table of attachments (if any), statement requesting oral argument (if any), statement of compliance with the word limitation, and any attachments do not count toward the word limitation. The Environmental Appeals Board may exclude any petition, response, or other brief that does not meet word limitations. Where a party can demonstrate a compelling and documented need to exceed such limitations, such party must seek advance leave of the Environmental Appeals Board to file a longer brief. Such requests are discouraged and will be granted only in unusual circumstances.

(e) *Participation by amicus curiae.* Any interested person may file an amicus brief in any appeal pending before the Environmental Appeals Board under this section. The deadline for filing such brief is 15 days after the filing of the response brief, except that amicus briefs in PSD or other new source permit appeals must be filed within 21 days after the filing of the petition. Amicus briefs must comply with all procedural requirements of this section.

(f) *Motions.* (1) *In general.* A request for an order or other relief must be made by written motion unless these rules prescribe another form.

(2) *Contents of a motion.* A motion must state with particularity the grounds for the motion, the relief sought, and the legal argument necessary to support the motion. In advance of filing a motion, parties must attempt to ascertain whether the other party(ies) concur(s) or object(s) to the motion and must indicate in the motion the attempt made and the response obtained.

(3) *Response to motion.* Any party may file a response to a motion. Responses must state with particularity the grounds for opposition and the legal argument necessary to support the motion. The response must be filed within 15 days after service of the motion unless the Environmental Appeals Board shortens or extends the time for response.

(4) *Reply.* Any reply to a response filed under paragraph (f)(3) of this section must be filed within 10 days after service of the response. A reply must not introduce any new issues or arguments and may respond only to matters presented in the response.

(5) *Disposition of a motion for a procedural order.* The Environmental Appeals Board may act on a motion for a procedural order at any time without awaiting a response.

(g) Timing of motions for extension of time. Parties must file motions for extensions of time sufficiently in advance of the due date to allow other

parties to have a reasonable opportunity to respond to the request for more time and to provide the Environmental Appeals Board with a reasonable opportunity to issue an order.

(h) *Oral argument.* The Environmental Appeals Board may hold oral argument on its own initiative or at its discretion in response to a request by one or more of the parties. To request oral argument, a party must include in its substantive brief a statement explaining why oral argument should be permitted. The Environmental Appeals Board will apply a presumption against oral argument in PSD or other new source permit appeals. The Environmental Appeals Board may, by order, establish additional procedures governing any oral argument before the Environmental Appeals Board.

(i) *Filing and service requirements.* Documents filed under this section, including the petition for review, must be filed with the Clerk of the Environmental Appeals Board. A document is filed when it is received by the Clerk of the Environmental Appeals Board at the address specified for the appropriate method of delivery as provided in paragraph (i)(2) of this section.

(1) *Caption and other filing requirements.* Every document filed with the Environmental Appeals Board must specifically identify in the caption the permit applicant, the permitted facility, and the permit number. All documents that are filed must be signed by the person filing the documents or the representative of the person filing the documents. Each filing must also indicate the signer's name, address, and telephone number, as well as an email address, and facsimile number, if any.

(2) *Method of filing.* Unless otherwise permitted under these rules, documents must be filed either electronically, by mail, or by hand delivery. In addition, a motion or a response to a motion may be submitted by facsimile if the submission contains no attachments. Upon filing a motion or response to a motion by facsimile, the sender must, within one business day, submit the original copy to the Clerk of the Environmental Appeals Board either electronically, by mail, or by hand-delivery.

(i) *Electronic filing.* Documents that are filed electronically must be submitted using the Environmental Appeals Board's electronic filing system, subject to any appropriate conditions and limitations imposed by order of the Environmental Appeals Board. All documents filed electronically must include the full name of the person filing below the signature line. Compliance with Environmental Appeals Board electronic filing requirements constitutes compliance with applicable signature requirements.

(ii) *Filing by U.S. Mail.* Documents that are sent by U.S. Postal Service (except by U.S. Express Mail) must be sent to the official mailing address of the Clerk of the Environmental Appeals Board at: U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue NW., Mail Code 1103M, Washington, DC 20460–0001. The original and two copies of each document must be filed. The person filing the documents must include a cover letter to the Clerk of the Environmental Appeals Board clearly identifying the documents that are being submitted, the name of the party on whose behalf the documents are being submitted, as well as the name of the person filing the documents, his or her address, telephone number and, if available, fax number and email address.

(iii) *Filing by hand delivery.* Documents delivered by hand or courier (including deliveries by U.S. Express Mail) must be delivered to the Clerk of the Environmental Appeals Board at: U.S. Environmental Protection Agency, Environmental Appeals Board, EPA East Building, 1201 Constitution Avenue NW., Room 3334, Washington, DC 20004. The original and two copies of each document must be filed. The person filing the documents must include a cover letter to the Clerk of the Environmental Appeals Board clearly identifying the documents being submitted, the name of the party on whose behalf the documents are being submitted, as well as the name of the person filing the documents, his or her address, telephone number and, if available, fax number and email address.

(3) *Service requirements.* Petitioner must serve the petition for review on the Regional Administrator and the permit applicant (if the applicant is not the petitioner). Once an appeal is docketed, every document filed with the Environmental Appeals Board must be served on all other parties. Service must be by first class mail, or by any reliable commercial delivery service. Upon agreement by the parties, service may be made by facsimile or electronic means.

(4) *Proof of service.* A certificate of service must be appended to each document filed stating the names of persons served, the date and manner of service, as well as the electronic, mailing, or hand delivery address, or facsimile number, as appropriate.

(j) *Withdrawal of permit or portions of permit by Regional Administrator.* The Regional Administrator, at any time prior to 30 days after the Regional Administrator files its response to the petition for review under paragraph (b) of this section, may, upon notification to the Environmental Appeals Board and any interested parties, withdraw the permit and prepare a new draft permit under § 124.6 addressing the portions so withdrawn. The new draft permit must proceed through the same process of public comment and opportunity for a public hearing as would apply to any other draft permit subject to this part. Any portions of the permit that are not withdrawn and that are not stayed under § 124.16(a) continue to apply. If the Environmental Appeals Board has held oral argument, the Regional Administrator may not unilaterally withdraw the permit, but instead must request that the Environmental Appeals Board grant a voluntary remand of the permit or any portion thereof.

(k) *Petitioner request for dismissal of petition.* Petitioner, by motion, may request to have the Environmental Appeals Board dismiss its appeal. The motion must briefly state the reason for its request.

(l) *Final disposition and judicial review.* (1) A petition to the Environmental Appeals Board under paragraph (a) of this section is, under 5 U.S.C. 704, a prerequisite to seeking judicial review of the final agency action.

(2) For purposes of judicial review under the appropriate Act, final agency action on a RCRA, UIC, NPDES, or PSD permit occurs when agency review procedures under this section are exhausted and the Regional Administrator subsequently issues a final permit decision under this paragraph. A final permit decision must be issued by the Regional Administrator:

(i) When the Environmental Appeals Board issues notice to the parties that the petition for review has been denied;

(ii) When the Environmental Appeals Board issues a decision on the merits of the appeal and the decision does not include a remand of the proceedings; or

(iii) Upon the completion of remand proceedings if the proceedings are remanded, unless the Environmental Appeals Board's remand order specifically provides that appeal of the remand decision will be required to exhaust administrative remedies.

(3) The Regional Administrator must promptly publish notice of any final agency action regarding a PSD permit in the **Federal Register**.

(m) *Motions for reconsideration or clarification.* Motions to reconsider or clarify any final disposition of the Environmental Appeals Board must be filed within 10 days after service of that order. Motions for reconsideration must set forth the matters claimed to have been erroneously decided and the nature of the alleged errors. Motions for clarification must set forth with specificity the portion of the decision for which clarification is being sought and the reason clarification is necessary. Motions for reconsideration or clarification under this provision must be directed to, and decided by, the Environmental Appeals Board. Motions for reconsideration or clarification directed to the Administrator, rather than the Environmental Appeals Board, will not be considered, unless such motion relates to a matter that the Environmental Appeals Board has referred to the Administrator pursuant to § 124.2 and for which the Administrator has issued the final order. A motion for reconsideration or clarification does not stay the effective date of the final order unless the Environmental Appeals Board specifically so orders.

(n) *Board authority.* In exercising its duties and responsibilities under this part, the Environmental Appeals Board may do all acts and take all measures necessary for the efficient, fair, and impartial adjudication of issues arising in an appeal under this part including, but not limited to, imposing procedural sanctions against a party who, without adequate justification, fails or refuses to comply with this part or an order of the Environmental Appeals Board. Such sanctions may include drawing adverse inferences against a party, striking a party's pleadings or other submissions from the record, and denying any or all relief sought by the party in the proceeding. Additionally, for good cause, the Board may relax or suspend the filing requirements prescribed by these rules or Board order.

(o) *General NPDES permits.* (1) Persons affected by an NPDES general permit may not file a petition under this section or otherwise challenge the conditions of a general permit in further Agency proceedings. Instead, they may do either of the following:

(i) Challenge the general permit by filing an action in court; or

(ii) Apply for an individual NPDES permit under § 122.21 as authorized in § 122.28 of this chapter and may then petition the Environmental Appeals Board to review the individual permit as provided by this section.

(2) As provided in § 122.28(b)(3) of this chapter, any interested person may also petition the Director to require an individual NPDES permit for any discharger eligible for authorization to discharge under an NPDES general permit.

(p) The Environmental Appeals Board also may decide on its own initiative to review any condition of any RCRA, UIC, NPDES, or PSD permit decision issued under this part for which review is available under paragraph (a) of this section. The Environmental Appeals Board must act under this paragraph within 30 days of the service date of notice of the Regional Administrator's action.

■ 5. Paragraph (b)(1) of § 124.60 is amended by removing the reference to "§ 124.19(f)" in the first sentence and adding in its place "§ 124.19(k)(2)".

PART 270—EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

■ 6. The authority citation for part 270 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912, 6924, 6925, 6927, 6939, and 6974.

■ 7. Paragraph (f)(3) of § 270.42 is revised to read as follows:

§ 270.42 Permit modification at the request of permittee.

* * * * *

(f) * * *

(3) An automatic authorization that goes into effect under paragraph (b)(6)(iii) or (v) of this section may be appealed under the permit appeal procedures of 40 CFR 124.19; however, the permittee may continue to conduct the activities pursuant to the automatic authorization unless and until a final determination is made by the Environmental Appeals Board to grant review and remand the permit decision.

* * * * *

■ 8. Paragraph (a) of 270.155 is revised to read as follows:

§ 270.155 May the decision to approve or deny my RAP application be administratively appealed?

(a) Any commenter on the draft RAP or notice of intent to deny, or any participant in any public hearing(s) on the draft RAP, may appeal the Director's decision to approve or deny your RAP application to EPA's Environmental Appeals Board under § 124.19 of this chapter. Any person who did not file comments, or did not participate in any public hearing(s) on the draft RAP, may petition for administrative review only to the extent of the changes from the draft to the final RAP decision. Appeals of RAPs may be made to the same extent as for final permit decisions under § 124.15 of this chapter (or a decision under § 270.29 to deny a permit for the active life of a RCRA hazardous waste management facility or unit).

* * * * *

[FR Doc. 2013–01318 Filed 1–24–13; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 239 and 258

[EPA–R01–RCRA–2012–0944; FRL–9771–7]

Adequacy of Massachusetts Municipal Solid Waste Landfill Permit Program

AGENCY: Environmental Protection Agency (EPA).

ACTION: Direct final rule.

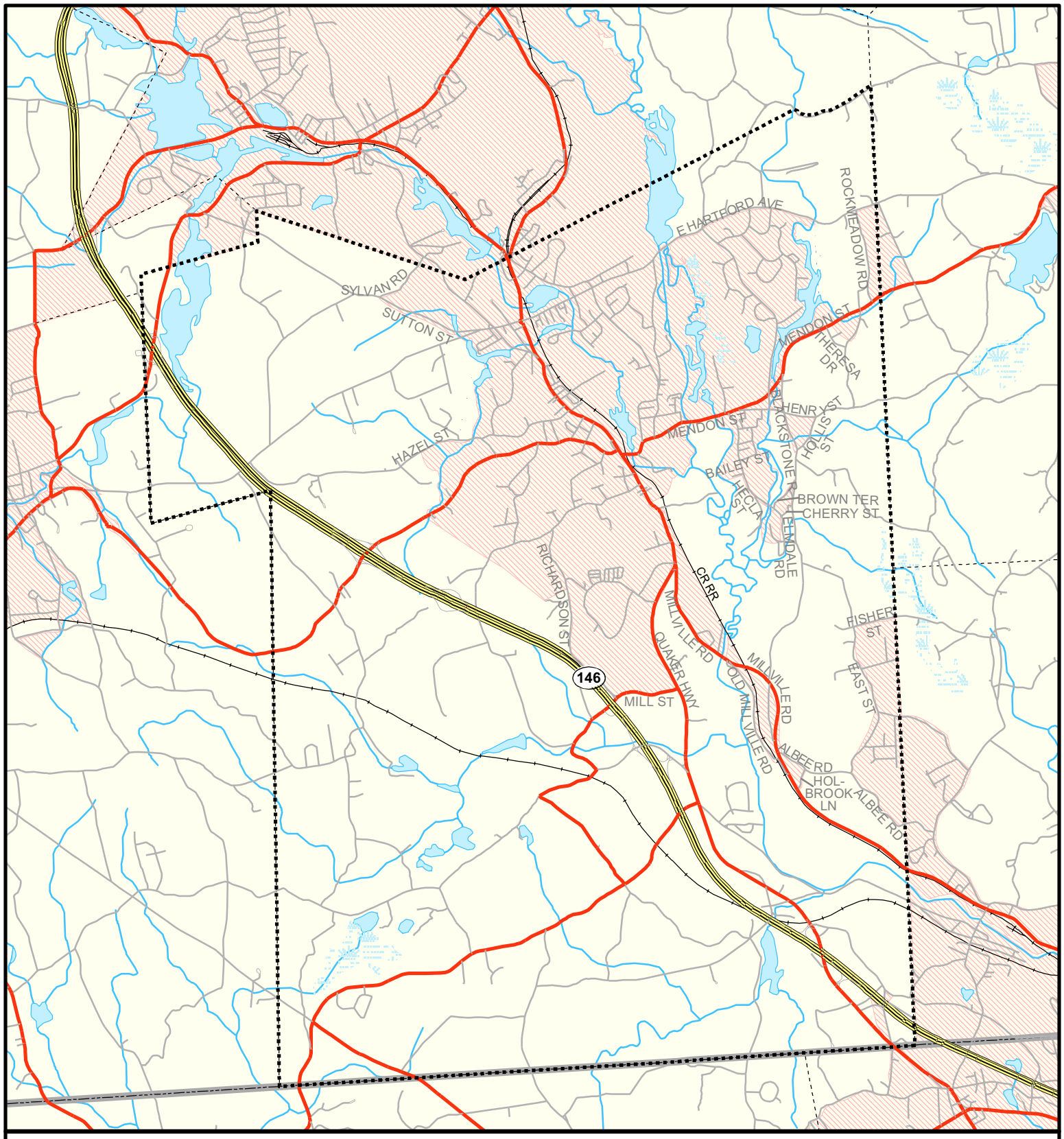
SUMMARY: This action approves a modification to Massachusetts's approved municipal solid waste landfill (MSWLF) program. The approved modification allows the State to issue Research, Development, and Demonstration (RD&D) Permits to owners and operators of MSWLF in accordance with its State law. On March 22, 2004, EPA issued final regulations allowing research, development, and demonstration (RD&D) permits to be issued to certain municipal solid waste landfills by approved states. On December 7, 2012 Massachusetts submitted an application to EPA Region 1 seeking Federal approval of its RD&D requirements. After thorough review EPA Region 1 is determining that Massachusetts's RD&D permit requirements are adequate through this direct final action.

DATES: This determination of RD&D program adequacy for Massachusetts will become effective April 25, 2013 without further notice unless EPA receives adverse comments on or before March 26, 2013. If adverse comments are received, EPA will review the comments and publish another **Federal Register** document responding to the comments and either affirming or revising the initial decision.

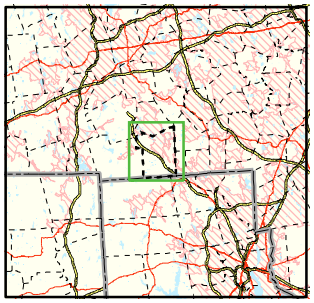
ADDRESSES: Submit your comments, identified by Docket ID No. EPA–R01–RCRA–2012–0944, by one of the following methods:

- *www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *Email: hsieh.juiyu@epa.gov.*
- *Fax:* (617) 918–0646, to the attention of Juiyu Hsieh.
- *Mail:* Juiyu Hsieh, RCRA Waste Management and UST Section, Office of

Appendix B - NPDES Phase II Stormwater Program Automatically Designated MS4 Areas



Area of Focus:



NPDES Phase II Stormwater Program Automatically Designated MS4 Areas

Uxbridge, Massachusetts

Uxbridge Town Boundary

Regulated Area (2000 Urbanized Area)

Town Population: 11,156
Regulated Population: 7,546

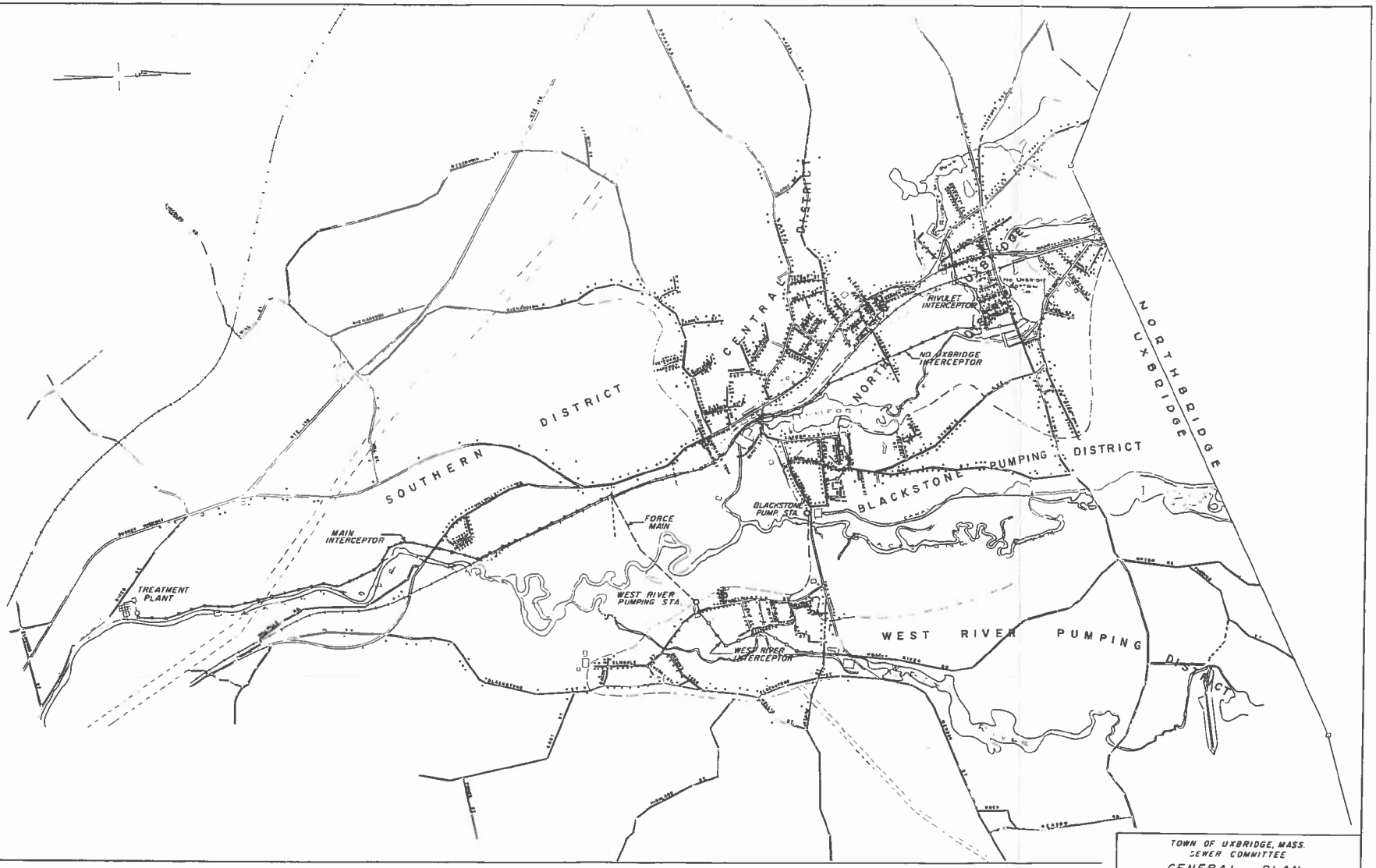
N W E S

EPA New England

0 0.5 1 1.5 Miles

Data Sources: Urbanized Areas from US Census Bureau (2000). Political boundaries from MassGIS. Hydrography from NHD. Transportation data from GDT at 1:24,000.
Map Created: 11/25/02; US EPA- New England GIS Center
L:/projects/stormwater/phase2/matowns/new/

Appendix C - General Plan Showing Sewage Drainage Areas, Main Interceptors, and Pumping Stations



0 1000 2000 3000 4000 5000 6000 FEET
Scale

TOWN OF UXBRIDGE, MASS.
SEWER COMMITTEE

GENERAL PLAN
SHOWING
SEWAGE DRAINAGE AREAS, MAIN INTERCEPTORS AND PUMPING STATIONS

HALEY AND WARD, INC.
ENGINEERS
WALTHAM, MASS.

Feb 1969

318 - S68 - 2

GHD Inc

1545 Iyannough Road

Hyannis, MA 02601

T: 774-470-1630 F: 774-470-1631 E: hyamail@ghd.com

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www.ghd.com

Town of Uxbridge

Draft – Alternatives Screening Analysis Report

Comprehensive Wastewater Management Planning (CWMP) Project

December 2014

Executive Summary

ES.1 Project Background

The purpose of the Comprehensive Wastewater Management Planning (CWMP) Project is to provide an environmentally and economically sound plan for wastewater treatment and nutrient management in the Town of Uxbridge (Town) for the planning period 2015-2035, with a vision for the Town's build-out projections. The CWMP Project will assess the wastewater and nutrient-related needs in the Town; evaluate appropriate mitigation measures for those needs and develop a recommended plan for improved management systems.

This Alternatives Screening Analysis Report documents the second of three major phases of the CWMP. The first phase was the needs assessment, which was documented in the October 2014 Needs Assessment Report, and evaluated and identified wastewater needs in Uxbridge. The second phase is the identification and screening of alternative solutions to meet these wastewater needs, as documented in this Alternatives Screening Analysis Report. The last phase of the Project will consist of the development of a recommended plan. The last phase will also include a summary of the detailed evaluations to develop the recommended plan and public outreach to inform the public on the details of the plan.

This Alternatives Screening Analysis Report was completed through the coordinated efforts of the Town of Uxbridge Department of Public Works and GHD serving as the project consultant. Valuable assistance has been provided from the Town's Board of Health as well as a working group comprised of Town staff, GHD staff and Town volunteers.

The Town's water resources: groundwater, drinking water and surface waters form the basis of the Town's human health, environmental health and economic prosperity. All of these water resources are interconnected and must be properly managed for sustainable development.

The Town of Uxbridge is located in the Blackstone River Valley. The Town is located entirely in the Blackstone River watershed. The Uxbridge Wastewater Treatment Facility (WWTF), which was constructed in the 1970's and is owned and operated by the Town, discharges to the Blackstone River. The Blackstone River has been referred to as "America's hardest working river" and has been severely impacted by untreated sewage, industrial wastes and numerous dams and canals which impede the flow of its waters. The portion of the river that flows through Uxbridge has been classified as a 'Category 5' river in the Massachusetts Year 2012 Integrated List of Waters – which means that the river is considered impaired or threatened by one or more uses and requiring a Total Maximum Daily Load (TMDL) limit. A TMDL is the greatest amount of a pollutant (such as nutrients from a wastewater treatment facility) that a waterbody can accept and still meet water quality standards for protecting public health and maintaining the designated beneficial uses of the waterbody.

In 2013 the Town received a new National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0102400). Because the facility was not designed to treat to the new, more stringent nutrient requirements, the Uxbridge WWTF is unable to meet certain conditions of the permit with its existing equipment.

Additionally, most of the equipment at the facility is over thirty five years old and well past its useful life. As the equipment continues to age the cost of operating and maintaining the existing

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mechanical and electrical equipment, instrumentation, and controls becomes more difficult. Much of the equipment is obsolete and replacement parts are difficult and costly to obtain.

The Draft Needs Assessment also analyzed the portions of the Town that are not currently connected to the centralized system to determine whether environmental reasons exist for a major extension of the Town's existing collection system. No concentrated problematic areas for on-site wastewater disposal were found. It was concluded that the continued use of individual on-site septic systems is the most cost effective solution for properties currently outside the boundaries of the existing collection system.

ES.2 Summary of Alternative Technologies and Solutions

Alternative technologies and solutions were identified and screened in the following major categories:

- Sustainability considerations
- Individual on-site system and cluster system alternatives
- Centralized treatment system alternatives
- Satellite treatment system alternatives
- Treated water recharge technologies
- Collection system technologies
- Wastewater flow and loading reduction technologies

Many technologies and solutions were evaluated for each of these categories, as detailed in the following chapters. The following list identifies the alternative technologies and scenarios that are considered most feasible and will be further evaluated and discussed in the next phase of the study:

1. Sustainability Considerations
    - Water Conservation Opportunities
    - Energy Efficiency Opportunities
    - Energy Recovery Opportunities
    - Alternative Energy Opportunities
2. Individual On-site System and Cluster System Alternatives
    - Continued use of conventional Title 5 disposal systems
    - Decentralized treatment alternatives that are approved by MassDEP as part of their Innovative and Alternative (I/A) technology program for areas outside of the centralized sewer service areas in Uxbridge.
3. Preliminary Treatment Alternatives
    - Replacement of grinder and coarse bar screen with two fine screens and replacement of all mechanical equipment that is past its useful life.
4. Primary Treatment Alternatives
    - Replacement of all mechanical equipment that is past its useful life.

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5. Secondary/Advanced Treatment Alternatives to attain Phosphorus Removal
    - Chemical addition and tertiary filtration
6. Secondary/Advanced Treatment Alternatives to attain Nitrogen Removal
    - Modified Ludzack-Ettinger (MLE) process
    - Integrated Fixed-Film Activated Sludge (IFAS) process
    - BioMag® process
7. Disinfection Alternatives
    - Chlorination
    - UV Disinfection
8. Post Aeration Alternatives
    - Mechanical Post Aeration
9. Support Facilities Alternatives
    - Replacement of all mechanical equipment that is past its useful life.
10. Residual Management Alternatives
    - Sludge thickening
    - Sludge dewatering
11. Odor Control Alternatives
    - Biofilter
12. Pump Station Alternatives
    - Replacement of all mechanical equipment that is past its useful life at the Main Pump Station
    - Replacement of the West River Pump Station
13. Satellite Treatment Alternatives
    - To be evaluated in the future if concentrated problematic areas for on-site wastewater disposal are found.
14. Treated Water Recharge Alternatives
    - To be evaluated in the future if concentrated problematic areas for on-site wastewater disposal are found.
15. Collection System Alternatives
    - To be evaluated in the future if concentrated problematic areas for on-site wastewater disposal are found.
16. Wastewater Flow and Loading Reduction Alternatives
    - Infiltration and Inflow (I/I) reduction to sewers
    - Reduction of household water consumption

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- Continued use of the existing rate structure to discourage greater water consumption and wastewater generation

ES.3 No Action Alternative

The No Action Alternative is presented to identify the consequences of doing nothing.

The portions of the Town that are not serviced by the centralized treatment system would continue to utilize on-site wastewater disposal systems. Since the Draft Needs Assessment did not identify any concentrated areas of the Town that are problematic for on-site wastewater disposal the continued use of on-site wastewater disposal is a feasible and cost effective option.

Under the No Action alternative the Town would continue operating the Uxbridge WWTF with no improvements to upgrade the degree of wastewater treatment or to replace aging equipment. The cost of operating and maintaining the existing equipment is expected to increase as equipment becomes obsolete and replacement parts are more difficult and costly to obtain. The frequency of equipment failures is expected to increase, subsequently increasing operating cost and making compliance with the discharge permit effluent limits more difficult to achieve.

Because the Uxbridge WWTF was not designed to provide the degree of wastewater treatment necessary for consistent and reliable compliance with the new effluent limit for total nitrogen and the more stringent effluent limit for total phosphorus, permit non-compliance is expected. Permit non-compliance may cause or contribute to the degradation of water quality of the Blackstone River. If the Town did not demonstrate progress to meet the permit requirements, MassDEP would most likely initiate an enforcement action against the Town as allowed by state law.

ES.4 Future Evaluations to Identify a Recommended Plan

The first phase of the CWMP Project was the identification of the wastewater and nutrient management needs as documented by the Needs Assessment Report. This Alternative Screening Analysis Report documents the second major phase. The final phase of the Project will provide a detailed evaluation of cost effectiveness comparisons using present worth evaluation and evaluation of non-monetary factors. The following evaluations will be performed as part of the final phase:

1. Prepare a methodology of the planned detailed evaluations for project and regulatory review.
2. Perform present-worth evaluations of the alternatives identified in the Alternative Screening Analysis Report.
3. Perform non-monetary evaluations of the alternatives identified in the Alternative Screening Analysis Report.
4. Complete the present-worth analysis with the non-monetary evaluations to select the most appropriate management scenarios.
5. Develop and present the recommended Wastewater Management Plan.
6. Submit the Wastewater Management Plan for regulatory and public reviews.

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Appendices

Appendix A - (Title name for Appendix)

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Glossary of Common Acronyms

ACEC	Areas of Critical Environmental Concern
BAF	Biologically Active Filter
BNR	Biological Nitrogen Removal
BOD	Biochemical Oxygen Demand
BOD_5	Five-Day Biochemical Oxygen Demand
BOH	Board of Health
CHP	Combined Heat and Power
CNR	Cyclical Nitrogen Removal
CWMP	Comprehensive Wastewater Management Plan
db	Decibel
DO	Dissolved Oxygen
eMLE	Enhanced Modified Ludzack-Ettinger
ENR	Enhanced Nitrogen Removal
EPA	Environmental Protection Agency
gpd	Gallons Per Day
gpd/sf	Gallons Per Day Per Square Foot
HRT	Hydraulic Retention Time
I/A	Innovative and Alternative
ICEAS	Intermittent Cycle Extended Aeration System
I/I	Infiltration and Inflow
IFAS	Integrated Fixed-Film Activated Sludge
kWh	Kilowatt-hour
LEED	Leadership in Energy and Environmental Design
MassCEC	Massachusetts Center for Clean Energy
MassDED	Massachusetts Department of Economic Development
MassDEP	Massachusetts Department of Environmental Protection
MBBR	Moving Bed Biofilm Reactor
MBR	Membrane Bioreactor
MGD	Million Gallons Per Day
mg/L	Milligrams Per Liter
MLE	Modified Ludzack-Ettinger
MLSS	Mixed Liquor Suspended Solids
N_2	Nitrogen
NaOCl	Sodium Hypochlorite
NH_3-N	Ammonia Nitrogen
NHESP	Natural Heritage and Endangered Species Program

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NO_3-N	Nitrate Nitrogen
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
O&M	Operation and Maintenance
PAC	Polyaluminum Chloride
psi	Pounds Per Square Inch
PV	Photovoltaic
PVC	Polyvinylchloride
RAS	Return Activated Sludge
RBC	Rotating Biological Contactor
REC	Renewable Energy Certificates
REPI	Renewable Energy Production Incentives
ROW	Right-of-Way
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SREC	Solar Renewable Energy Certificates
SRF	State Revolving Fund
SRT	Solids Retention Time
STEG	Septic Tank Effluent Gravity
STEP	Septic Tank Effluent Pump
UV	Ultraviolet
THM	Trihalomethanes
TKN	Total Kjeldahl Nitrogen
TMDLs	Total Maximum Daily Loads
TOC	Total Organic Carbon
TP	Total Phosphorus
TSS	Total Suspended Solids
UCT	University of Cape Town
USEPA	United States Environmental Protection Agency
VIP	Virginia Initiative Plant
WEF MOP 32	Water Environment Federation Manual of Practice No. 32
WWTF	Wastewater Treatment Facility

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1. Introduction

1.1 Background and Purpose

This Alternatives Screening Analysis Report is the second of three reports that will be produced for the Town of Uxbridge (Town) Comprehensive Wastewater Management Planning Project (Project). The first of these reports was the Needs Assessment, dated October 2014, which documented the nutrient management and wastewater needs for the Town. The third report will be the Detailed Evaluation of Alternatives and Recommended Plan.

The purpose of the Alternatives Screening Analysis Report is to identify and screen alternative wastewater and nutrient management technologies and solutions so that a group of alternative management plans can be formulated to meet the Town's wastewater and nutrient management needs.

1.2 Project Purpose

The purpose of the Comprehensive Wastewater Management Planning (CWMP) Project is to provide an environmentally and economically sound plan for wastewater treatment and nutrient management in the Town of Uxbridge (Town) for the next 20 years. The CWMP Project will assess the wastewater and nutrient-related needs in the Town; evaluate appropriate mitigation measures for those needs; and develop a recommended plan for improved management systems. The primary purpose of the Project is to develop a plan to:

- Protect public health.
- Protect the water supply.
- Plan for and maintain flexibility to meet future Massachusetts Department of Environmental Protection (MassDEP) and United States Environmental Protection Agency (USEPA) requirements (as defined in the NPDES permit).
- Incorporate the wastewater infrastructure and facilities planning into a cohesive document.

1.3 Planning Area

The Town of Uxbridge is located in the Blackstone River Valley. With a total land area of 30 square miles, the Town is bordered by the Massachusetts towns of Douglas, Mendon, Millville, Northbridge and Sutton, and the Rhode Island towns of Burrillville and North Smithfield. The Blackstone River and two of its tributaries—the Mumford River and the West River—flow through the Town.

1.4 Planning Period

The CWMP will provide a recommended plan for wastewater facilities and nutrient management recommendations in Town for the 20 year planning period of 2015 to 2035.

1.5 Project Background and Issues

Project background and existing wastewater issues within the Town of Uxbridge were reviewed in detail in the Draft Needs Assessment Report. A brief summary of the material is provided below.

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1.5.1 Existing Centralized Wastewater Infrastructure

The Town of Uxbridge owns and operates the Uxbridge Wastewater Treatment Facility (WWTF), which treats wastewater collected from commercial and residential districts north and east of Route 146. The facility commenced operation in the 1970s. The facility has not undergone any major upgrades since it was constructed and is currently operating with much of its original equipment. Most of the equipment at the facility is over 30 years old and past its useful life. As the equipment continues to age, it becomes much less reliable and more difficult to service.

In 2013 the facility was issued a new National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0102440). Several of the effluent limits in the 2013 permit are more stringent than the 1999 permit (which the facility was previously operating under).

The Town of Uxbridge cannot meet the conditions of its new permit with its existing wastewater infrastructure. The existing facility needs to be upgraded in order to both replace equipment that has exceeded its useful life and to meet the more stringent permit requirements. This Alternatives Analysis will provide an evaluation of alternatives that could be implemented to satisfy both of these needs.

1.5.2 Existing On-Site Systems

Approximately half of the Town's population relies upon on on-site wastewater disposal systems. The Draft Needs Assessment Report divided this portion of the Town into three Study Areas, based on geographic divisions, and analyzed environmental factors that may preclude portions of the Town from being well suited for on-site wastewater disposal systems. Factors considered included:

- Soil type
- High groundwater areas
- 100-year flood zones
- Depth to bedrock
- Lot size
- Drinking water protection areas
- Buffer areas around water bodies and wetlands
- Priority estimated habitats
- Areas of Critical Environmental Concern (ACEC)
- Title 5 pass/fails
- Groundwater quality

The Needs Assessment analyzed both general indicators and site-specific data.

While the Needs Assessment Report found no concentrated, problematic areas for on-site wastewater disposal based on site-specific data, general indicators for areas that may have sub-optimal on-site wastewater disposal characteristics do exist in the Town.

The Alternatives Analysis provides an evaluation of alternatives that could be considered if, during future development in the Town, areas are found that are unsuitable for on-site wastewater disposal.

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1.5.3 Summary

The following major conclusions and needs were identified in the Needs Assessment Report:

- Based on the available data, no needs for major sewer extensions in any of the Study Areas were found.
- The Uxbridge WWTF needs to be upgraded in order to meet the discharge requirements of its new NPDES permit.
- Much of the equipment at the over 30 year old Uxbridge WWTF has either reached or is approaching the end of its useful life and is in need of replacement.

1.6 Planned Public Review

Public outreach for this project has several comprehensive components. The outreach includes public presentations, a project website, and coordination with DEP. Activities to date are as follows:

- CWMP Advisory Group – The Department of Public Works solicited volunteers from within all Town Departments in February, 2014. Volunteers were also sought in public presentations before the Board of Selectmen in March, 2014. In addition to public works participation, four members of the community have volunteered and have been invited to all CWMP progress meetings, after the date that they volunteered. Individual updates have also been provided when individuals expressed an interest.
- Board of Selectmen Presentations – Presentations have been given on a regular basis to the Board of Selectmen (the group also serves as the Water and Sewer Commissioners). The dates for these presentations were March 24, 2014, July 28, 2014 and November 10, 2014.
- Planning Board Presentations – A presentation was given before the Planning Board on June 11, 2014 to inform this Board of the process in the event that any Board member or member of the public wanted to participate in the process.
- The DPW created a web site to inform the general public on the progress of the project as well as to provide links to critical documents such as presentation, reports, etc.
- DEP coordination meeting – In August of 2014, a meeting was held with the Town of Uxbridge, MassDEP CERO and MassDEP SRF program representatives. The Town was asked to invite the attendees from DEP to future progress meetings, which the Town has done on each occasion.
- CWMP Report – The CWMP is being produced in three phases. Each Phase has a report that is written upon its conclusion. As each phase is completed, the draft report is submitted to MassDEP, presented before the Board of Selectmen and uploaded to the project website allowing for interim reviews of the project efforts and public and regulatory comment.

1.7 Purpose and Organization of the Alternatives Screening Analysis Report

The Alternatives Screening Analysis Report is developed to summarize Phase 2 components of the Project. The report is divided into 10 chapters. Chapter 1 presents general introductory information about the CWMP Project and the Alternatives Screening Analysis Report. Chapter 2 describes the approach and criteria used for screening alternative treatment technologies and solutions. Chapter 3 outlines environmental and sustainability considerations. Chapters 4 identifies and screens

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individual on-site system and cluster system alternatives. Chapter 5 identifies and screens alternatives for centralized and satellite wastewater treatment technologies and sites. Chapter 6 identifies and screens treated water recharge technologies and sites. Chapter 7 identifies and screens collection system technologies. Chapter 8 presents flow and loading reduction opportunities. Chapter 9 identifies the alternatives recommended for further evaluation and the outlines next steps to evaluate solutions for the Town's wastewater needs.

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2. Screening Approach and Criteria

2.1 Introduction

As discussed in Chapter 1, the purpose of this report is to identify and screen alternative technologies and management concepts to be used in a detailed evaluation in the next phase of this Project. This chapter describes the approach and criteria for identifying and screening alternative technologies and sites.

2.2 Methodology for Identification and Screening of Alternative Technologies

The following five groups of alternative technologies, facility sites, and management concepts will be identified and screened:

1. Individual on-site system and cluster system alternatives.
2. Alternatives for centralized and satellite wastewater treatment facilities and sites.
3. Treated water recharge technologies and sites.
4. Collection system technologies.
5. Flow and loading reduction alternatives.

The five groups of alternative technologies are identified and discussed below:

Individual and Cluster On-Site Systems

These types of wastewater management systems typically have wastewater flows less than 10,000 gallons per day (gpd) and are regulated by MassDEP and local Boards of Health under the Title 5 regulations. These systems are often called “decentralized management” systems though there is no universally accepted definition or flow range for “decentralized management” systems. For the purpose of this report, the following definitions are used to categorize these types of wastewater management systems:

- Individual on-site systems serve one site and do not require a collection (sewer) system. They are privately owned and they are regulated by the Title 5 regulations.
- Cluster systems serve more than one property and require a collection (sewer) system to convey the wastewater from the properties to the treatment and recharge system. They can be privately or municipally owned. Cluster systems are regulated by the Title 5 regulations and can be used for maximum-day flows up to 10,000 gpd. This maximum-day flow typically corresponds to a maximum of 30 three-bedroom houses.

The following individual on-site system and cluster system technologies will be identified and screened (this list is based on MassDEP’s summary of innovative and alternative (I/A) technologies approved for use in Massachusetts as of October 2014):

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1. Individual and multiple unit systems for flows less than 10,000 gpd.
    a. On-site systems approved for general use including Title 5 systems and I/A technologies:
        - Title 5 system
        - Recirculating sand filters that comply with Title 5
        - Bioclere®
        - Waterloo Biofilter®
        - AdvanTex®
        - NITREX®
        - SeptiTech®
        - Singulair® (for flows less than 2,000 gpd)
        - Orenco System Sand Filter
        - JET Aerobic
2. Non-discharge systems.
    a. Tight tanks
    b. Waterless toilets

These technologies will be described and screened based on their suitability for individual unit applications and for cluster systems in Uxbridge and on the criteria described in this chapter.

Centralized and Satellite Treatment Facilities

These types of wastewater management systems have wastewater flows greater than 10,000 gpd and are regulated by MassDEP through their groundwater discharge permit program, and must meet more stringent treatment requirements. There is no universally accepted flow definition that separates centralized from satellite systems. We have chosen definitions for these two types of systems that are consistent with general planning guidance as listed below:

- Satellite systems serve more than one property and require a collection (sewer) system. They require a MassDEP discharge permit and typically have pollutant and nutrient discharge limits and flows in the 10,000 gpd to 300,000 gpd range.
- Centralized systems typically treat flows greater than 300,000 gpd and require a MassDEP discharge permit for nutrients as well as other parameters. The Uxbridge WWTF is considered the centralized system in the Town of Uxbridge.

Standard centralized and satellite treatment system components include preliminary and primary treatment, secondary/advanced treatment, and treated water discharge. Systems may also include effluent filtration, effluent disinfection and post aeration depending on the type of treatment process, the facility location, and permitting requirements as set by MassDEP.

The following list summarizes the centralized satellite technologies which will be evaluated and screened in this report:

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1. Preliminary Treatment
    - Grinding
    - Screening
2. Primary Treatment
    - Primary Clarification
3. Secondary/Advanced Treatment
    a. Physical/Chemical Wastewater Treatment Processes including:
        - Chemical addition for phosphorus removal
        - Filtration for phosphorus removal
        - Ion exchange
        - Ammonia stripping
        - Breakpoint chlorination

    b. Suspended Growth Biological Treatment Alternatives including:
        - Multiple-stage processes for nitrogen and phosphorus removal
        - Multiple-phase/cyclical aeration
        - Membrane bioreactors
        - Magnetite Ballasted Settling
        - Oxidation ditches
        - Sequencing batch reactors
        - Multiple sludge processes

    b. Attached Growth Treatment Alternatives including:
        - Rotating biological contactors
        - Denitrifying filters
        - Biological aerated filters
        - Integrated Fixed-Film Activated Sludge (IFAS) processes.
4. Effluent Disinfection Technologies
    - Chlorination
    - Ozone
    - Ultraviolet Radiation
5. Post Aeration
    - Cascade Aeration
    - Mechanical Post Aeration
6. Residual Management Alternatives
    - Sludge thickening and disposal at a regional facility
    - Sludge dewatering and disposal at a regional facility
    - Sludge dewatering and composting for distribution to the public
    - Land application of sludge
7. Odor Control Alternatives
    - Chemical odor control
    - Packed tower scrubber

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- Activated carbon filter
- Biofilter
- Activated sludge diffusion
- Specialty types

8. Satellite Wastewater Treatment Facilities
    a. Suspended Growth Biological Treatment
    b. Attached Growth (Fixed Film) Biological Wastewater Treatment
        - Wood chip filters
        - Amphidrome System®
    c. Plant and Biological Systems:
        - Hydroponic systems
        - Constructed wetlands
        - Solar Aquatics®
        - Lagoons
9. Potential New Treatment Plant Sites

Treated Water Recharge Alternatives

This group of alternatives will identify and screen technologies and potential sites to recharge the treated water, from satellite treatment facilities, back to the natural environment. The following technologies will be investigated:

1. Sand infiltration beds
2. Subsurface infiltration
3. Spray irrigation
4. Well injection
5. Wick well technology
6. Drip irrigation
7. Treated surface water discharge

Collection System Technologies

Although not required for any environmental reason that were identified in the Draft Needs Assessment Report the following collection system technologies will be evaluated and screened in the event they are needed in the future:

1. Gravity sewers and pumping stations
2. Pressure sewers and grinder pumps
3. Septic tank effluent sewers
4. Vacuum sewer systems

Screening of Wastewater Management Technologies

The wastewater management technologies will be described to allow the reader to understand the technology and related process.

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Advantages and disadvantages of all of the alternatives will be presented. The screened technologies will then have system characteristics summarized with respect to a set of standard criteria to allow a side-by-side comparison. The summary is typically in the form of a tabular matrix and will end with a recommendation to either eliminate the technology or retain it for further evaluation. The following is a summary of the standard criteria that will be used for screening alternative technologies:

1. **Relative Capital Costs.** Relative capital costs for each alternative will be identified and compared to the other alternatives.
2. **Relative Operation and Maintenance Costs.** Costs to operate and maintain a typical installation of an alternative will be identified and compared to other alternatives.
3. **Flexibility.** Flexibility of a treatment system relates to the ability of that system to respond to seasonal or future changes in flows, loads, and effluent requirements.
4. **Environmental Considerations Including Energy Use and Sensitive Environmental Receptors.** Energy used to operate an alternative will be noted and compared to the other alternatives. Impact of alternatives to sensitive environmental receptors will also be considered.
5. **Effluent Quality.** Wastewater treatment systems provide various degrees of pollutant removal of Biological Oxygen Demand (BOD), TSS, nitrogen, and phosphorus. The expected effluent quality for each treatment technology will be identified and compared.
6. **Regulatory Requirements.** This criterion includes a discussion regarding the permits, variances, and monitoring requirements of federal, state, and regional regulatory agencies.
7. **Potential for Air Emissions.** The potential for odors and other air emissions from treatment systems will be discussed.
8. **Land Requirements.** The amount of land needed for each alternative treatment system will be discussed.
9. **Anticipated Public Acceptance.** This criterion involves how the public may react to a specific type of treatment system. Major public concerns regarding these alternatives are expected to include relative cost of installation, visibility, potential for odors, operations and maintenance requirements, and the perceived impact of proposed facilities on neighboring residents.
10. **Ease of Implementation.** Implementation issues will be discussed such as methods the Town could use to monitor and operate on-site systems or treatment plants over the expected lifetime of the treatment system. Management issues to be discussed include public or private ownership of treatment facilities, obtaining land for multiple home treatment sites, and Town regulations needed to address the potential administrative issues.
11. **Maintenance Requirements and Complexity of Operation.** This criterion is related to the complexity and number of mechanical components of each treatment process. Long-term reliability and the level of skill needed to maintain a technology will be considered. Reliability and technical feasibility of a process or plan is a function of how consistently it is expected to function and to achieve required effluent limits. In general, long-term reliability decreases as the complexity of mechanical equipment increases.

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Fix it First Alternative

The “Fix it First” alternative focuses on optimizing existing infrastructure through the following practices:

- Continuing to use existing facilities while optimizing performance by repairing and/or upgrading existing infrastructure.
- Improving operations and maintenance of existing facilities.
- Increasing water conservation.
- Implementing best management practices.

This alternative will be considered for all existing infrastructure.

Flow and Loading Reduction Alternatives

These are alternatives to reduce wastewater flows and loadings and thereby reduce costs for construction and operation of wastewater facilities. The following alternatives and management opportunities will be reviewed for their application in Uxbridge:

1. Inflow and infiltration (I/I) reduction
2. Reduction of household water consumption
3. Review of the Town’s water pricing structure
4. Wastewater reuse and recycling
5. Wastewater loading reduction opportunities
6. Growth management regulation

These alternatives are screened and the feasible options are recommended for further consideration.

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3. Environmental and Sustainability Considerations

3.1 Introduction

This chapter outlines environmental and sustainability considerations to be considered during both the planning and design phases of the Project—including water conservation, energy efficiency, energy recovery, and alternative energy.

3.2 Background

The Environmental Protection Agency (EPA) estimates that water and wastewater treatment together represent approximately 3% of the total energy consumption in the United States. It is typically one of the largest energy users in a community, often accounting for 30 to 60% of a municipal government's energy usage (U.S. EPA, 2008). There are many opportunities to reduce the total energy usage at a facility; both to reduce the carbon footprint of the facility and to realize operations savings through the minimization of wasted power.

WEF MOP 32 defines energy conservation measures as 'physical improvement, plant operation, or equipment maintenance practices that result in a reduction in utility or operating cost.' Several rating systems have been developed to help identify energy reduction measures and sustainability opportunities at facilities—including Leadership in Energy and Environmental Design (LEED) certification and the Envision Rating System. Additionally, many industry design standards including TR-16 (which is considered the New England design standard) incorporate sustainability considerations into their guidelines. The promotion of clean energy through the maximization of energy efficiency and renewable energy opportunities is encouraged by the Commonwealth of Massachusetts Sustainable Development Principles.

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LEED Certification

LEED certification is a formal green building design process in which buildings are rated based on achievements in sustainable design and performance of buildings. Obtaining LEED certification for a building can be a large effort. However even if a building does not apply for certification, following the LEED process can help identify useful design features that in many cases can be no more costly than the standard type of construction, but offer a higher quality working environment and can be less costly to operate in the long run. At this time LEED certification can only be obtained for individual buildings, not for a wastewater treatment facility in its entirety.

Envision Rating System

The Envision Rating System is a rating system developed for rating infrastructure projects—including wastewater treatment plants. Envision focuses on the sustainability of infrastructure projects and their overall contribution to the communities they serve.

TR-16 Design Guidelines

Sustainability considerations are covered in the 2011 TR-16 Guides for the Design of Wastewater Treatment Works and include guidelines for the following topics:

- Water Conservation
- Energy Conservation

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- Site Considerations
- Design Considerations for Non-Process Buildings

3.3 Water Conservation

The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs and Water Resources Commission developed the 'Massachusetts Water Conservation Standards' (last updated in 2012) to set state-wide goals for water conservation and water-use efficiency. The document discusses both the environmental benefits of water conservation and the potentially significant financial savings of water conservation through reduced operation and maintenance costs, reduced wastewater treatment costs, resulting increase in water and wastewater treatment plant capacities and savings from avoiding having to find and develop new sources of water for the community. Water conservation efforts that can be undertaken by a wastewater treatment facility include installing reduced flow plumbing, reducing infiltration and inflow in the collection system, maximizing reuse of reclaimed wastewater and implementing water conserving landscaping practices.

Reduced Flow Plumbing

Reduced flow plumbing should be considered in design whenever possible and permitted by the local plumbing code. Devices that can be installed in the facility to reduce water consumption include water-saving toilets, reduced flush devices, and restricted flow shower heads.

Reducing Infiltration and Inflow

Locating and repairing sources of inflow and infiltration in the collection system helps minimize the amount of water which needs to be pumped to and treated by the facility.

The I/I analysis conducted by Beta Group Inc. in 2006, which is described in detail in Chapter 5 of the Draft Needs Assessment Report, recommended several sections of the existing collection system for further investigation to determine whether cost-effective I/I reduction measures could be implemented at these locations.

Reclaimed Wastewater Reuse

TR-16 recommends conducting an assessment to determine if there are any economic effluent reuse opportunities at a facility in order to minimize the use of potable water at the facility. Plant water is currently used for spray wash on the clarifiers, for the gravity thickener, grit washing, and pump seal systems. Increasing treated wastewater recharge and reuse is one of the ten major recommendations of the 2004 Massachusetts Water Policy issued by the Executive Office of Environmental Affairs.

Landscaping

Wherever possible, TR-16 recommends that native species be used in landscaping to eliminate supplementary watering needs. Landscaping features, such as open-grid pavers, should be considered to minimize stormwater runoff (and pollutant loading through runoff), and heat island effect from paved surfaces. Promoting stormwater recharge close to its site of origin is one of the ten major recommendations of the 2004 Massachusetts Water Policy issued by the Executive Office of Environmental Affairs.

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3.4 Energy Efficiency

Because of their often small size, many energy efficiency projects have relatively low capital costs and a short payback period. Together the combination of many small projects designed to lower the amount of energy usage at a plant can lead to substantial overall energy savings. Regional utilities often offer financial incentives to complete energy efficiency upgrades.

A Scoping Study was prepared by Energy New England for National Grid in April 2009 to outline energy efficiency measures that could be implemented at the Uxbridge WWTF. National Grid has a customer rebate program that could potentially assist in funding the six potential energy conservation measures they identified. The six items are:

1. Replacement of existing centrifugal blowers with higher efficiency turbo units.
2. Installation of submersible mixers in the anoxic zone.
3. Replacement of coarse bubble diffusers with a fine bubble system.
4. RAS flow pacing based on plant influent flow.
5. Grit and septage blower cycling.
6. Pump station heating and ventilation modifications to minimize introduction of ventilation air during winter months.

In order to obtain funding the Town would need to submit a proposal for further evaluation by a National Grid designated Technical Assistance Contractor. The evaluation would be partially paid for by the utility. The projects could obtain funding through National Grids custom incentive program.

Table 3-1 summarizes the energy breakdown for the Uxbridge WWTF from the National Grid Scoping Study. The study estimated that the facility uses approximately 2,576 kilowatt-hour (kWh) of electricity per million gallons of wastewater treated, which is in the typical range for regional wastewater treatment facilities of similar size.

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Table 3-1 National Grid Scoping Study Uxbridge - WWTF Power Breakdown

System	Energy Use
Secondary Treatment / Aeration System	62%
Primary Clarification	4%
Grit Removal and Septage	6%
Raw Wastewater Pump Station	10%
Building Systems	8%
Chemical Use	0.29%
Sludge Handling	3%
Plant Water System	8%

Energy Audit

An energy audit is used to determine if the equipment at a facility is properly sized for a process. The audit might include motor sizing and analyzing the heating/lighting in existing buildings to see if their efficiency can be increased through better insulation, more efficient light bulbs, use of natural lighting, etc.

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Optimizing Existing Infrastructure

During design, existing infrastructure should be evaluated to determine if anything that is scheduled to be demolished can be used in future construction.

Sub-Metering

Sub-metering tracks energy usage through the use of individual meters and other electrical consumption indicators. TR-16 recommends using separate meters to monitor areas of major energy use at the plant.

Energy Management System

Energy management systems are used to lock out specified process operations during periods of peak energy demand in order to minimize demand charges from the local utility. According to the Scoping Study performed by National Grid the 360 kW diesel powered emergency generator is adequately sized to allow the plant to shed its full load during a demand response event. Incentivized programs are available through ISO-NE that provides customers with a monthly incentive payment in exchange for committing to reducing energy consumption to a pre-determined amount when needed. The Uxbridge WWTF is currently participating in the ISO-NE program.

Pump Considerations

Aeration system blowers can potentially be oversized if the expected population growth during the design phase has not yet occurred or if the organic loading entering the plant decreases due to a reduction in population. Energy savings can be realized by replacing larger blowers with one or more smaller units, installing variable frequency drives, or installing inlet throttling. TR-16 recommends installing dissolved oxygen (DO) probes in aeration systems in order to match air supplied by blowers to the systems need and reduce energy consumption. Because of their age, the facilities pumps should be tested to determine if they are operating at efficiencies near their original design points.

Ventilation Systems

Ventilation systems can add significant energy costs. Codes should be examined for provisions that allow for lower heating requirements and fewer air changes when an area is unoccupied. Both these changes will reduce energy requirements at the facility.

Instrumentation and Control Systems

Instrumentation and control systems are used to help match supply with demand. Supervisory control and data acquisition (SCADA) software can be used to monitor and control large portions of a facility. SCADA can be configured to monitor energy usage trends and to remotely adjust the system to current conditions through the measurement of process variables such as liquid and gas flow rates, chemical residual, and dissolved oxygen concentrations.

Lighting

Energy efficiency measures to be considered for the lighting system include adding motion sensors on lights in non-process buildings, using high-efficiency fixtures, and maximizing the use of natural light through the use of windows, translucent panels, skylights, etc. to reduce reliance on artificial lighting. In order to limit light pollution, light sensors or light timers should be considered and exterior lighting should be limited to what is required by local codes or for safety.

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3.5 Energy Recovery

Wastewater facilities have historically been treated as receivers of waste products that need to be handled as waste products. In reality, wastewater facilities receive waste products that can be recovered as valuable resources. These resources include potential energy from water elevations, energy rich by-products, and heat recovery.

Hydropower

Hydropower can be used to harvest potential energy in a pipeline or at the outfall of a plant. The differential elevation between the water surface leaving the final process and the invert of the effluent discharge pipe provides a static elevation head that can potentially be converted into kinetic energy through a small hydro-turbine. Several low head generation devices could be explored.

Anaerobic Sludge Digestion

During anaerobic digestion, microorganisms break down organic materials in the absence of oxygen. A by-product of this process is the production of methane gas, which can be harvested and used as a biogas.

If a facility has excess capacity in its anaerobic digester it can also consider co-digestion where additional energy-rich organic waste materials such as fats, oils, grease, and food scraps are added to the existing waste stream in order to increase methane production. The Water Environment Federation Manual of Practice No. 32 – Energy Conservation in Water and Wastewater Facilities (WEF MOP 32) estimates that the biogas produced by the digestion of biosolids is approximately 60% methane. It is also possible to use the methane gas from anaerobic digestion as a hydrogen source to fuel hydrogen fuel cells. The biogas can be used to power boilers, generators, pumps, or blowers. In a combined heat and power (CHP) application the biogas can be used to power an engine or turbine and the waste heat can be recovered to heat the anaerobic digester.

Ideally a plant considering co-digestion should be located in close proximity to an industry or business that is a source of carbon-based waste. In addition to the increased energy production from accepting additional waste streams, co-generation can be a possible revenue stream for the facility.

Heat Recovery

Heat can be recovered from many areas at a WWTF. TR-16 recommends considering the following heat recovery applications:

- Heat recovery from blower rooms.
- Use of solar thermal heating units on south-facing walls with limited shade.
- Heat recovery units for ventilating rooms at high rates.
- Units that recover heat from effluent wastewater.

Typical wastewater effluent contains enough heat extractable through a heat exchanger to be considered as a building heating source. Heat is typically transferred through a water-to-refrigerant heat exchanger. Effluent characteristics that would need to be evaluated to determine the feasibility of an effluent heating system include temperature and total suspended solids.

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3.6 Alternative Energy

Several potential sources of alternative energy production are present at a WWTF site. Depending on the amount of power produced and site conditions, the electricity generated from production can either be used on-site or fed back to the local utility in a net metering arrangement. In a net metering arrangement the facility sells back electricity produced in return for a predetermined credit towards its usage bill.

Solar

Solar photovoltaic (PV) arrays can be used by facilities with adequate space to produce renewable energy on-site. Arrays can be ground-mounted or roof-mounted depending on the orientation of the facilities buildings and available roof space. South facing roofs with minimal shadow interference provide the most ideal conditions for a roof-mounted solar array.

A shade analysis would need to be conducted at a potential site to determine the feasibility of a solar installation. On average, Massachusetts experiences 4.5 “sun hours per day” of solar energy. This means that over an entire year, direct sunlight hits an area for an average of 4.5 hours per day. In comparison Phoenix, Arizona experiences 6.4 sun hours per day. For an equivalent amount of power output from a PV panel in Massachusetts, the module area would be designed to be approximately 40% larger than in Phoenix.

Wind

Wind turbines can be used to harvest wind energy from sites with ideal conditions. According to the 50m Wind Power map produced by the National Renewable Energy Laboratory (NREL) the wind potential in the Uxbridge area is poor to marginal. If wind energy is to be considered at the Uxbridge WWTF an evaluation should be done at the specific area of interest. Wind resources can vary significantly at the micro level. WEF MOP 32 recommends that a potential site is monitored for wind potential for at least a year to determine its suitability for a wind turbine installation.

In addition to wind potential, several other factors need to be considered when assessing a potential turbine location including sound impact, shadow flicker, visual impact, and potential environmental permitting. Massachusetts State regulations (Massachusetts Air Pollution Control Regulation, Regulation 310 CMR 7.10) does not allow a rise of 10 decibels (db) or greater above background levels at a property boundary. Environmental considerations include whether the site is within a state designation of Natural Heritage and Endangered Species Program (NHESP) Open Space, Wetland, or other land-use designations or restrictions.

Geothermal

Geothermal systems use the nearly constant temperature of the earth to act as a heat source and a heat sink to heat and cool buildings through a heat pump. A heat exchanger is a system of pipes buried in the shallow ground near the building. A fluid, usually water or a mixture or water and antifreeze, circulates through the pipes and absorbs or gives off heat to the ground. In the winter the heat pump removes heat from the heat exchanger and pumps it through an air delivery system to heat a building’s interior. In the summer the system runs in reverse removing heat from the building and using the ground as a heat sink. Heat removed from the building during the summer can also be used to heat water.

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3.7 Current Renewable Energy Funding Available

Several incentives are currently available for renewable energy installations. These include Solar Renewal Energy Certificates (SREC), Renewable Energy Certificates (REC) and Renewable Energy Production Incentives (REPI).

The SREC program provides a market-based credit for every megawatt of energy produced by a qualifying solar PV power production system. Credits are sold at auction through brokers with prices set between the market floor and market ceiling. The market ceiling is set by the Solar Alternative Compliance Payment which a utility must pay if they are unable to meet their Renewable Energy Portfolio.

The REC program is a similar market-based program. Whereas the SREC market is only set up for solar PV power producers, the REC market includes a much broader range of technologies but offers a much lower price per credit. It is applicable for solar PV, solar thermal electric, wind energy, small hydropower, landfill methane and anaerobic digester gas, marine or hydrokinetic energy, geothermal energy, and eligible biomass fuel.

The REPI is a federal program that provides financial incentives for renewable energy electricity produced and sold by qualified renewable energy generation facilities. This program is only available for facilities that export some of their energy instead of using it all on-site and offers an annual incentive payment of 1.5 cents per kilowatt-hour for the first 10 years of operation.

The Massachusetts Center for Clean Energy (MassCEC) has several programs to provide funding for feasibility, design, and construction of clean energy technologies.

3.8 Summary

The sustainability considerations discussed in Chapter 3 are summarized in Table 3-2. All of the considerations discussed in his chapter will be taken into consideration both during Phase 3 and the design of the upcoming WWTF upgrade.

Table 3-2 Sustainability Considerations

Water Conservation	Energy Efficiency	Energy Recovery	Alternative Energy
Reduced Flow Plumbing	Energy Audit	Hydropower	Solar
Reducing I/I	Optimizing Existing Infrastructure	Anaerobic Sludge Digestion	Wind
Reclaimed WW Reuse	Sub Metering	Heat Recovery	Geothermal
Landscaping	Energy Management Systems		
	Pump Considerations		
	Ventilation Systems		
	Instrumentation and Control Systems		
	Lighting		

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4. Individual On-Site System and Cluster System Alternative

4.1 Introduction

The purpose of this chapter is to identify and screen individual On-Site System and Cluster System wastewater treatment and recharge technologies which could be used to mitigate wastewater issues identified in the Draft Needs Assessment Report.

While the Needs Assessment Report found no site-specific data indicating concentrated, problematic areas for on-site wastewater disposal, general indicators for areas that may have sub-optimal on-site wastewater disposal characteristics do exist in the Town. The technologies in this chapter should be considered if, during future development in the Town, individual sites are found to be unsuitable for on-site wastewater disposal.

4.2 Comparison of Individual On-Site Systems with Centralized Collection and Treatment

The individual on-site system and cluster system technologies in this chapter are presented as an alternative to satellite or centralized wastewater collection and treatment. To properly evaluate decentralized collection and treatment system alternatives, it is important to understand some of the general advantages and disadvantages of centralized collection and treatment systems, as summarized below.

Centralized collection and treatment has the following advantages:

- Wastewater is removed from the sewered area, minimizing health threats and nitrogen loading to the specific sewered area.
- Individual property owners will not have the responsibility of operating their own on-site or cluster wastewater treatment system.
- Fewer treatment sites would be required within the Town.
- Centralized and satellite wastewater treatment systems are reliable, provide high quality effluent, have professional operations staff, and have regular monitoring of the recharged water.
- Expanding sewers into portions of the Town that are adjacent to existing centralized collection facilities is typically less expensive than other treatment and recharge scenarios that require site purchase and new facilities. An “economy of scale” to treat and recharge the wastewater at one location can reduce capital and O&M costs.
- Fewer resources are required for the Town to operate one or two facilities as compared to many cluster or satellite systems.

Centralized collection and treatment has the following disadvantages:

- Sewer construction can potentially disrupt traffic and have a high capital cost associated with it (this disadvantage applies to cluster and satellite systems too.)

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- Treated water recharge issues, including siting, capacity, and groundwater elevation impacts to low elevation properties, can limit the amount of treated water recharged in one location when recharging to groundwater.
- Centralized facilities may be located at great distances from the areas being served, increasing costs associated with wastewater collection and transfer.
- As outlined in the 'Massachusetts Water Conservation Standards' treatment and discharge at a centralized treatment facility can potentially transport wastewater out of its basin of origin and disturb the local water balance. A disturbed water balance can potentially lead to depleted groundwater and local stream flow.

4.3 Individual On-Site Systems and Cluster Systems

Both individual on site systems and cluster systems typically have wastewater flows less than 10,000 gpd and are regulated by MassDEP and local Boards of Health under the Title 5 regulations. These systems are often called "decentralized management" systems though there is no universally accepted definition or flow range for "decentralized management" systems. Systems with flows greater than 10,000 gpd require a MassDEP groundwater discharge permit and must meet more stringent discharge requirements. These larger systems (the ones needing a groundwater discharge permit) are often called "centralized and/or satellite" systems, though again, there is no universally accepted definition or flow range for these larger systems.

For the purpose of this report, the following definitions are used to categorize the various types of wastewater management systems:

- Individual on-site systems serve one site and do not require a collection (sewer) system. They are privately owned and are regulated by the Title 5 regulations.
- Cluster systems serve more than one property and require a collection (sewer) system to convey the wastewater from the properties to the treatment and recharge system. They can be privately or municipally owned. They are regulated by the Title 5 regulations and can be used for maximum-day flows up to 10,000 gpd. This maximum-day flow typically corresponds to a maximum of 30 three-bedroom houses.
- Satellite systems serve more than one property and require a collection (sewer) system. They require a MassDEP discharge permit. These systems may have stringent discharge limits, depending on the recharge location.
- Centralized systems typically treat flows greater than 300,000 gpd and need to meet stringent discharge limits (as required for a MassDEP discharge permit) for nutrients as well as other parameters. The Uxbridge WWTF is considered the centralized system in Uxbridge.

Individual on-site system and cluster system technologies are identified and screened in this Chapter based on their ability to address the wastewater needs in Uxbridge.

In the Draft Needs Assessment Report the portion for the Town not currently connected to the centralized system was divided into three study areas and analyzed to determine whether sub-areas existed where the continued use of Title 5 disposal systems may be problematic.

Though no concentrated, problematic areas for on-site wastewater disposal were found, general indicators do exist in all three study areas for locations that may be problematic for on-site

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wastewater disposal. These technologies could be considered if, during future development in the Town, individual sites are found to be unsuitable for on-site wastewater disposal.

Individual properties with site limitations may need to consider the installation of I/A systems. The following is the definition of I/A technologies in accordance with Title 5 Regulations (310 CMR 15.002):

> *"Alternative Systems – Systems designed to provide or enhance on-site sewage disposal which either do not contain all of the components of an on-site disposal system constructed in accordance with 310 CMR 15.100 through 15.293 or which contain components in addition to those specified in 310 CMR 15.100 through 15.293 and which are proposed to the local approving authority and/or the Department for remedial, pilot, provisional, or general use approval pursuant to 310 CMR 15.280 through 15.289."*

Due to their higher level of treatment, several I/A technologies can be considered for sites that cannot meet the Title 5 sizing requirements for a leaching field.

MassDEP has identified the allowable uses for each approved I/A system and has assigned each into one of four categories: remedial, pilot, provisional, and general use. Each of these categories is defined below:

> *"The purpose of a **Piloting Approval** is to provide field testing and technical demonstration that an I/A technology can or cannot function effectively under relevant physical and climatological conditions at one or more pilot facilities. Although information obtained during piloting is likely to be relevant to long term operation and maintenance concerns about a particular alternative system, approval for piloting is not intended, in and by itself, to provide a full evaluation of these issues.*
>
> ***Provisional Approval** is intended to designate alternative systems that appear technically capable of providing levels of protection at least equivalent to those of standard on-site disposal systems and to determine whether, under actual field conditions in Massachusetts with broader usage than a controlled pilot setting, general use of the alternative system will provide such protection, and whether any additional conditions addressing long-term operation and maintenance and monitoring considerations are necessary to ensure that such protection will be provided.*
>
> *Certification for **General Use** is intended to facilitate the use, under appropriate conditions, of alternative systems that have been demonstrated to provide levels of environmental protection at least equivalent to those of standard on-site systems.*
>
> *The purpose of approval for **Remedial Use** is to allow for the rapid approval of an alternative system that is likely to improve existing conditions at a particular facility or facilities currently served by a failed, failing, or nonconforming system."*

For the purposes of this evaluation, the various on-site treatment system technologies are grouped as follows:

1. Conventional systems
    - Title 5 Systems
2. Systems to Consider for Size-Constrained Sites
    - Recirculating sand filters that comply with Title 5

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- Bioclere®
- Waterloo Biofilter®
- AdvanTex®
- NITREX® (Provisional Use Approval)
- SeptiTech®
- Norweco Singulair® (for flows less than 2,000 gpd)
- Orenco System Sand Filter
- JET Aerobic

3. Non-Discharge Systems
    - Tight tanks
    - Waterless Toilets

4.3.1 Conventional Systems

Conventional Title 5 Systems

Conventional Title 5 systems consist of a septic tank, a distribution box, and a leaching area. Wastewater is discharged to the septic tank where settleable solids sink to the bottom of the tank, and floatables (like grease and toilet paper) rise to the surface, forming a scum layer. The septic tank prevents the solids from flowing to the leaching area where they could plug the soils and cause a failed septic system (septic tank effluent rising to the ground surface where it could cause odors or disease; or causing the building drains to backup). Decomposition of the organic matter occurs in the septic tank and produces ammonia and other dissolved pollutants. The liquid effluent then flows via the distribution box to a leaching area, where it percolates through stone bedding and the soil prior to reaching the groundwater.

Septic tank effluent ammonia-nitrogen levels are generally in the range of 20 to 60 mg/L. Septic tank effluent concentrations of BOD and TSS are approximately 140 to 200 mg/L and 50 to 90 mg/L, respectively. There are large ranges in the concentrations of these parameters because different households use varying amounts of water for showers, laundry, and household cleaning. The more water that is used, the more diluted the septic tank effluent will be. When a household conserves water, these concentrations will be higher. Title 5 systems reduce bacterial contamination primarily via filtration of effluent through a biological mat and the soils beneath the leaching area. The leaching area is designed to promote aerobic conditions; therefore, nitrification will occur, converting the ammonia nitrogen (NH_3-N) to nitrate nitrogen (NO_3-N). A small amount of denitrification occurs in a leaching system and some of the nitrogen will be converted to nitrogen gas to be released to the atmosphere.

Soil characteristics are an important consideration for the leaching systems. Clay and silt in the soil will result in low infiltration capacity of the soils and require a more expensive leaching system.

Title 5 systems have the following advantages:

- Well proven, mechanically simple technology.
- No significant public acceptance concerns when they are properly sited and designed.
- Generally, no pumps are required for flows less than 2,000 gpd.

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- Low maintenance cost compared to other systems.
- They are very successful at protecting against failed septic systems and protecting public health.

They have the following disadvantages:

- Septic tank requires pumping every two to five years (as do all individual on-site systems).
- The effluent from the system is not well treated, and it is high in nitrogen and phosphorus.

4.3.2 Systems to Consider for Size-Constrained Sites

The following I/A systems can be considered for sites where site constraints are unsuitable for a conventional Title 5 septic system.

JET Aerobic Treatment System

This is an aerobic treatment system designed to achieve limits of 30 mg/L BOD and 30 mg/L TSS. Flow enters a primary settling chamber to remove solids, and then enters an aerated chamber where BOD and TSS removal is achieved. Aeration is provided by a mechanical aspirator that mixes the chamber and entrains air. The system uses both suspended growth and fixed-film bacteria to achieve the above stated removal.

Regular maintenance is required, as this is a mechanical system. Massachusetts requires that a quarterly preventative maintenance schedule be maintained for this system.

Jet systems have the following advantages:

- High effluent quality (BOD and TSS less than 30 mg/L).
- Allows for variances for reduction in leaching area or separation to groundwater.
- Approved for General Use in Massachusetts.

They have the following disadvantages:

- Higher capital cost and operation and maintenance costs than standard Title 5 systems.
- Requires routine maintenance, beyond the typical pumping of a septic tank.

Orenco Systems Sand Filters

Orenco Systems, Inc. manufacturers an intermittent sand filter and a recirculating trickling filter, which can be installed either as a component of a new septic system or retrofitted into an existing septic tank. Intermittent sand filters are designed to disperse daily septic tank effluent flow over a distribution area through the course of a 24 hour period. The even distribution provides for a higher quality final effluent because it allows for more efficient use of the soil absorption system. In a recirculating trickling filter, the septic tank is fitted with a small trickling filter on the top of the tank and a polyvinylchloride (PVC) pump vault inside the tank. The pump vault houses both a recirculation pump and an effluent pump. Inlet holes in the pump vault allow septic tank liquid to enter the vault, where it is either recirculated to the trickling filter or pumped to a leaching area. Nitrification occurs in the trickling filter, and with a recirculation ratio of 15 to 1, the effluent is denitrified after returning to the septic tank.

The Orenco filters have the following advantages:

- Better treatment than a Title 5 system can be attained and the leaching size can be reduced through variance.

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- Septage pumping requirements are similar to those of a standard septic system.
- Proven technology.
- Approved for General Use in Massachusetts.
- Can be retrofited into an existing system.
- No significant environmental or public acceptance concerns when they are properly sited and designed.
- The process operation is flexible, with the ability to adjust cycle times.

The Orenco systems have the following disadvantages:

- Costs are typically higher than those of a standard septic system due to the filters and pumps.
- Temperature-sensitive in winter.
- More maintenance is required than a standard septic system due to mechanical and electrical components.

Recirculating (Non-Proprietary) Sand Filters

Sand, rock, or mixed media recirculating filters are non-proprietary systems with a recirculation tank and filter. Septic tank effluent flows from the septic tank to the recirculation tank, where it is pumped to the top of the filter and over the media. A portion of the flow is recirculated back to the recirculation tank and the remaining flow is discharged to the leaching area.

Anaerobic decomposition occurs in the septic tank, changing organic matter to ammonia. The ammonia is converted to nitrate in the aerobic filter media. The recirculated effluent then undergoes denitrification in the recirculation tank, and nitrates are converted to nitrogen gas. The nitrogen gas is lost to the atmosphere, yielding a net loss of nitrogen from the wastewater (the MassDEP certification for General Use indicates that the technology consistently produces an effluent with total nitrogen less than 25 mg/L). Many variations on the basic system are available to handle the specific needs of a project or site.

Maintenance includes periodic removal and replacement of the upper layers of media or backwashing and routine pump maintenance. In emergencies, such as power loss, the system can be designed to function as a flow-through system, with treatment equivalent to a standard Title 5 system.

Recirculating sand, rock, or mixed media filters have the following advantages:

- Better treatment than a conventional Title 5 septic system can be attained and the leaching size can be reduced.
- Approved for General Use by MassDEP in nitrogen-sensitive areas.
- Septage pumping requirements are similar to those of a conventional Title 5 septic system.
- Well proven technology with operating history since the 1970's.
- Systems do not require a high level of technical skill to operate when designed and installed correctly.
- No significant environmental or public acceptance concerns when they are properly sited and designed.

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- The process has operational flexibility, with capability to adjust cycle times.

They have the following disadvantages:

- More maintenance is required than for a standard septic system due to mechanical and electrical components.
- Generally requires a larger land area than a standard septic system. Land surface may be occupied by the filter unit and not available for other uses.
- Systems are sensitive to temperature and must be protected from freezing.
- Costs are higher than those of a standard septic system.

Bioclere®

Bioclere® is a trickling filter and pump unit in one manufactured unit, designed to treat the anaerobic effluent from a septic tank, which is high in ammonia. The filter media is PVC or polypropylene. Effluent from the septic tank is pumped to a distributor, which spreads the wastewater over the top of the media, where aerobic conditions allow nitrification to occur (conversion of ammonia to nitrate). In the media, anaerobic micro-sites form where some limited denitrification (NO_3-N to N_2 [gas]) can take place. However, the majority of denitrification occurs when the effluent is collected at the base of the filter, and about 70% of the flow is recirculated back to the septic tank. The rest of the effluent is discharged to a leaching area.

Installation of the Bioclere® tank is relatively simple. One treatment unit contains a pump, a distributor, and the filter media. The treatment unit can either be retrofitted into existing septic systems by reusing the septic tank, piping, and leaching area, or it can be installed into a new system. The sealed double wall of the treatment unit provides insulation to minimize cold weather impacts. Nitrogen reductions of 50% are typical. The system can handle flow variations by varying the recirculation rates, and the units can handle increased flow by inserting additional media into the unit; however, the approval is limited to systems with flows less than 2,000 gpd.

The Bioclere® system has the following advantages:

- Better treatment can be attained and the leaching size can be reduced.
- Well proven technology in Massachusetts.
- Approved for General Use in Massachusetts in non-nitrogen sensitive areas.
- No significant environmental or public acceptance concerns when properly sited and designed.
- The process operation is flexible, with ability to adjust cycle times and add additional media.
- The basic system has relatively low operation and maintenance costs. The pump contained in the unit is easily accessible for replacement, when required.
- Septage pumping requirements are similar to those of a standard septic system.
- Nitrogen removal rates are approximately 50%.

They have the following disadvantages:

- Costs are typically higher than those of a standard Title 5 system.
- Maintenance agreements are required and have an associated cost.

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- More maintenance is required than a standard Title 5 system due to mechanical and electrical components.
- Generally require a larger area (for the treatment tank) than a standard Title 5 system.
- Tops of Bioclere® tanks extend above ground.

Waterloo Biofilter®

The Waterloo Biofilter® consists of a 6-foot by 6-foot by 4-foot enclosure which includes filter media, an air ventilation system, and a wastewater distribution system. The distribution system pumps effluent from the septic tank and sprays it over the surface of the media. Wastewater trickles through the media while air is blown through the system. The system uses a small ventilation fan and an effluent pump timed via a control panel to dose effluent at frequent intervals over a 24-hour period. The effluent is collected at the base of the biofilter and a portion is recirculated back through the media, while the rest is discharged to a leaching area.

The Waterloo Biofilter® has the following advantages:

- Better treatment than a standard septic system can be attained and the leaching size can be reduced.
- Septage pumping requirements are similar to those of a standard septic system.
- No significant environmental or public acceptance concerns when they are properly sited and designed.
- The process operation is flexible, with the ability to adjust cycle times.
- The basic system uses a small pump, which has low operation and maintenance (O&M) costs. The pump is easily accessible for service or replacement.
- Although the design hydraulic loading rate is 10 gal/ft^2/day, it can handle surges of up to 49 gal/ft^2/day for several days with little effect on effluent quality.
- Removal rates for nitrogen are approximately 505. Effluent BOD and TSS are expected to be <30 mg/L. Fecal coliform removal is typically 99%.

They have the following disadvantages:

- Costs are typically higher than those of a standard septic system.
- Systems are sensitive to the temperature of the septic tank effluent entering the system. Insulation of the septic tank is recommended.
- More maintenance is required than a standard septic system due to mechanical and electrical components.
- Pumps and/or fans are used which must be maintained and periodically replaced.
- The denitrification unit periodically requires recharging with material like sawdust or leaves to serve as a carbon source for denitrification.
- The unit may need to be installed above ground depending on depth to groundwater.

AdvanTex® System

The AdvanTex® system is a textile filter technology. The main components are a control panel, a filter pod, a recirculating splitter valve, a pumping package, and a processing tank. The filter material consists of an engineered textile that has greater surface area than sand or gravel,

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allowing greater volumes of wastewater treatment in less space. After initial settling in the first compartment of the processing tank, effluent is pumped to the filter pod. As effluent percolates through the filter media, a biological film develops, providing additional BOD, TSS, and nitrogen removal.

The splitter valve directs a portion of the flow to the effluent discharge and a portion back to the processing tank. The splitter valve also maintains a minimum water level in the processing tank; therefore, all of the treated effluent is recycled back to the processing tank when there is no influent. Effluent discharge is controlled by a timer, which discharges in "microdoses." The microdoses occur for relatively short intervals, typically 72 times per day.

AdvanTex® systems have the following advantages:

- The system can be installed within a small footprint.
- High quality effluent (5 mg/L BOD and TSS) can be used for drip irrigation.
- Septage pumping requirements are similar to those of a standard septic system.
- No significant environmental or public acceptance concerns when they are properly sited and designed.
- The process operation is flexible, with the ability to adjust cycle times.
- The basic system uses a small pump, which has low operational and maintenance costs.

AdvanTex® systems have the following disadvantages:

- Costs are typically higher than those of a standard septic system.
- More maintenance is required than a standard septic system due to mechanical and electrical components.
- Pumps and/or fans are used, which must be maintained and periodically replaced.
- May require media replacement at a higher cost than a system with sand or gravel media.

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NITREX® System

This system is a denitrification filter unit that can be added to the end of an I/A system. The system requires a nitrified effluent for the unit to work; therefore a treatment process beyond a normal septic system is required prior to this system. The filter media is contained in a tank and is a gravity flow-through system. The media is comprised of wood chips and cellulose.

The NITREX® system has the following advantages:

- Better treatment can be attained and the leaching size can be reduced.
- Septage pumping requirements are similar to those of a standard septic system.
- No significant environmental or public acceptance concerns when they are properly sited and designed.
- Does not require pumping.
- Excellent nitrogen removal is possible (greater than 50%) when the upstream treatment process has converted all the organic and ammonia nitrogen to nitrate nitrogen.

The NITREX® system the following disadvantages:

- Costs are typically higher than those of a standard septic system.

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- Requires a very effective nitrification process as an earlier treatment step to provide a nitrified effluent to the system.
- Media life is unknown and is expected to need replacement in 10 to 20 years.

Norweco Singulair

The Norweco Singulair system is a type of extended aeration system. The treatment process is contained within a three-chambered tank. The first chamber provides solids settling, the second chamber is the aerobic zone where the wastewater is aerated to promote BOD removal and nitrification, and the third chamber is the final settling chamber. This chamber is equipped with a filtration unit to aid in clarification prior to effluent disposal. The system is followed by a recirculation chamber to pump 10 to 20% of the flow back to the first chamber for nitrogen recycle.

The Singulair system has the following advantages:

- Septage pumping requirements are similar to those of a standard septic system.
- No significant environmental or public acceptance concerns when they are properly sited and designed.
- Can achieve better treatment than a Title 5 system and the leaching size can be reduced

The Singulair system has the following disadvantages:

- Costs are typically higher than those of a standard septic system.
- More maintenance is required than a standard septic system due to mechanical and electrical components.
- Pumps are used which must be maintained and periodically replaced.

SeptiTech® System

This system is a fixed-film-type system. The first two tanks or chambers of the system provide solids settling and the anoxic zone for denitrification. The second chamber contains trickling filter media and wastewater is recirculated within this chamber for treatment. Flow is also recirculated back to the anoxic zone to promote denitrification.

The SeptiTech® system has the following advantages:

- Better treatment than a standard septic system can be attained and the leaching size can be reduced.
- Septage pumping requirements are similar to those of a standard septic system.
- No significant environmental or public acceptance concerns when they are properly sited and designed.

It has the following disadvantages:

- Costs are typically higher than those of a standard septic system.
- More maintenance is required than a standard septic system due to mechanical and electrical components.
- Pumps are used which must be maintained and periodically replaced.

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4.3.3 Non-Discharge Systems

There are several non-discharge systems that may be appropriate for specific areas of Uxbridge as identified below.

Tight Tanks

Tight tanks are non-discharge systems that collect and store the wastewater until it can be removed by a septage hauler. All of the wastewater generated by the household or business goes directly into the tight tank. The storage tank typically has a level indicator with an alarm. A signal is transmitted when the liquid level reaches a specified height. When the tank is full, a septage hauler empties the tank and transports the contents to a treatment facility.

Tight tanks have the following advantages:

- Simple technology.
- No significant environmental concerns when they are properly sited and designed.
- Require less land area than a septic system (no leaching area).
- Water use is discouraged because most water used must be transported and disposed off-site at a high cost.

They have the following disadvantages:

- MassDEP does not consider tight tanks an adequate long-term solution.
- High operational costs due to frequent pumping and disposal.
- Potential for frequent pump-truck traffic and odors that occur during pumping.
- Wastewater treatment and disposal issues are transferred to another location.

Waterless Toilets

Water consumption, wastewater flow, and pollutant loading can be reduced using waterless toilets. Waterless toilet systems operate by separating black wastewater and gray wastewater. Black wastewater is toilet waste and gray wastewater is generated from non-sanitary sources, such as washing clothes and dishes, and bathtub and shower use. Black wastewater is treated in the waterless toilet unit, and gray wastewater is discharged to a septic system with potential size reductions. The two most common wastewater toilet systems are composting toilets and incinerating toilets.

Composting toilets recirculate the black wastewater over remaining solids to promote a natural decomposition process. Incinerating toilets burn black wastewater and generate a small quantity of ash and gas. Composted material and ash are periodically removed from the respective systems, and air filters and exhaust units are used to minimize odors. Public acceptance of waterless toilet systems is often low due to the composting, incinerating, and handling of human waste within living spaces. A potential use of waterless toilets is in public restrooms and convenience stations or at remote locations.

Waterless toilets have the following advantages:

- Wastewater flows and loads are reduced if properly designed and installed.
- Water consumption is significantly reduced.
- Minimal environmental concerns occur when properly sited and designed.

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- Composting toilets require minimal energy use.
- Size of standard septic system may be reduced to treat only gray wastewater.
- Routine maintenance is minimal and requires no special training.

Waterless toilets have the following disadvantages:

- Public acceptance is generally low.
- Incinerating toilets generally have high energy requirements.
- Handling of composting toilet contents can be objectionable.
- Incineration units are likely to generate odors if not vented properly.
- Not well suited to high seasonal peak loading.

4.4 Cluster Treatment Systems

Cluster treatment systems are systems which fall between individual on-site systems and larger municipal (satellite or centralized) facilities designed to serve large areas of a town. These systems are typically designed to treat and recharge wastewater generated (and collected by sewer systems) within individual neighborhoods. The main difference between cluster systems and centralized wastewater treatment facilities is the location of the treatment and treated water recharge.

Cluster systems can range in size from serving small groups of homes up to a group of 30 homes. Cluster treatment systems may utilize any one of the on-site technologies described previously in this chapter, or could be served by small applications of wastewater treatment systems (as described in Chapter 5 used for flows over 10,000 gpd). Because cluster systems are designed to handle "clusters" of properties, they require a collection system to transport the wastewater from the properties to the treatment facility. The collection system may be any one of the collection systems described in detail in Chapter 7.

These systems are regulated by Title 5 regulations and do not require a groundwater discharge permit. Treatment and recharge sites would need to be located for these systems.

4.5 Screening of Alternative Decentralized Technologies

Table 4-1 summarizes key information for each technology alternative with respect to the screening criteria discussed in Chapter 2. All of the wastewater treatment technologies require review and approval by MassDEP and/or the local Board of Health. Table 4-1 includes information on technologies currently approved by MassDEP. Additional technologies may be approved in the future.

As documented in the Draft Needs Assessment Report, conventional Title 5 systems are expected to continue to provide adequate treatment for the portion of the Town that is not connected to the centralized collection system. The remainder of the technologies summarized in this chapter should be considered only if, during future development in the Town, individual sites are found to be unsuitable for on-site wastewater disposal (site constrained) through a conventional Title 5 system.

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5. Alternatives for Centralized and Satellite Wastewater Treatment Facilities and Sites

5.1 Introduction

The purpose of this chapter is to identify technologies and sites that can be used by the Town of Uxbridge for wastewater treatment facilities. This chapter will review options for the centralized wastewater treatment facility as well as options for satellite wastewater treatment facilities, as satellite facilities may be a wastewater management option in the future for a yet to be identified need. Any recommended technologies will be considered for further detailed evaluation as part of the next phase of the Project.

As outlined in the Draft Needs Assessment the majority of the equipment at the Uxbridge WWTF is well past its useful life and in need of replacement. Additionally several of the existing processes need to be upgraded in order to meet the new NPDES permit (Permit No. MA012440), issued in 2013. This chapter will provide a process by process discussion of the alternatives for upgrading the existing facility.

Currently, the majority of the properties in Uxbridge that are not connected to the centralized system utilize conventional Title 5 systems for on-site wastewater disposal. Since the Draft Needs Assessment did not identify any concentrated, problematic areas for on-site wastewater disposal the most cost-effective option is for these areas to continue using on-site wastewater disposal systems or to consider expanding the existing collection system to service properties that are in close proximity to the existing system. However, in the event of a future need, due to remote concentrated development or another future issue, options for satellite facilities will be reviewed.

Wastewater treatment alternatives are divided into the following groups:

1. Alternatives for treatment system expansion and upgrade at the existing centralized Uxbridge WWTF (Section 5.5):
    a. Preliminary treatment
    b. Primary treatment
    c. Secondary/advanced treatment technologies
    d. Disinfection
    e. Post Aeration
    f. Support Facilities
    g. Residuals Management
    h. Odor Control
    i. Pump Stations
2. Away from the Centralized Treatment Facility (Satellite treatment facilities) (Section 6.6)
    a. Suspended Growth Biological Treatment

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b. Attached Growth (Fixed Film) Biological Wastewater Treatment

- Wood chip filters
- Amphidrome System®

c. Plant and Biological Systems

- Hydroponic systems
- Constructed wetlands
- Solar Aquatics®
- Lagoons

Each group of alternatives is presented and screened in a separate section of this chapter. Treated water recharge alternatives are discussed in Chapter 6.

5.2 No Action Alternative

In the No Action Alternative the Uxbridge WWTF would continue to operate with no improvements to the facility. The cost of operating and maintaining mechanical and electrical equipment, which is already well past its useful life, would continue to escalate and become more difficult as equipment becomes obsolete and replacement parts harder to find.

The Uxbridge WWTF was not designed to provide the level of treatment required by its new NPDES permit, and would violate the permit conditions under the "No Action" alternative. Permit non-compliance would cause or contribute to degradation of water quality conditions in the Blackstone River and would lead to legal enforcement actions by MassDEP, USEPA, and environmental groups.

The "No Action" alternative is not recommended for further consideration.

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5.3 "Fix It First" Alternative

As discussed in Chapter 2 the "Fix it First" alternative will be considered for each existing wastewater treatment process in order to reuse as much existing infrastructure as practical. For some processes the "Fix it First" alternative is to replace aging existing equipment in kind. For processes that are not capable of meeting the new discharge permit limits (such as the secondary treatment process) the "Fix it First" alternative looks at reusing as much of the existing infrastructure as possible—for example reusing existing tankage for a new treatment process.

5.4 Wastewater Treatment System Components

5.4.1 Introduction

Both centralized and satellite treatment facilities include the following system components: (1) preliminary treatment; (2) primary treatment; (3) secondary/advanced treatment; (4) effluent disinfection and (5) post aeration. These system components are described below, and treatment alternatives are described in detail and screened. These system components are also illustrated in Figure 5-1.

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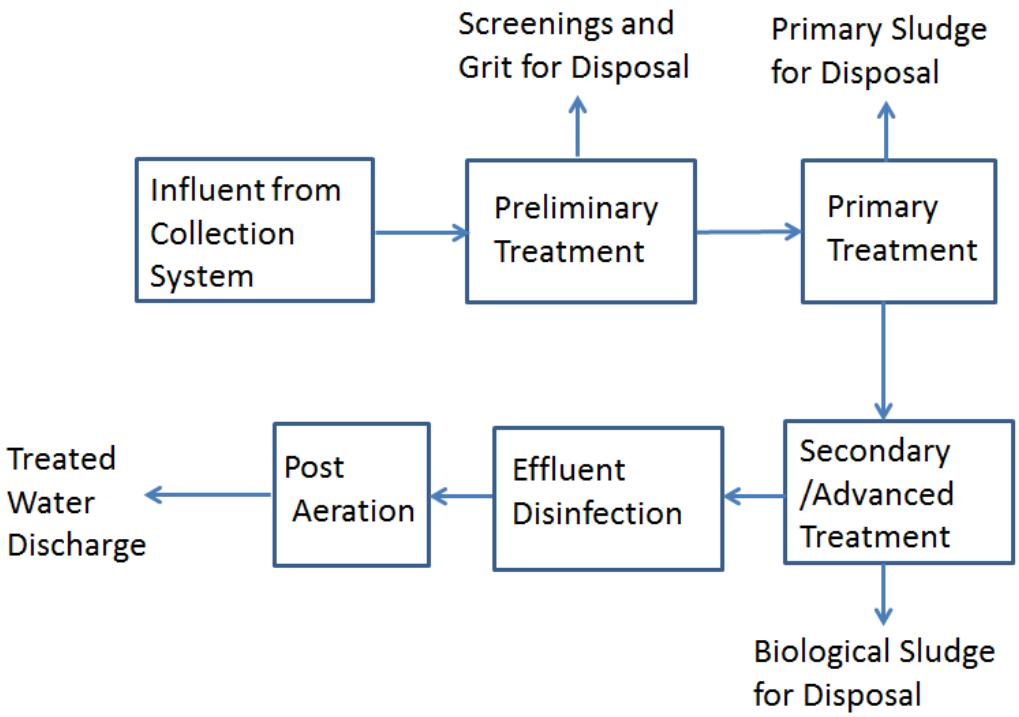

Figure 5-1 Wastewater Treatment System Components

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5.4.2 Preliminary Treatment

Preliminary treatment is designed to remove large and abrasive objects and is usually the first process of a treatment facility. The removal of these objects prevents damage to treatment equipment such as pumps, valves, and pipelines.

Bar screens are used to remove large objects and the material removed is referred to as “screenings”. Grit removal facilities are utilized to remove sand and other abrasive materials from the wastewater to prevent excessive wear on moving equipment and minimize heavy deposits in pipelines and channels.

5.4.3 Primary Treatment

Primary treatment is a process to remove settleable solids from the wastewater flow. The solids are removed by gravity settling and can be collected using mechanical equipment or by periodically pumping the tank. Primary treatment methods often include primary clarification for larger facilities and large septic tanks for smaller facilities.

Primary clarification involves the use of circular or rectangular tanks with mechanical equipment for collection and removal of solids and scum. As wastewater flows through the tank, solids settle to the bottom of the tank and the scum floats to the top of the tank; both are then collected and removed by mechanical equipment.

5.4.4 Secondary/Advanced Wastewater Treatment Systems

Secondary treatment processes are designed to remove dissolved and suspended solids from wastewater, reducing the BOD and TSS concentrations. Advanced treatment processes typically remove nutrients such as nitrogen and phosphorus. The most common and typically least

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expensive secondary and advanced treatment processes are biological processes. This section focuses on biological processes because they are the most used and efficient processes for wastewater treatment. This section also discusses physical and chemical processes that can enhance the performance of the biological processes.

Biological treatment of wastewater utilizes microorganisms to transform solids and organic matter into biological cell mass, carbon dioxide, and nitrogen gas. Biological processes provide an environment for microbial growth using nutrients, BOD, and TSS in the wastewater as a food source. Microorganisms are removed from the wastewater as sludge (also called bio-solids); and carbon dioxide and nitrogen gas are released to the atmosphere.

Biological processes are classified as aerobic, anoxic, or anaerobic processes. Aerobic processes are those which occur only in the presence of oxygen; anoxic processes occur when there is minimal oxygen but sufficient nitrate-nitrogen for biological respiration; and anaerobic processes occur when there is no oxygen or nitrate present.

Biological processes are also classified by the physical configuration used for promoting microbial growth. The following sections provide a brief description of the three major types of biological processes.

Suspended Growth Processes

Suspended growth processes are biological processes which maintain a concentrated supply of microorganisms suspended in the wastewater. The mixture of microorganisms, organic solids, and water are collectively referred to as mixed liquor suspended solids (MLSS). Decomposition of solids and organic matter is achieved by combining wastewater and MLSS in a contact tank. The microorganisms grow and consume the solids and organic material. The microorganisms multiply and are later separated from the treated water to be reused in the process. Excess biological growth is removed from the process as sludge. The microorganisms are typically separated from the treated water in settling tanks or through various separation processes.

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Attached Growth (Fixed-Film) Processes

Attached growth processes (also known as fixed-film processes) utilize an inert medium of plastic, stone, sand, or other material on which the microorganisms grow and multiply. The wastewater is brought in contact with the microorganisms (also called biomass) on the medium, and the biomass consumes the solids and organic material to produce more biomass. Attached growth processes include trickling filters, rotating biological contactors (RBCs), aerated biological filters, packed beds, fluidized beds, and moving bed biofilm reactors (MBBR). These process names identify the configuration of the support medium.

Plant and Biological Treatment Systems

Plant and biological treatment systems utilize plant materials as well as microbiological populations for wastewater treatment. They have not been widely applied for nitrogen removal and are not as well defined in terms of predicted performance and design criteria as the more conventional systems. They typically have large land area requirements. These treatment systems include hydroponic systems (like Solar Aquatics) and constructed wetlands. These systems rely on naturally occurring plants, aquatic life, and sunlight to remove contaminants.

5.4.5 Effluent Disinfection

Effluent disinfection systems reduce the concentration of harmful pathogens, such as viruses, bacteria, protozoa, cysts or parasites that are discharged from a treatment facility. Three widely

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used technologies for disinfection are chlorination, ultraviolet (UV) disinfection and treatment with ozone.

5.4.6 Post Aeration

Permits for effluent discharge to a river or stream typically require a high effluent dissolved oxygen level. Post aeration processes are designed to increase the dissolved oxygen in the effluent wastewater stream before final discharge. Post aeration is usually the final process before the effluent is discharged to the receiving water body. Oxygen can be introduced into the effluent either through turbulence or mechanical aeration.

5.5 Centralized Treatment Alternatives

Technologies considered to replace aging equipment at the Uxbridge WWTF and to upgrade the facility in order to meet its NPDES permit are described in the section below. The discussion for each process outlines the facilities existing infrastructure, alternatives considered and a screening of alternatives to determine which options will be retained for further evaluation

5.5.1 Preliminary Treatment Technologies

Existing Infrastructure

The Uxbridge WWTF preliminary treatment system currently has an aerated grit chamber followed by a grinder installed in the main channel and a coarse bar screen in the bypass channel. Although the existing system meets TR-16 standards both the grinder and the aerated grit chamber equipment are well past their useful life.

"Fix it First" Alternative

1. **Grit Removal**

Grit removal technologies are typically designed to provide for the removal of at least 95% of particles with a specific gravity of 2.65 that pass through a 65 or larger screen mesh. While several different grit removal technologies exist, the most cost-effective alternative is the "Fix it First" alternative, in which the existing aging equipment is replaced in kind.

2. **Grinding**

The facility currently uses a grinder for preliminary treatment. Grinders are no longer the industry standard and should only be considered when screening is not a viable option. The technology is also not appropriate for facilities with sensitive downstream processes, such as filters (which are likely to be needed as a result of the new NPDES permit). Due to these factors grinding is not considered further in this evaluation.

Screening

TR-16 recommends that fine-screen screening devices be installed to protect downstream pumps and treatment facilities. Installation of fine screens in the two existing preliminary treatment channels will be considered for further evaluation.

Removal of Disposable Wipes

The facility faces an operational challenge from the large amount of disposable wipes entering the WWTF. The wipes clog the Main Pump Station pumps, Main Pump Station check valves, and the aerated grit equipment.

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The following alternatives could be considered for managing the disposable wipes:

- Installation of a fine screen at the location where the raw sewage enters the raw sewage wet well in the Main Pump Station. Due to the depth of the Main Pump Station installation of a fine screen is not considered a practical solution. The operators would face maintenance challenges, the screen would lack the protection of a coarse bar rack and providing a backup would be very costly. As a result, this option was not considered for further evaluation.
- Installation of chopper pumps at the Main Pump Station. Previous experience has shown that when disposable wipes are chopped they are likely to make it past a downstream fine screen and then possibly make their way to sensitive, downstream processes. Since it would be unacceptable for these wipes to make their way to the sensitive downstream processes that are needed to meet the facility's new permit limits, this option was not considered for further evaluation.
- Upgrading Main Pump Station pumps to pass the disposable wipes and installation of a fine screen at the preliminary treatment system. Several manufacturers market impellers capable of passing disposable wipes. The wipes would pass through the Main Pump Station and be removed at the head-works. The headworks could be reconfigured so that flow passes through the fine screen prior to the aerated grit chamber, to minimize clogging potential in the aerated grit chamber. This option is retained for further evaluation.

Screening of Preliminary Treatment Alternatives

Fine screening is recommended as the preferred preliminary treatment alternative. Grinding is not recommended for further study since it is no longer the standard in the industry and not recommended for facilities with sensitive downstream processes. The "Fix it First" alternative of replacing existing aerated grit equipment in kind, upgrading the existing infrastructure with the construction of fine screens and reconfiguring the influent channel so that flow passes through the fine screens prior to grit removal is recommended for the preliminary treatment system.

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5.5.2 Primary Treatment Technologies

The purpose of this section is to identify and screen alternatives that could be used to achieve solids separation prior to the secondary treatment process.

Existing Infrastructure

The Uxbridge WWTF has three primary settling basins with chain and flight mechanisms mounted on parallel chains. The basins are properly sized for future flow conditions, however all of the mechanical components are well past their useful life.

"Fix it First" Alternative

The primary settling basins are properly sized for future flow conditions, based on TR-16 criteria, and can be reused. The mechanical equipment is well past its useful life and needs to be replaced in kind. The "Fix-it First" alternative is the most cost-effective option for primary treatment.

Screening of Primary Treatment Technologies

The "Fix it First" Alternative is recommended for further study.

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5.5.3 Secondary/Advanced Treatment Technologies

Existing Infrastructure

The facility has three aeration tanks. The tanks were originally designed to only provide BOD removal at the design flow of the facility; however the operators have modified the operation to provide some nitrogen removal. The aeration tanks are currently configured to operate with minimal air in the first tank, full aeration in the second tank, and low air in the third tank to remove some nitrogen, recover alkalinity, and decrease energy usage. The existing tanks are described in further detail in Chapter 5 of the Needs Assessment Report. The facility currently uses chemical precipitation for phosphorus removal.

"Fix it First" Alternative

In their current configuration the existing aeration tanks do not have enough volume to provide secondary treatment to meet the effluent limits of the 2013 permit. Additionally all of the mechanical equipment is well past its useful life. Though the current process is insufficient for future needs, the concrete tanks are in good condition and could be either reused or expanded to house a new process.

Nutrient Removal Processes

Phosphorus in wastewater from residential, commercial, institutional, and minor industrial sources exists principally in the form of soluble—or dissolved—phosphorus. As a result, significant phosphorus removal depends first and foremost on the ability to convert soluble/dissolved phosphorus to a particulate form for subsequent removal either by settling or by filtration.

Soluble/dissolved phosphorus can be converted to a particulate form by biological or chemical treatment. Because phosphorus is an essential nutrient for biological growth, biological treatment involves the incorporation of soluble phosphorus into biomass during wastewater treatment. The phosphorus content of biomass typically varies over a range of approximately 1.5 to 2% (dry weight basis).

The amount of phosphorus incorporated into biomass, however, can be increased significantly by incorporating anaerobic zones into biological wastewater treatment systems. By sequentially subjecting biological microorganisms to first anaerobic and then aerobic conditions the phosphorus content of biomass can be increased to 3 to 6% (dry weight basis). With proper control of operating conditions and with effective settling these systems are generally able to reduce the concentration of phosphorus in wastewater to the range of 0.5 to 2.0 milligrams per liter.

In addition to these, biological phosphorus removal can also be achieved by incorporating an anaerobic stage in the design and operation of sequencing batch reactors and by primary sludge fermentation, which involves recycling biological sludge solids to primary settling tanks.

Nitrogen removal from wastewater is an established technology, but it requires larger process tanks and skilled operation. Nitrogen removal includes the two steps of nitrification and denitrification. Nitrification converts ammonia-nitrogen to nitrate-nitrogen, and denitrification converts nitrate-nitrogen to nitrogen gas which is released to the atmosphere.

Biological Nitrogen Removal (BNR) processes have typically been designed to meet the drinking water standard of 10 mg/L total nitrogen, and can be designed to exceed this performance. As a result (when they are operated well), they will provide a treated water with an average total nitrogen concentration of 5 to 7 mg/L.

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1. **Physical/Chemical Wastewater Treatment Processes**

Physical/chemical treatment is commonly used for phosphorus removal but has received limited application for nitrogen removal municipal wastewaters because biological processes tend to be more efficient and cost-effective for this nutrient. Although not common, physical/chemical processes for nitrogen removal are included in the review of physical chemical secondary processes in an effort to be complete in our identification of treatment processes.

a. **Chemical Addition for Phosphorus Removal.** Chemical treatment for phosphorus removal involves adding an iron or aluminum salt solution to precipitate phosphorus. Lime addition has also been used in the past, but has largely fallen out of favor due to the significant amounts of chemical sludge produced and operational difficulties associated with the handling of lime. Current practice for municipal wastewater treatment typically involves the addition of ferric chloride, ferrous chloride, ferrous sulfate, aluminum sulfate (alum), polyaluminum chloride (PAC), or sodium aluminate. Chemical treatment for phosphorus removal is currently used at the Uxbridge WWTF as shown in Figure 5-2. The operators of the facility recently switched from using PAC to alum.

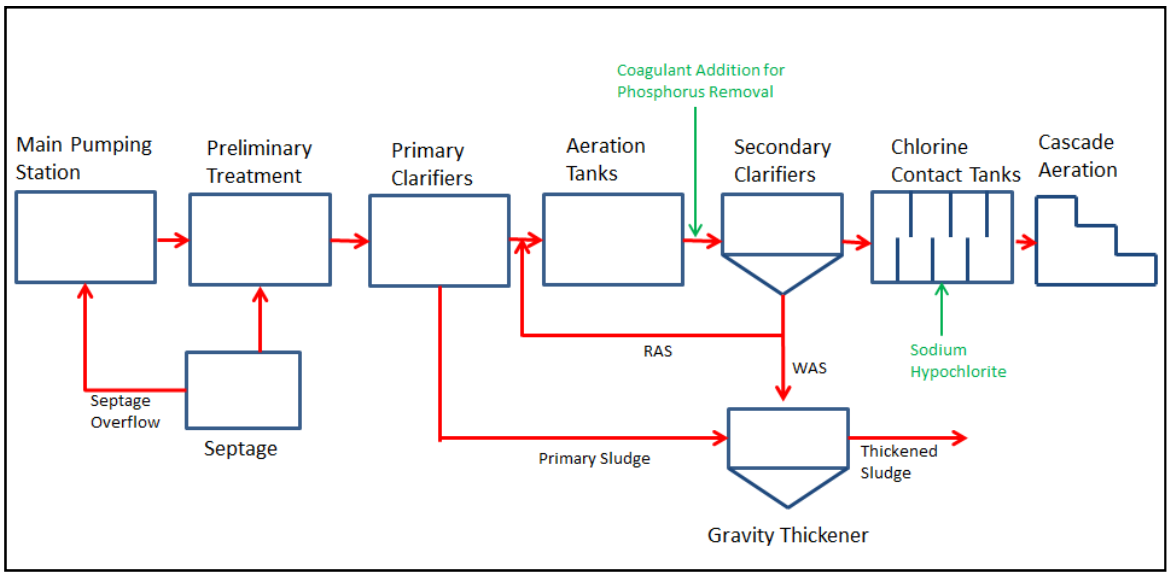

Figure 5-2 Uxbrige WWTF Chemical Phosphorus Addition

b. **Filtration for Phosphorus Removal.** With effective secondary settling, chemical addition is typically able to reduce the concentration of phosphorus in wastewater to the range of 0.5 to 1.0 milligrams per liter. For consistent and reliable long-term compliance with effluent phosphorus limits below 0.5 milligrams per liter, effluent filtration is generally required. This is due to the phosphorus content of suspended and colloidal solids normally present in secondary clarifier effluent. With the exception of facilities that use high mixed liquor suspended solids concentration technologies such as MBRs or ballasted settling (i.e. BioMag process) for biological wastewater treatment, facilities that are required to meet effluent phosphorus limits less than 0.5 mg/L typically use a second dose point for chemical feed to the filter influent. In addition, a chemical flocculation tank is often used to promote development of a chemical floc that can be effectively removed by the effluent filter system.

In order to achieve consistent and reliable long-term compliance with the new effluent phosphorus limit of 0.2 milligrams per liter required for the period of April 1 through October

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31, tertiary effluent filtration will be required. A typical setup for phosphorus removal with tertiary effluent filtration is shown in Figure 5-3.

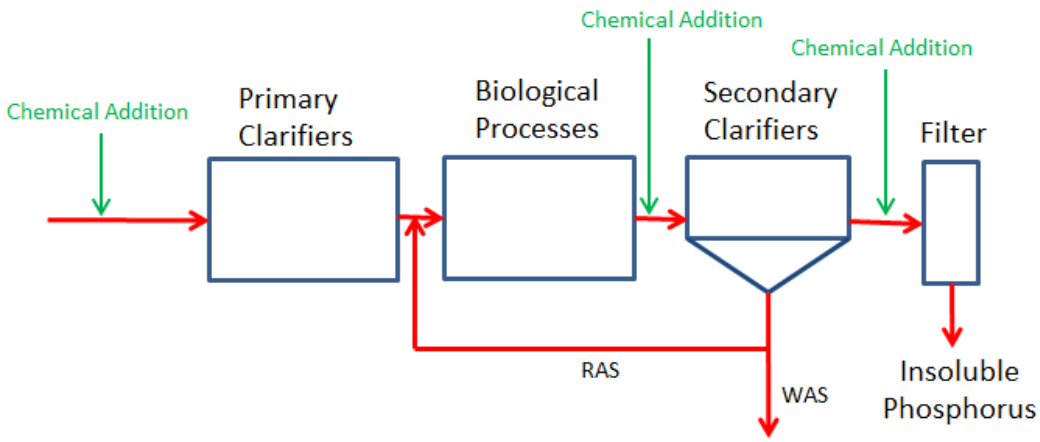

Figure 5-3 Typical Setup for Phosphorus Removal with Tertiary Filter

A number of different types of effluent filters are available, including various types of sand filters and cloth media/disc filters. For the degree of phosphorus removal required for Uxbridge, sand filters would need to be of the deep-bed continuous-backwash type. The topography of the Uxbridge WWTF site appears more conducive to the use of a cloth media type filter. These filters can be furnished as package steel units or for installation in concrete tanks.

c. **Ion Exchange.** Ion exchange is an ion-specific process that can be used to remove specific nitrogen, carbon, or other contaminants and involves the use of columns or beds containing resins that will exchange one ion for another. The column is operated until the resin is exhausted and breakthrough occurs, at which time the bed must be regenerated with a concentrated alkaline solution to remove the ions. The spent regenerant must then be treated and disposed of, or processed for recovery and reuse. To avoid plugging of the resin, influent pretreatment and filtration must be provided ahead of the ion exchange column.

Full-scale applications have shown that the process is labor-intensive and costly, requires frequent maintenance, and presents safety and corrosion concerns due to the handling of caustic acid and salt solutions. This technology is not considered further.

d. **Ammonia Stripping.** Ammonia stripping and related processes—such as steam stripping and ammonia stripping at elevated temperatures—consist of adding lime or other alkaline compounds to raise the pH of the wastewater stream to a high level and passing the stream through a tower with countercurrent air flow to strip out the ammonia gas. The stripped ammonia is then released to the atmosphere, which can create odor problems or may not be considered environmentally acceptable. The air stream must then be passed through an air scrubber to recover the ammonia in the form of ammonium sulfate. Ammonia stripping does not remove organic nitrogen, nitrites, or nitrates, and thus would not be able to consistently achieve the expected nitrogen removal limits without other processes. Ammonia stripping is highly temperature-dependent and more suited to warm climates; stripping efficiency is greatly reduced at cold temperatures. Full-scale applications have encountered serious scaling problems in the towers. Ammonia stripping and related processes are more suited to

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industrial applications with low volume, high-strength ammonia streams, or specific applications such as digester supernatant streams. Chemical dosages are dependent on the volume of flow and the ammonia concentrations; therefore, this process becomes more cost-effective at increased ammonia concentrations. This technology is not considered further.

e. **Breakpoint Chlorination.** Breakpoint chlorination involves the dosing of wastewater with high concentrations of chlorine to convert ammonium-nitrogen to other forms. Organic nitrogen and nitrates are not removed by breakpoint chlorination. It would be difficult to meet total nitrogen limits using this process. Many other reactions occur and dissolved solids are generated. Dechlorination is required due to the large dosages of chlorine required to achieve breakpoint. This technology is not considered further.

2. **Suspended Growth Biological Wastewater Treatment**

Suspended growth biological wastewater treatment systems for nitrogen removal have been widely investigated, developed, and implemented over the last four decades. As a variation of the activated sludge process, suspended growth systems provide additional tankage volume for 1) longer solids retention times for nitrification and 2) anoxic conditions for denitrification. A variety of systems are available, including single-sludge and multi-sludge systems. Within the single-sludge category, further process classifications can be defined, such as:

- Oxidation ditches.
- Multi-stage processes for nitrogen and phosphorus removal.
- Multi-phase/cyclical aeration.
- Sequencing batch reactors (SBRs).

Some systems have been developed to meet more stringent effluent limitations for nitrogen by providing multiple anoxic zones, and some system have been developed to remove both phosphorus and nitrogen with an emphasis on optimizing phosphorus removal.

Consistent and effective phosphorus removal depends on subsequent handling and disposal of the sludge that is generated. If the sludge is subsequently subjected to anaerobic conditions, such as may occur in a gravity sludge thickener or sludge storage tank, phosphorus will be released from the biomass and soluble phosphorus will be recycled to the plant influent in the sidestreams from sludge processing operations.

The applicability of various processes for Uxbridge is dependent on the level of treatment required and the degree of phosphorus removal to be provided.

Single-sludge systems combine carbonaceous BOD removal, nitrification, and denitrification in a single mixed liquor by providing aeration tankage with one set of clarifiers. Consequently, the activated sludge (single-sludge) returned to the aeration tankage from the clarifiers contains a concentrated mixture of microorganisms to accomplish all three processes. BOD removal and nitrification are accomplished simultaneously in the aerobic zones. Denitrification is accomplished in anoxic zones, which are mixed but not aerated to maintain a low dissolved oxygen level. Single or multiple anoxic zones or phases can be provided depending on the features of the various processes and/or level of treatment required. A higher level of nitrogen removal can be achieved with longer solids retention times (SRTs) and two or more anoxic zones, which result in increased aeration tankage. The major process variations or classifications of single-sludge systems include the following.

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a. **Oxidation Ditches:** Figure 5-4 illustrates a generic process schematic for an oxidation ditch.

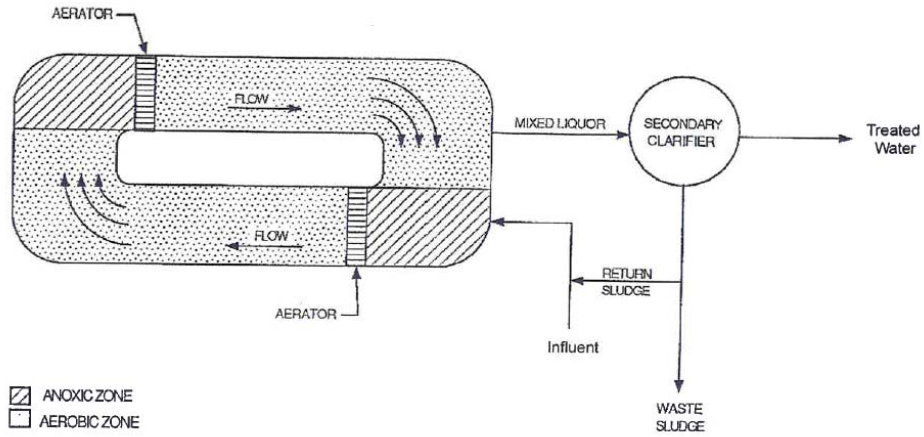

Figure 5-4 Oxidation Ditch

Oxidation ditches were developed to minimize operational requirements and maintenance. Ditches have large surface areas and one or more fixed aerators, located at strategic points to provide aeration and mixing as well as propulsion of flow around the tank. Wastewater flows in a continuous, circuitous path around the ditch with a high internal recycle rate to provide a complete mix flow regime. Ditches are designed to provide long solids retention time with no primary settling tank. Since aeration is provided at key points in the loop, aerobic conditions are created downstream of the aerator, while anoxic conditions generally exist upstream of the aerator. Consequently, nitrogen removal is achieved.

Various systems have been developed for nitrogen removal to take advantage of this inherent characteristic of oxidation ditches. Among these are the Carrousel, Orbal, and Bi-denitro processes. Pre- and post-anoxic tanks are often used with oxidation ditches to further promote nitrogen removal.

Oxidation ditches require larger land areas due to their large volume requirements.

Oxidation ditches have the following advantages:

- Requires minimal operator attention.
- Can achieve high level of nitrogen removal (3 to 5 mg/L when configured as a Bardenpho process and 5 to 7 mg/L configured as a MLE process).

They have the following disadvantages:

- Large land area is required for new tankage.
- Large capital costs associated with new tankage.

b. **Multi-Stage Single-Sludge Systems for Nitrogen and Phosphorus Removal:** Figure 5-5 represents a process schematic of a multiple-stage process developed to achieve both nitrogen and phosphorus removal.

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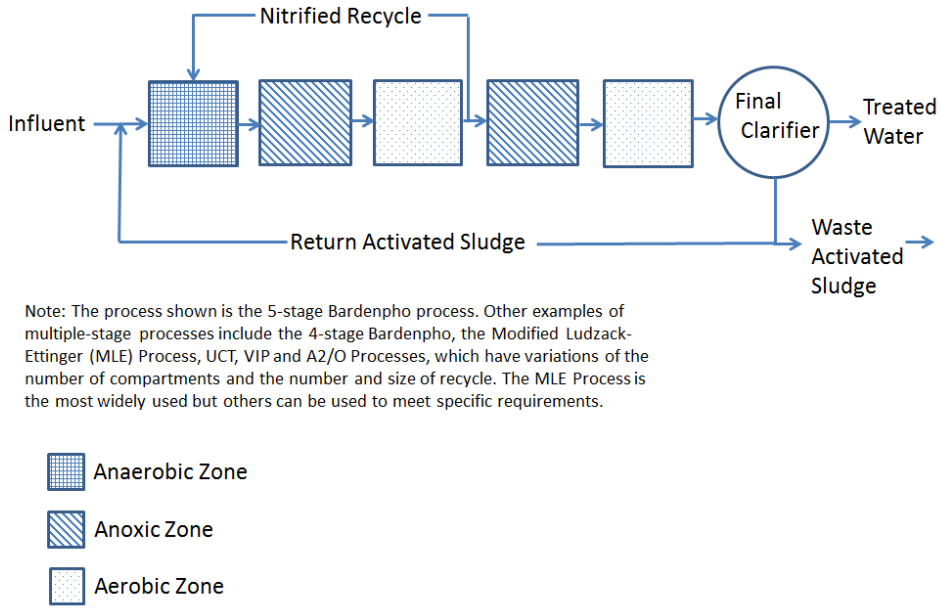

Figure 5-5 Multi-Stage Nitrogen and Phosphorus Removal Schematic

Influent wastewater or primary effluent first enters an anaerobic zone, followed by an anoxic zone and aerated zone. BOD removal and nitrification is achieved in the aerobic portion. Mixed liquor from the end of the aerobic zone is recycled to the head of the anoxic zone to achieve denitrification of nitrates (generated by the aerobic zone) to nitrogen gas. A high recycle rate is required (200 to 400% of influent flow) to return a sufficiently large fraction of nitrates to achieve good denitrification efficiency. Return activated sludge (RAS) is returned to the head of the anaerobic or anoxic zone. If returned to the anoxic zone, then another internal recycle is required to pump mixed liquor from the anoxic zone to the upstream anaerobic zone. The anaerobic zone is utilized to achieve phosphorus removal. Anaerobic conditions are used to stress the bacteria; phosphorus is released but later taken up by the bacteria during synthesis in higher proportions than normal synthesis, known as biological uptake or luxury uptake of phosphorus. A side benefit of the anaerobic zone is that it acts as a “selector” which has been shown to improve settleability characteristics of the sludge. Process variations have been developed including the A2/O process, the four-stage Bardenpho process, University of Cape Town (UCT) process, and the Virginia Initiative Plant (VIP).

The Bardenpho process, which utilizes dual anoxic zones, shown in Figure 5-6, is capable of achieving a total nitrogen limit of 3 to 5 mg/L on average, and 3 mg/L to meet ENR requirements when followed by filtration.

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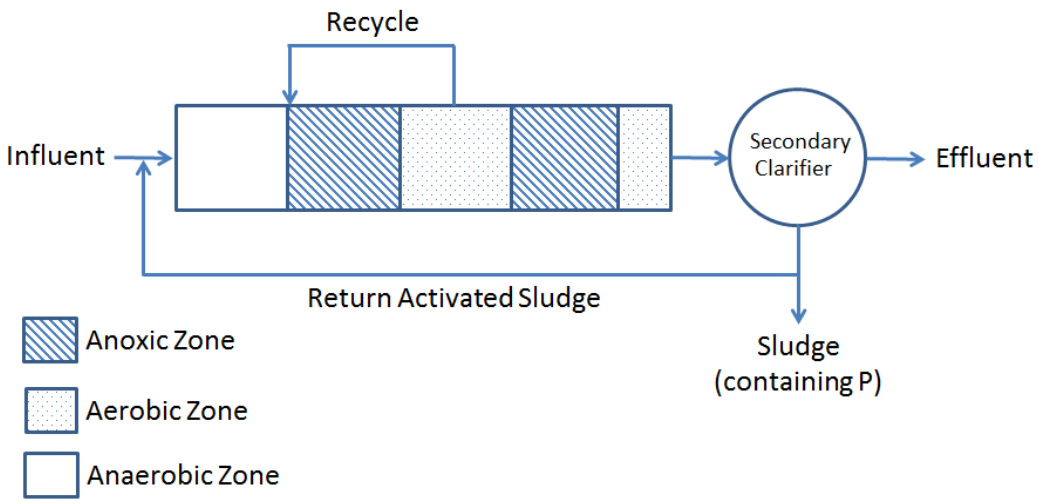

Figure 5-6 Modified Bardenpho Process (5-Stage)

The A2/O process, shown in Figure 5-7, has a single anoxic zone, can achieve 5 to 7 mg/L total nitrogen.

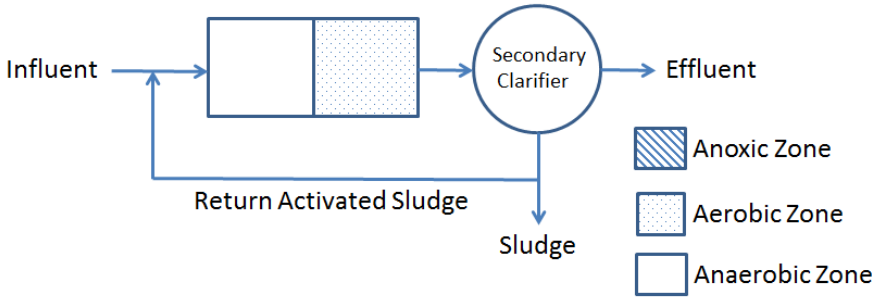

Figure 5-7 A2/O Process

The VIP (Figure 5-8) and UCT processes (Figure 5-9) are similar in that they were developed to optimize phosphorus removal. By providing multiple recycles for various zones, it is possible to achieve increased phosphorus removal.

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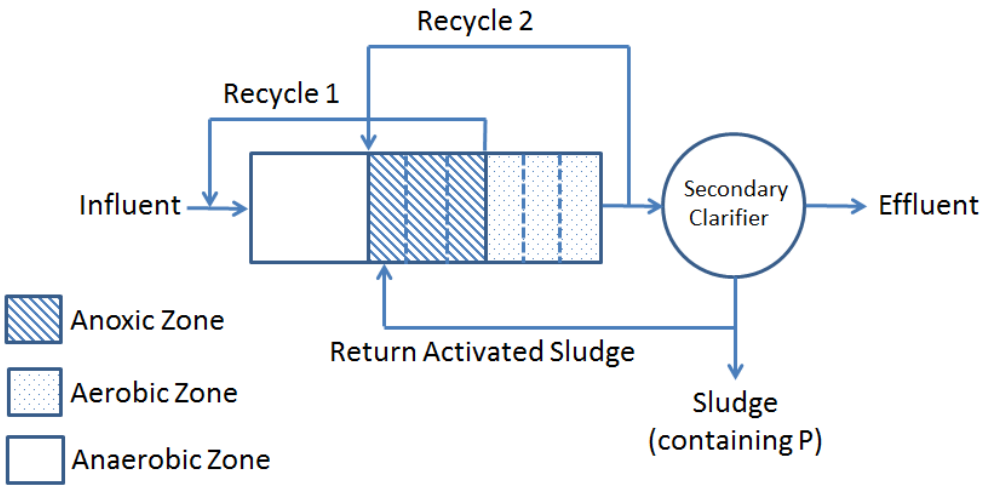

Figure 5-8 Virginia Initiative Plant (VIP) Process

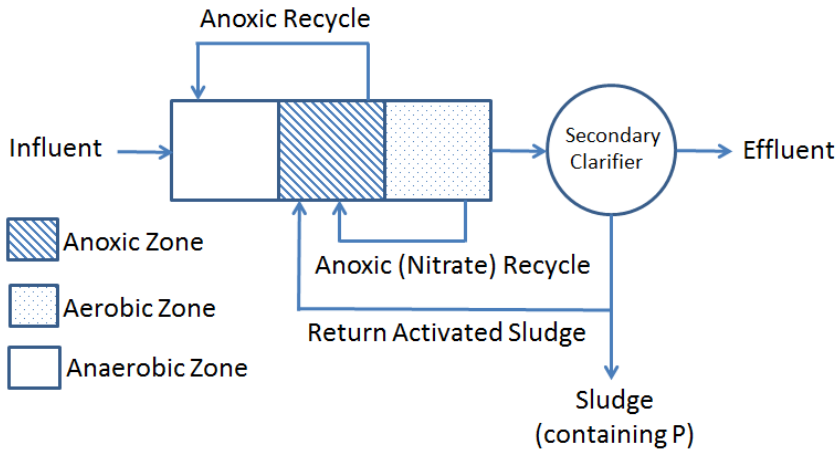

Figure 5-9 University of Cape Town (UCT Process)

Although the UCT and VIP processes have dual anoxic zones, they have not been capable of reliably meeting a total nitrogen limit of 3 to 5 mg/L on average.

Figure 5-10 illustrates the process schematic for two multi-stage nitrogen removal alternatives: the Modified Ludzack-Ettinger (MLE) process, which contains a single anoxic zone for pre-denitrification; and the four-stage Bardenpho process with two anoxic zones (one for pre-denitrification and the second for post-denitrification).

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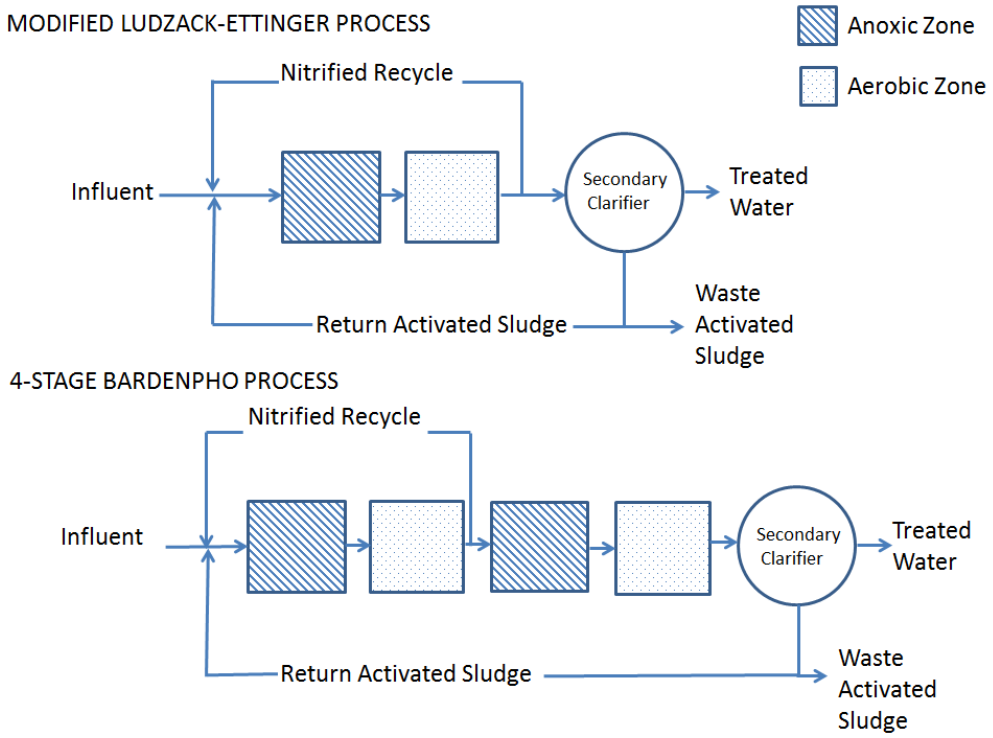

Figure 5-10 Multiple-Stage Processes for Nitrogen Removal

These processes are very similar to those discussed in the first section, but without the anaerobic zone for phosphorus removal.

The MLE process utilizes an internal recycle following the nitrification (aerobic) zone to return nitrates to the anoxic zone for denitrification. The recycle rate determines denitrification efficiency.

The four-stage Bardenpho process is similar but follows the nitrification zone with a second anoxic zone and a post-aeration zone. The second anoxic zone provides additional denitrification to achieve a higher level of nitrogen removal. Post-aeration is necessary to remove nitrogen gas formed during denitrification and to provide dissolved oxygen ahead of the clarifiers so that settling performance is not hindered.

A carbon source is required to allow denitrification to occur. In the first anoxic zone, BOD in influent wastewater or primary effluent provides the necessary carbon source for denitrification. In the second anoxic zone, due to the low BOD concentration remaining at that stage of treatment, either an external carbon source must be provided or carbon available from the products of endogenous respiration must be utilized. If an external source is utilized, such as methanol, a high rate of denitrification can be achieved, but residual methanol must be removed. This process is referred to as enhanced MLE (eMLE). Without an external source (Bardenpho), the denitrification rate is very low and the volume of the second anoxic zone must be substantially increased.

The MLE process is well proven and can reliably achieve an effluent total nitrogen level of 5 to 7 mg/L on average. The Bardenpho system can meet an effluent limit of 3 to 5 ml/l total nitrogen, but requires additional tankage due to the additional zones and more conservative design criteria; and it may require the addition of an external carbon source, such as

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methanol, and removal of residual methanol. The Bardenpho system can achieve an effluent total nitrogen of 3 mg/L on average if the effluent is filtered to remove fine suspended solids that contain small amounts of nitrogen. At this performance level (3 mg/L), it is classified as an ENR treatment process.

Multi-stage processes for nitrogen removal have the following advantages:

- Can reliably achieve 3 to 5 mg/L or 5 to 7 mg/L total nitrogen on average.
- Well developed, investigated and implemented with established design criteria and features.
- No significant environmental or public acceptance concerns.

They have the following disadvantages:

- Operational requirements require skilled staff to control the process.
- High energy usage with aeration requirements and recycle pumping.
- High capital costs for new tankage.

(continued)

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c. **Multiple-Phase/Cyclical Aeration.** Figure 5-11 illustrates two processes that utilize multiple phases for nitrogen removal in lieu of dedicated zones.

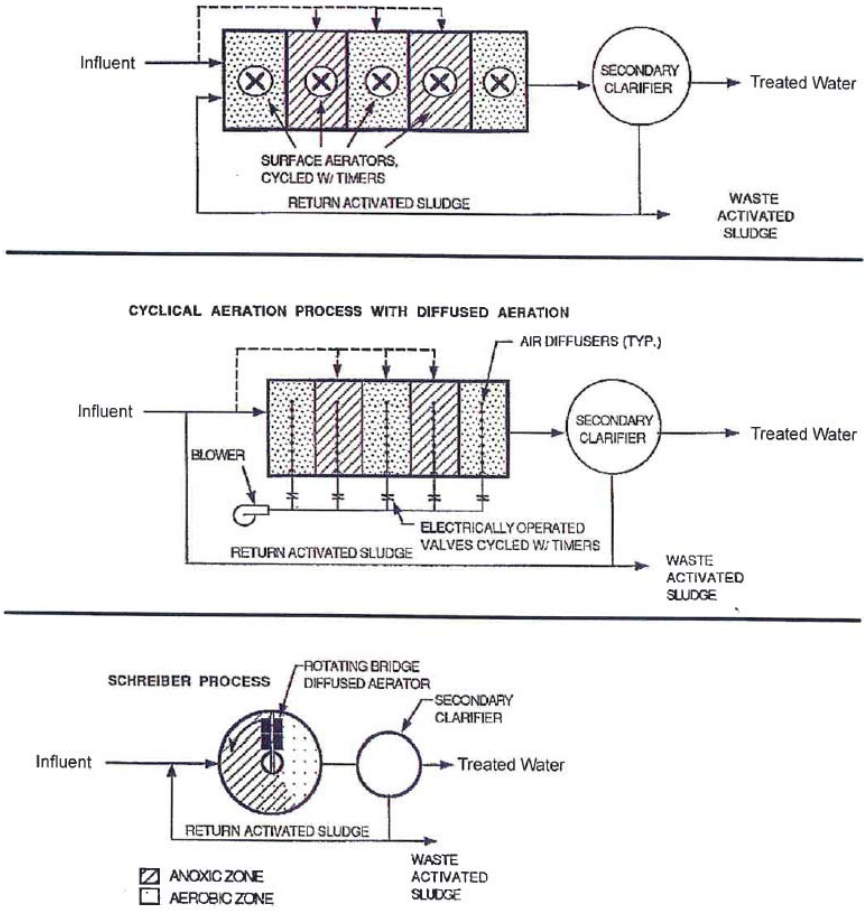

Figure 5-11 Multiple-Stage Cyclical Aeration

Alternating aerobic/anoxic conditions are created within the same zone or tankage. The first process is cyclical nitrogen removal (CNR), also called cyclical aeration, which can be used with mechanical aerators, submerged turbines, or diffused air. Timers are used with mechanical aerators to turn the aerators on and off, thereby creating alternating aerobic conditions for nitrification and anoxic conditions for denitrification. Preferably, there should be at least three compartments in series; the final compartment is aerated continuously. Step-feeding of influent flow can be utilized to provide a carbon source for denitrification in downstream compartments; but even without step-feed, wastewater carbon flows forward negating the need for a nitrate recycle to return nitrates to a dedicated anoxic zone. Internal recycle of nitrified effluent is not required since nitrification and denitrification occur within the same zone, although recycle can be provided for operational flexibility. Mixing is desirable during the aerator off cycle to provide good solids contact for denitrification. CNR can also be used with diffused aeration systems by providing electrically operated valves on the air headers or drop legs for each compartment to turn the air on and off.

Another multiple-phase system is the Schreiber process, which utilizes a circular tank and a rotating bridge with aeration diffusers. As the bridge rotates, aerobic conditions are created by aerating that portion of the tank, which gradually loses DO until anoxic conditions prevail,

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thereby creating alternating aerobic/anoxic phases in all portions of the tank. Internal recycle of nitrified effluent and step-feeding are not required.

Multiple-phase processes can achieve a nitrogen level of 8 to 10 mg/L in the effluent. These processes are well proven at operating installation. In terms of screening criteria, these processes would be very similar to the multiple-stage processes discussed, with some additional advantages and disadvantages. However, the CNR process and Schreiber process differ in situations involving retrofits to existing activated sludge plants. The CNR process can generally be retrofitted to existing tankage with minor modifications. The Schreiber process requires new tankage, and therefore, is more suited to new plants or plants without existing aeration tanks.

Multiple-phase processes have the following advantages:

- Can reliably achieve 8 to 10 mg/L total nitrogen.
- Well proven technology.
- No significant environmental or public acceptance concerns.
- Schreiber process is provided with process guarantee by the vendor.
- Internal recycle pumping of nitrified effluent is not required.
- Cycles can be varied to increase or decrease cycle times, thereby providing operational flexibility in optimizing the process.

Multiple-phase processes have the following disadvantages:

- Operational requirements are intensive to control the process.
- Energy usage is moderate.
- High capital costs for new tankage.
- The settling characteristic of the sludge is not as good as multi-phase processes with dedicated anoxic zones.

d. **Membrane Bioreactors:** Membrane Bioreactors (MBRs) are activated sludge processes that are typically configured as MLE or 4-stage Bardenpho processes for nitrogen removal. MBRs utilize membrane filter modules (instead of settling tanks) to separate the treated water from the suspended solids. They can provide an even higher quality effluent; typically 3 mg/L total nitrogen for a Bardenpho configuration with methanol addition. The membranes require special controls and cleaning procedures to provide long-term performance. Figure 5-12 illustrates how the membrane system and associated equipment is used to replace the settling tanks.

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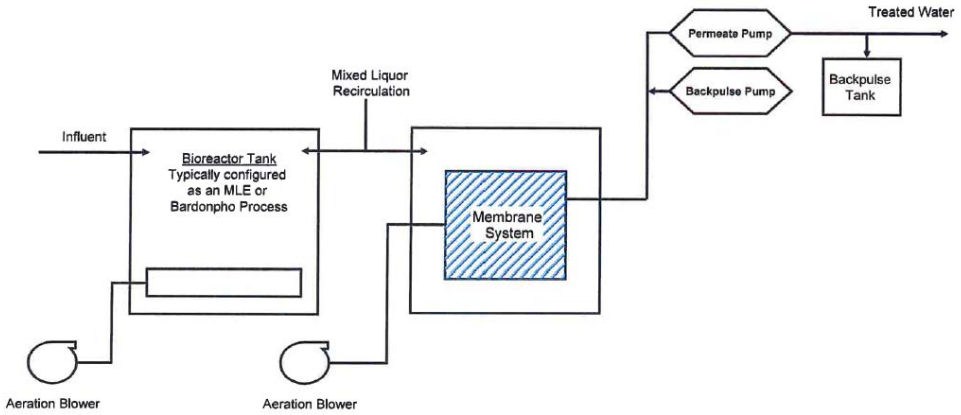

Figure 5-12 Membrane Bioreactor System

The MBR process has the following advantages:

- No final settling tanks are required.
- Effluent can potentially be reused for non-potable uses such as toilet flushing or irrigation because of the high degree of particulate removal.
- Can increase capacity of existing tankage by allowing a higher biomass concentration in the aeration tank.

MBR processes have the following disadvantages:

- Capital costs for the tankage and membrane facilities are high.
- Membrane replacement costs are high.

e. **Sequencing Batch Reactors:** SBRs consist of batch-type processes utilizing fill-and-draw operation (as illustrated in Figure 5-13) in a self-contained system.

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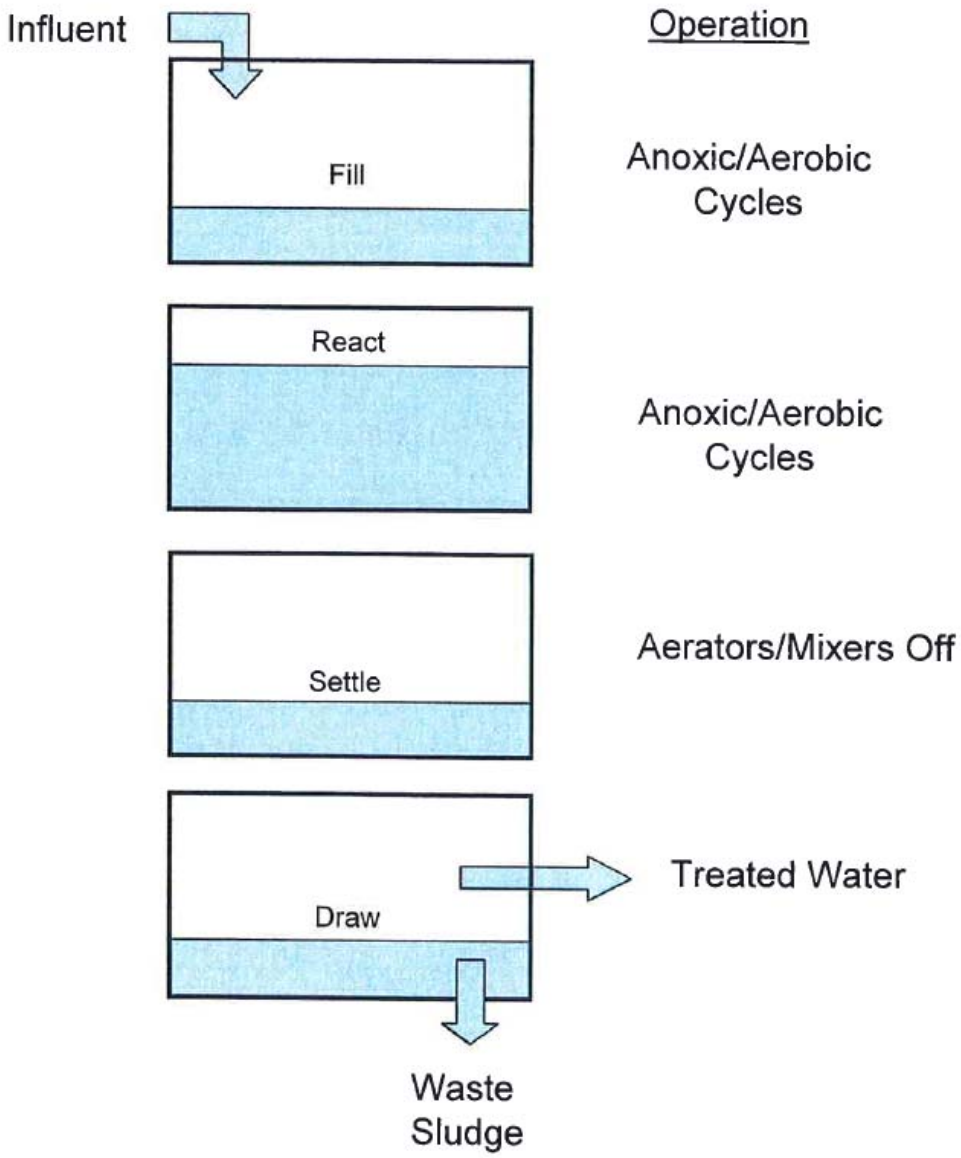

Figure 5-13 Sequencing Batch Reactor

Equalization, aeration, anoxic reactor, and settling are accomplished in a single basin. Continuous operation can be achieved by providing several SBR basins, such that each basin is intermittently fed, and in a different phase of the cycle. The various phases include fill, react, settle, draw, and idle. Wastewater is added during the fill cycle with and without aeration. During the react phase, nitrification and denitrification reactions are completed by alternating the aeration cycle. The next phase is settling for liquid/solids separation, followed by decanting of clarified effluent in the draw phase. During the idle phase, sludge wasting is performed while the basin is waiting to begin the next cycle. The length of the cycles can be varied to achieve the desired degree of treatment. Internal recycle and return of activated sludge is not required. A number of manufacturers have developed proprietary processes and equipment to enhance nitrogen removal, treatment efficiency, and simplify operations.

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The following is a listing of some of the more widely marketed systems:

- **Aqua SBR:** Utilizes a proprietary floating mixer, effluent decanter, and microprocessor control system.
- **Omniflow:** Utilizes a patented control system for aeration phases to optimize nitrification and denitrification cycles.
- **CASS:** Cyclic Activated Sludge System is similar to other SBRs but utilizes a proprietary selector reactor to improve settling characteristics.
- **ICEAS:** Intermittent Cycle Extended Aeration System is a modified batch system. Continuous influent flow is provided during all cycles to reduce the valving and headworks requirements compared to non-continuous flow SBRs. ICEAS also utilizes a patented anoxic selector.

A high level of nitrogen removal can be achieved due to the ability to retain the reactor contents as desired. Since settling occurs in the same basin, separate final settling tanks are not required.

SBRs have the following advantages:

- Batch operation allows reactor contents to be retained until desired effluent quality is achieved.
- RAS and internal recycles are not required.
- Settling occurs under totally quiescent conditions with no influent flow (except ICEAS), eliminating short circuiting.
- All phases are provided in a single basin, eliminating the need for separate final clarifiers, therefore they typically have lower capital costs.
- Highly flexible operationally with ability to adjust cycle times.

They have the following disadvantages:

- A sophisticated control system with valves, timers, probes, and level sensors is required to control intermittent feeding, cycle times, phases, and process performance.
- Downstream equalization typically required for cost-effective design of filtration and disinfection processes.
- Volume of reactor must be increased to allow for cycle times and use of basin for settling.
- High operating costs due to increased pumping.

f. **Magnetite Ballasted Settling.** Magnetite ballasted settling is a developing technology that is gaining popularity. The technology is patented by Cambridge Water Technologies (recently purchased by Siemens) with a system called BioMag. The BioMag process is an enhanced biological wastewater treatment process that uses magnetite, a common inert iron derivative, to increase the specific gravity of a biological flock. Magnetite addition allows for a higher mixed liquor suspended solids (MLSS) for a given clarifier area and also increases the treatment capacity of the biological tanks. A process schematic is shown in Figure 5-14. The majority of the magnetite ballasted sludge is returned to the front of the process through the return sludge line. Waste sludge is pumped through a shear mixer and then to a recovery

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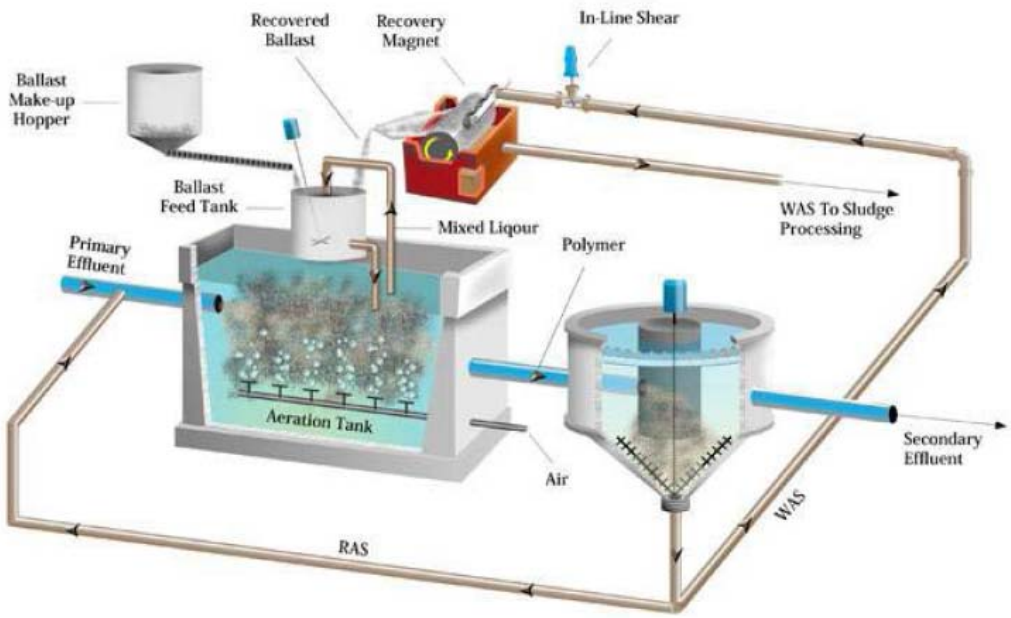
drum. In these two processes, the magnetite is removed and recovered from the sludge. The recovered magnetite is then blended with a small amount of fresh magnetite. This slurry is mixed with a diverted portion of the return sludge from the secondary clarifiers in the magnetite mix tank prior to return to the biological treatment trains. BioMag has indicated a recovery rate of over 95% of the magnetite material.



Source: http://cambridgewatertech.com/technology/biomag

Figure 5-14 BioMag Process Schematic

The system can achieve an effluent total phosphorus concentration as low as 0.2 mg/L without downstream filtration when operated within the operating parameters recommended by the manufacturers. A potential concern with this alternative is that there are only a few permanently installed systems for operational comparison.

Magnetite ballasted settling has the following advantages:

- Reduced amount of secondary clarifier surface area required
- Reduced aeration tank volume required

Magnetite ballasted settling has the following disadvantages:

- Greater mixing is required to keep mixed liquor in suspension
- Additional solids processing equipment required for removal and return of magnetite
- Limited approved sources of magnetite

g. **Multi-Sludge Alternatives:** Multi-sludge systems have also been utilized for nitrogen control. Two-sludge and three-sludge systems are illustrated in Figure 5-15.

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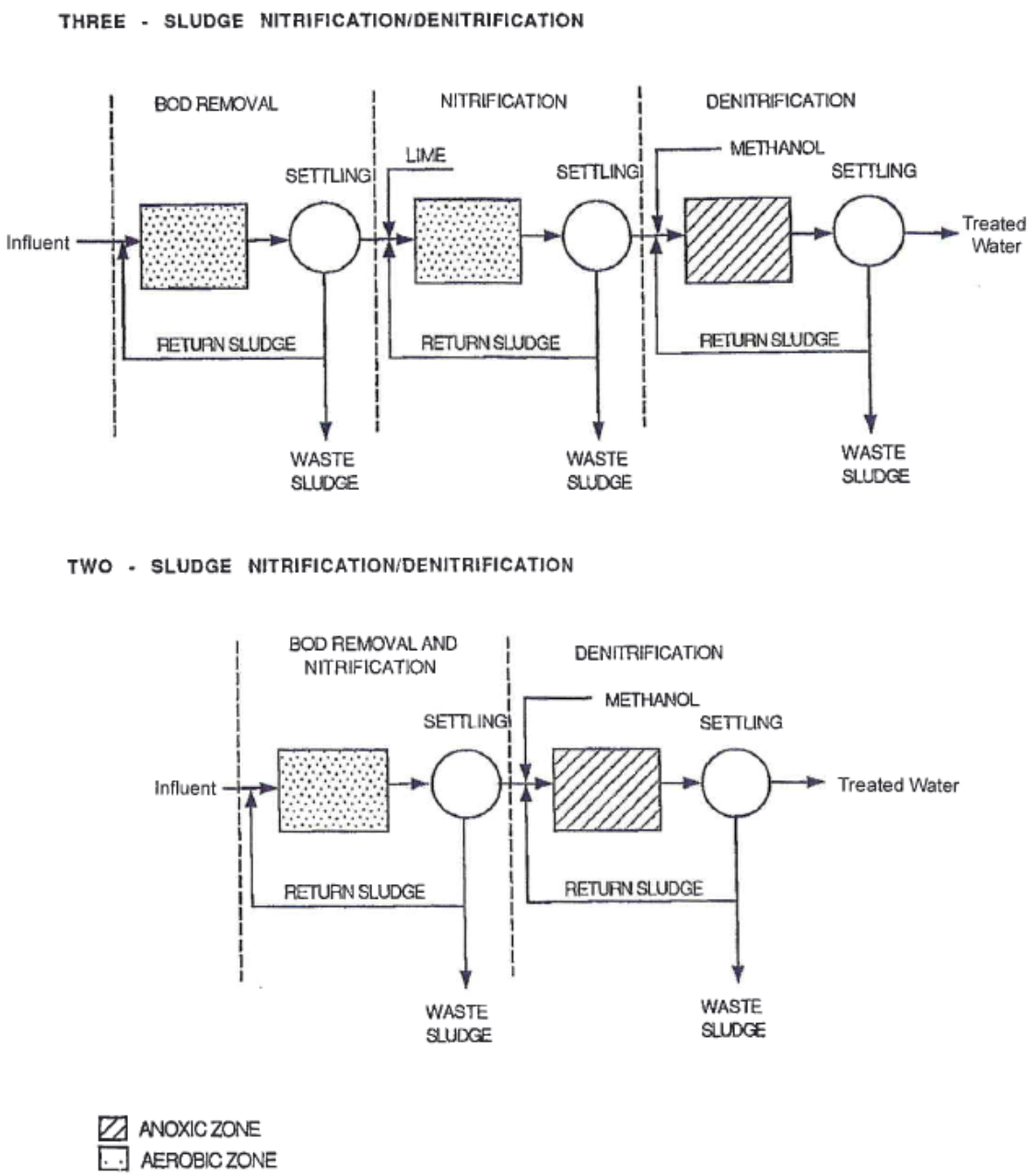

Figure 5-15 Multiple Sludge Processes

Contrary to single-sludge systems where processes are combined in a single step, multiple sludge systems separate process functions by utilizing intermediate clarifiers. A two-sludge system combines BOD removal and nitrification in one step, followed by suspended growth denitrification in a second step, each with its own clarifier(s). A two-sludge system combines BOD removal and nitrification in one step, followed by suspended growth denitrification in a second step, each with its own clarifier(s). Methanol or other carbon source addition is required for denitrification due to the lack of influent BOD available following the first step. A three-sludge system further separates BOD removal and nitrification, as well as denitrification, thereby requiring a third set of clarifiers.

Multiple sludge systems can achieve a high level of nitrogen removal and were often the process of choice used while single-sludge systems were under development. The thought

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was that by separating the processes, each process could be better controlled, compared to combining two or more processes. However, due to the limited solids production which occurs in nitrification and denitrification, process control of the solids inventory is more difficult. The need for one or two sets of intermediate clarifiers increases capital costs. The multiple steps result in higher hydraulic head losses. O&M costs are typically greater due to the additional clarifiers and process control requirements for each of the separate phases.

Multi-sludge systems have the following advantage:

- Individual processes can be controlled to maximize nitrogen removal.

They have the following disadvantages:

- More difficult and complex operational control requirements with two or more separate processes.
- Less benefit of BOD reduction and alkalinity generation with post-denitrification compared to single-sludge systems with pre-denitrification.
- More sludge production with separate-stage BOD removal.
- Larger land area is required for intermediate clarifiers compared to single-sludge systems.
- Methanol addition required with post-denitrification, increasing O&M costs.
- High capital costs associated with extensive new tankage.

3. **Attached Growth (Fixed-Film) Biological Wastewater Treatment**

Attached growth systems are wastewater treatment systems where the biological growth occurs on a solid medium that comes in contact with the wastewater. The systems are used for BOD removal, nitrification, and/or denitrification. BOD removal and nitrification can be provided by trickling filters, RBCs, aerated biological filters, packed beds, and fluidized beds. Denitrification can be provided by RBCs, packed bed, and fluidized beds. A special type of attached growth system located in an activated sludge, known as an Integrated Fixed-Film Activated Sludge (IFAS) process, is generally used for nitrification but could also be considered for denitrification. Fixed-film enhancement involves the placement of media, such as small plastic elements, sponges, or hanging rope-like strands, into suspended growth systems, thereby increasing the capacity of such systems by providing surface area for microbial growth or organisms, which increases the effective solids content in the reactor.

a. **Rotating Biological Contactor (RBC):** RBC units are attached growth systems that function as described previously. When RBC units are used for nitrogen removal, a separate submerged (anoxic) RBC follows the partially submerged (aerobic) RBC to provide denitrification and remove nitrogen to the 5 to 7 mg/L total nitrogen range. Methanol must be added to the anoxic RBC to assist nitrogen removal. This RBC process configuration is illustrated in Figure 5-16.

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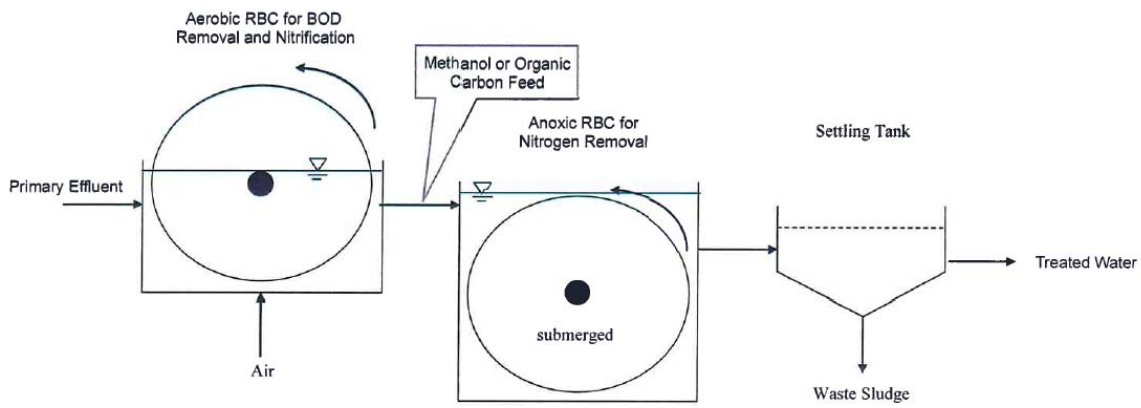

Figure 5-16 Rotating Biological Contactor

RBCs have the following advantages:

- The technology is used extensively for small treatment facilities and is well accepted by MassDEP.
- Energy requirements are low.
- Operational requirements are low.

They have the following disadvantages:

- Must be preceded by primary treatment.
- Must be followed by a final settling tank.
- Capital costs are high.
- Cold weather performance is a concern and the tanks must be covered.
- There is minimal process control and flexibility for high seasonal flows.

b. **Denitrification Filters:** Denitrification filters are a form of Biologically Active Filters (BAFs) which are operated anoxically for denitrification. They would follow the BOD removal and nitrification phase to provide separate-stage denitrification. A high level of nitrification would be necessary prior to the filters to achieve a low level total nitrogen discharge in the treated water. The general types of denitrification filters include: downflow packed bed systems, upflow media beds and continuous backwash filters.

Downflow Packed-Bed Denitrification Filters: Downflow packed bed systems are actually deep bed sand filters operated to encourage attached microorganisms to denitrify. A denitrification filter is used in conjunction with a nitrification step. Methanol addition is typically used to provide the carbon source needed for denitrification. The packed beds also act as effluent filters to remove suspended solids and improve effluent quality. Periodically, the beds must be backwashed similar to sand filters and must be bumped with backwash for a few seconds to release nitrogen gas which accumulates in the filter media and increases headloss through the media. Figure 5-17 presents a generic schematic for denitrifying filters.

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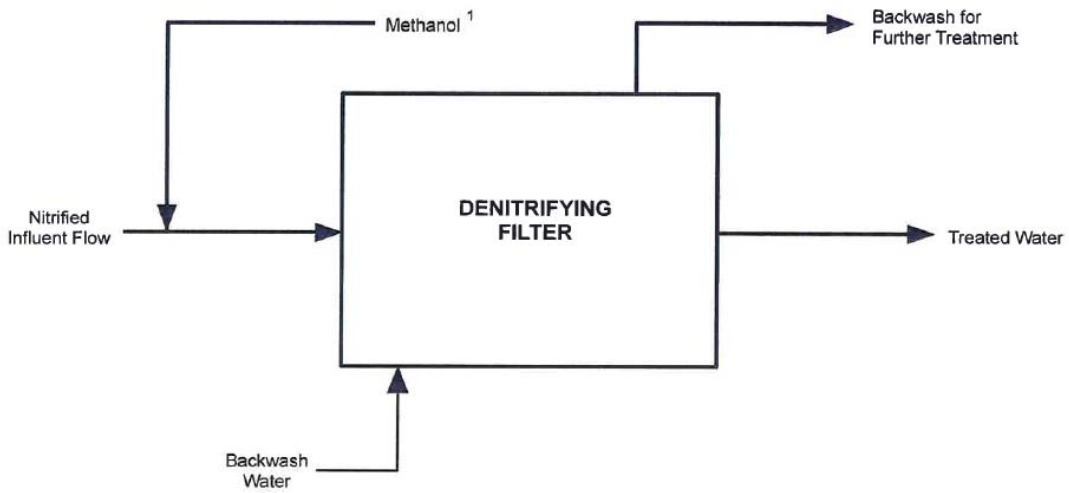

[1] Methanol addition is not needed for wood chip bed filters

Figure 5-17 Denitrifying Filter

Downflow packed-bed denitrification filter systems include proprietary systems such as the TETRA denitrification filter.

Upflow Denitrification Filters: Upflow denitrification filters include filters that use either media that is heavier than water (Degremont Biofor) or a floating plastic media (Kruger Biostyr). Denitrifying microorganisms attach to the media as nitrified effluent flows upward through the media. Reactor sizes and area requirements are small due to the highly effective biomass concentration in the column. Methanol addition is typically used to provide the carbon source needed for denitrification.

Continuous Backwash Filters: Continuous backwash filters consist of a column of sand media in which the nitrified wastewater is introduced at the bottom. The wastewater flows upward as the media flows downward and is discharged over a weir at the top. An air lift pump induces the flow which recirculates the media from the top to bottom and back. The media in this type of filter is continuously cleaned as it recirculates and thus a separate backwash cycle is not required. An example is the Parkson Dynasand Filter.

c. **Biological Aerated Filters (BAF):** BAFs consist of submerged filter media which allow biological growth on the media. The filters act as deep upflow beds with air injected either below the bed or at an intermediate point, depending on the treatment process. They are used mainly for BOD and TSS removal and nitrification of ammonia. A denitrifying filter is an anoxic form of the BAF and would typically follow an aerobic BAF for nitrogen removal. A primary clarifier is typically required as a pretreatment step before the flow goes to the BAF.

BAFs have the following advantages:

- Reliable technology for BOD and TSS removal and some nitrogen removal.
- Potential for air emission is minimal, as filters are enclosed in a building.

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They have the following disadvantages:

- High capital costs for primary treatment and the BAF.
- Cold effluent wastewater temperatures may impact the nitrification process.

d. **Integrated Fixed-Film Activated Sludge (IFAS) Systems.** IFAS technologies involve the addition of media for fixed-film growth in activated sludge aeration basins to increase the nitrification capacity. Depending on the type of media, IFAS can also be used for denitrification. Figure 5-18 presents a generic schematic for the fixed-film activated sludge technologies.

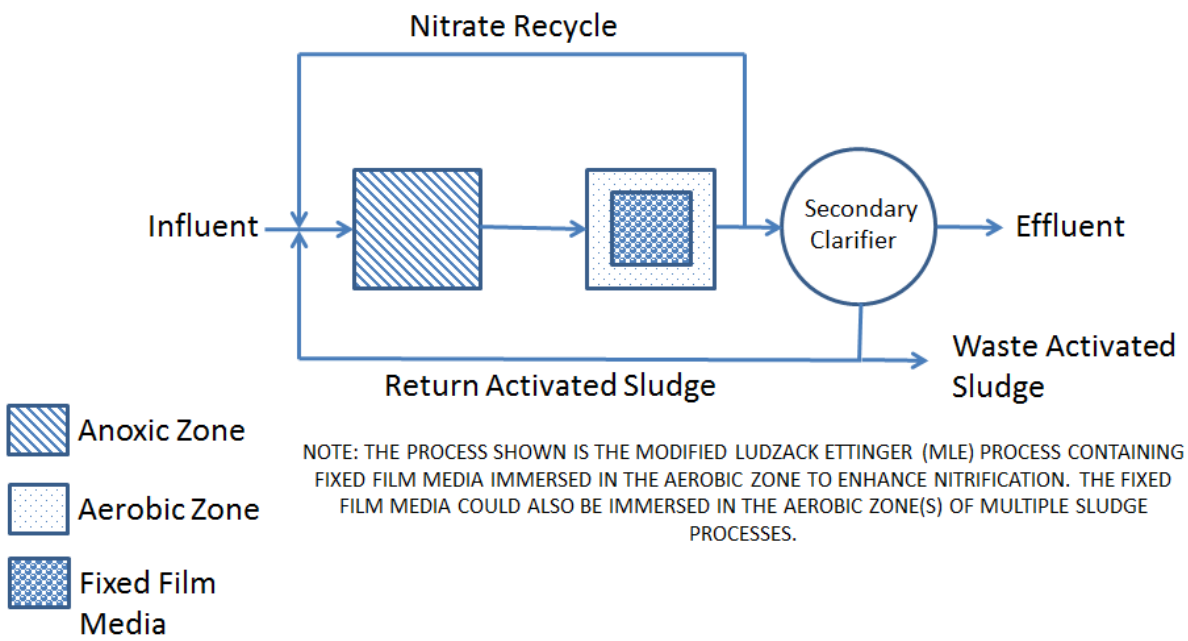

Figure 5-18 Integrated Fixed-Film Activated Sludge (IFAS)

Sponge-type media, or plastic media, are freely suspended by mixing in the aeration basin. The media is contained within the aeration basin by screens. Sponge media is typically returned to the head of the media zone by an airlift pump to prevent accumulation at the downstream screen. Another type of system, called Ringlace, utilizes ropes or strands of plastic material which are mounted in racks and placed in the aeration tank. The racks can be fixed or mounted on moveable rails to allow relocation of the racks to provide access to the air diffusers. Submerged RBCs and other types of large plastic media can also be used for fixed-film enhancement.

These systems have been thoroughly investigated and results have shown that they are highly effective and can be combined in various single-sludge treatment schemes to improve nitrogen removal performance.

Fixed-film enhanced systems have the following advantages:

- Can be utilized in a variety of treatment schemes.
- Shown to be highly effective in enhancing nitrification.
- Provides flexibility in operation and process control.

They have the following disadvantages:

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- Pilot testing may be required if wastewater has unusual characteristics.
- High material costs.
- Control of growths, such as nematodes, may be required (rope and sponge media).
- Replacement and maintenance of media is required (rope and sponge media).

IFAS systems are not a process by themselves, but enhance other processes and therefore must be included in the evaluation of other process schemes designed to meet the desired level of treatment.

Screening of Secondary Treatment Alternatives

The screening of secondary treatment alternatives is based on the description provided for each alternative, its advantages and disadvantages, and the screening criteria established in Chapter 2 of this report. A summary of secondary treatment alternative and a side-by-side comparison of screening criteria is included in Table 5-1.

Use of a biological phosphorus removal technology for Uxbridge is not recommended due to the facility size, operating complexity, and method of handling and disposing of the sludge generated as a result of wastewater treatment. Chemical treatment for phosphorus removal is already familiar to the operators of the facility and is recommended for further evaluation in combination with tertiary filtration, which is the least complex phosphorus removal option for the facility.

The following nutrient removal processes are recommended for further evaluation:

- Modified Ludzack-Ettinger Process (MLE) with chemical addition and filtration for phosphorus removal
- Magnetite Ballasted Settling Process with chemical addition and filtration for phosphorus removal
- Integrated Fixed-Film Activated Sludge (IFAS) with chemical addition and filtration for phosphorus removal

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5.5.4 Disinfection Alternatives

Introduction

This section presents several alternatives for disinfection which will be required by MassDEP.

Existing Infrastructure

The Uxbridge WWTF has two chlorine contact tanks. The tanks do not have adequate volume to provide the TR-16 recommended minimum thirty minute contact time during future peak flow events. The concrete tanks are in good condition.

"Fix It First" Alternative

Although the existing tanks are undersized to provide adequate contact time during peak flow events, the tanks could be expanded to provide adequate contact time.

Chlorination

Chlorination can be provided by the addition of a number of chemicals, including sodium hypochlorite, calcium hypochlorite, gaseous chlorine, bromine chloride, and chlorine dioxide. Use of

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either sodium hypochlorite or calcium hypochlorite for disinfection is very similar and involves storage and feeding of hypochlorites in solution form. Hypochlorites are hazardous and corrosive, but these chemicals are safer than gaseous chlorine with respect to storage and overall management. All chlorine compounds can combine with organic material and produce trihalmethanes (THMs), which are suspected carcinogens.

Sodium hypochlorite is the preferred method of chlorination and it is the current disinfection process at the Uxbridge WWTF. It has the following advantages:

- The process can be controlled for feed dosages and chlorine residual.
- Minimal energy use.
- Low O&M costs.

Use of chlorination for disinfection has the following disadvantages:

- A large contact tank is needed.
- The storage and handling of sodium hypochlorite can be a safety hazard.
- Sodium hypochlorite has a limited shelf life.
- Chlorine compounds can produce THMs

Ozone

Ozone has been found to be highly effective in disinfection and has few potential adverse environmental impacts on receiving waters and water supplies. Ozone must be generated on site, which normally involves the use of high voltage electrodes and pure oxygen. Ozone is then transferred from the gas phase to the liquid phase with diffusers and closed contactors. The off-gases from the contactor must be treated thermally to destroy excess ozone, which is toxic.

Ozone presents less environmental concern than chlorination because ozone rapidly dissipates to oxygen after application, leaving no ozone residual and adding dissolved oxygen to the treated water. Ozone can, however, produce toxic mutagenic and/or carcinogenic compounds. Unlike chlorine, ozone does not produce a disinfection residual concentration that can be measured and used as an indication of satisfactory disinfection.

The cost to produce ozone on site is high, resulting from the high capital cost of generation equipment and high energy requirements. Ozonation is labor-intensive because the system is complex and difficult to operate and maintain.

Disinfection with ozone has the following advantages:

- Ozone adds dissolved oxygen to the treated water.
- Fewer adverse environmental impacts as compared to chlorination.

It has the following disadvantages:

- Ozone is toxic, even though it rapidly dissipates to oxygen.
- High capital costs associated with generating equipment.
- High energy usage to generate ozone.
- Complex operation and maintenance.
- High O&M costs.

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- Can produce toxic mutagenic and/or carcinogenic compounds.
- Destruction of off-gases from the ozone contactors is required.
- Does not produce a monitorable residual.

Ultraviolet (UV) Radiation

Unlike the previous alternatives, UV radiation provides disinfection without the use of chemicals. UV light provides radiation which penetrates bacterial cell walls and viruses and kills them or prevents them from reproducing. No toxic residuals are produced. The UV bulbs are contained in racks or modules which are submerged in channels. Required contact time with the bulbs is short.

Suspended solids in the treated water can interfere with disinfection efficiency by preventing light transmission in the water; therefore, high quality treated water is required prior to the UV disinfection. The UV bulbs become dirty over time and must be periodically removed and cleaned, which is accomplished by dipping the rack of bulbs in cleaning solution or utilizing a submerged mechanical wiper blade system. The bulbs must be periodically replaced, which adds to the O&M costs; however, UV disinfection has been found to be cost competitive with chlorination.

UV disinfection has the following advantages:

- No adverse environmental impacts.
- Minimal space requirements due to the required short contact time.
- Ease of operation and maintenance.
- Cost competitive with other disinfection techniques.
- Well-proven effectiveness.

It has the following disadvantages:

- Suspended solids, turbidity, and color can interfere with the effectiveness of disinfection.
- High quality treated water is required prior to UV disinfection.
- Periodic cleaning and replacement of bulbs is required.
- Does not produce a monitorable residual.

Screening of Disinfection Alternatives

Table 5-2 presents a matrix summary of disinfection alternatives for further evaluation. The following alternatives are recommended for further evaluation:

- Chlorination
- UV Disinfection

5.5.5 Post Aeration

Existing Infrastructure

The Uxbridge WWTF has a cascade aeration system to increase the level of dissolved oxygen in the effluent. The present system is undersized and the facility has been unable to meet its effluent dissolved oxygen requirements on several instances during low flow summer conditions. Additionally, the system is within the 100 year flood zone.

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"Fix it First" Alternative

The existing cascade aeration system is undersized and within the 100 year flood zone. In order to re-use the system, several steps would have to be added and the walls of the structure would have to be built up above the 100 year flood zone. Adding steps to the existing structure is infeasible due to hydraulic constraints. Cascade aeration is an uncontrolled process, making it more difficult to ensure that a required dissolved oxygen level is maintained. Because the current system is undersized, uncontrolled, and in a 100 year flood zone, upgrading the cascade aeration process was not considered for further evaluation.

Mechanical Post Aeration

Mechanical post-aeration systems use a mechanical system to re-oxygenate wastewater. Available systems include fixed or floating mechanical aerators, fine or coarse bubble aeration, jet aeration, and pump agitators. Mechanical aeration is a controlled process. A mechanical post-aeration system would require the construction of a new tank downstream of the disinfection system. The tank could likely be located out of the 100 year flood zone.

Screening of Post Aeration Technologies

Mechanical post-aeration is the recommended alternative since the process can likely be located out of the 100 year flood zone and will provide better dissolved oxygen concentration control than a cascade aeration system.

5.5.6 Support Facilities

Existing Infrastructure

The Uxbridge WWTF has a plant water system and chemical feed system, which are considered support facilities. The mechanical equipment for both systems is well past its useful life.

"Fix it First" Alternative

The "Fix it First" alternative is to replace the mechanical equipment for both systems. This alternative is recommended for further evaluation.

Screening of Support Facility Technologies

The "Fix it First" alternative is recommended for further evaluation.

5.5.7 Residuals Management

Introduction

The purpose of this section is to identify and screen alternatives that could be used to properly treat and dispose of residuals from new wastewater treatment processes. Residuals are byproducts of wastewater treatment and are often difficult to handle, expensive to dispose of, and can be a source of odors. The following is a description of the various types of residuals associated with municipal sanitary wastewater.

1. **Septage**

Septage is comprised of wastewater solids that accumulate in septic tanks, tights tanks, and cesspools, and includes sludge, scum, and liquids.

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2. **Trap Grease**

Trap grease is the material that is periodically pumped out of restaurant grease traps and is a combination of solid floatable grease, settleable solids, and water. Trap grease is difficult to handle, difficult to dispose of, and should be isolated from wastewater treatment processes because it fouls piping, valves, and other treatment equipment.

3. **Wastewater Screenings and Grit**

Screenings and grit are byproducts of treating wastewater, septage, and trap grease. Screenings are large solid objects removed from wastewater in bar screens during preliminary treatment. Grit consists primarily of sand and gravel and is also typically removed during the preliminary treatment process. Removing screenings and grit from wastewater and sludge treatment processes is important to prevent damage to pumps, valves, and pipelines.

4. **Wastewater Sludge**

Sludge (also called biosolids) is the organic material removed from wastewater treatment processes. Wastewater sludge is solid material that settles by gravity in a primary wastewater treatment process, or is a combination of microorganisms and organic material generated in secondary/advanced treatment processes and effluent polishing processes. Sludge is produced as a liquid and typically has a solids concentration of 5,000 to 20,000 mg/L (0.5 to 2% total solids). It is typically thickened and disposed of at regional disposal facilities at a concentration of 5% total solids. Also, it can be dewatered and disposed of at regional disposal facilities as a sludge cake at a concentration of 20 to 25% total solids. It can also be dewatered and composted to produce a soil conditioner material of approximately 35 to 50% total solids.

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Existing Infrastructure

Primary and secondary sludge are thickened in a gravity thickener. A sludge holding tank is used to store waste activated sludge before it is pumped to the gravity thickener. The gravity thickener is adequately sized for future loads. All mechanical equipment is well past its useful life, however tankage concrete was found to be in good condition.

"Fix it First" Alternative

The facility could replace the mechanical equipment in the sludge holding tank and gravity thickener and continue to combine primary and waste activated sludge, and dispose of the thickened sludge at a regional facility.

Septage and Trap Grease Treatment and Disposal Alternatives

Septage and trap grease are collected from residences and commercial establishments and transported to the Uxbridge WWTF where they are treated. Septage is accepted from both within and outside the Town boundaries. Trap grease originating from outside of the Town is not accepted. The Draft Needs Assessment Report, Chapter 5, provides a detailed description of the septage treatment process at the Uxbridge WWTF. Septage treatment at the WWTF makes the best use of existing facilities and provides reliable service and flexible operation.

Septage currently goes through preliminary treatment and is treated with the facilities liquid process. The septage could also be treated in the solids process reducing the load to the facility. Handling septage with the solids process has the following advantages:

- Reduced capital cost for secondary treatment system expansion

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- Reduced annual operating cost for aeration
- Septage is not "handled twice" – as part of the liquid process and then again with the sludge stream
- Septage is typically easier to decant in a gravity thickener prior to processing

Handling septage with the solids process has the following disadvantages:

- Increased sludge hauling costs

In order to reduce the loading requirements (and associated system size expansion) to the secondary treatment process, the Town decided that septage should be treated with the solids process instead of with the liquid process.

Screenings and Grit Disposal Alternatives

Screenings and grit are typically generated during preliminary treatment and hauled off-site for disposal.

Sludge Processing Alternatives

Sludge is a byproduct of secondary/advanced wastewater treatment processes and must be treated properly to avoid odors, reduce disposal costs, and minimize potential risks to human health. The manner in which sludge is treated can have significant impacts on the liquid stream treatment performance and the efficiency of nitrogen removal. This is because of the interdependency of the liquid and solid streams through return flows and recycle streams. Sludge processing alternatives are divided into the following categories:

- Sludge thickening
- Sludge dewatering
- Sludge stabilization and composting
- Sludge disposal

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1. **Sludge Thickening**

Sludge thickening is a process to concentrate sludge by removing a portion of the liquid fraction. Sludge thickening reduces transportation and disposal costs and facilitates additional sludge treatment processes, including dewatering and stabilization/composting. Sludge thickening can be accomplished by several processes. The simplest thickening process involves storing sludge in an aerated tank and periodically stopping aeration to allow sludge to settle and excess liquid to be decanted. Other thickening processes utilize equipment such as filters, gravity belts, centrifuges, and rotating drums. Thickening with these types of mechanical equipment (mechanical thickening) often requires a covered process building, odor control facilities, and additional process equipment such as feed pumps and piping. Mechanical thickening also typically requires the addition of chemicals, such as polymer, to condition the sludge and facilitate the thickening process. The Uxbridge WWTF currently uses a gravity thickener to concentrate sludge. Sludge is hauled for off-site disposal at the New England Treatment Company sewage sludge incinerator in Woonsocket, Rhode Island.

2. **Sludge Dewatering**

Sludge dewatering is a physical process used to reduce the water content of thickened sludge. Dewatered sludge, also known as sludge cake, has the consistency of moist sawdust and requires

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less volume for storage or transportation to a disposal site. Dewatering processes include belt filter presses, rotary fan presses, centrifuges, and plant and frame presses.

3. **Sludge Stabilization/Composting**

Sludge is stabilized to reduce pathogens, odors, and the potential for the sludge to biologically decay. Sludge stabilization processes can be used prior to or following sludge dewatering. Common sludge stabilization technologies include composting, digestion, alkaline stabilization, and heat treatment and drying.

4. **Sludge Composting**

Composting is a biological sludge stabilization process that destroys pathogens, reduces the water and organic solids content of dewatered sludge, and produces a granular, soil-like material. Sludge composting processes typically include the following three steps:

- Dewatered sludge is mixed with a bulking agent such as wood chips, yard waste, or sawdust.
- The mixture is aerated or regularly mixed, which increases the temperature of the mixture, killing pathogens and degrading the volatile solids of the sludge.
- The composted material is cured and stored for distribution.

Finished compost can be distributed to the public if it meets criteria established by MassDEP regulations. Composting is typically most successful if the sludge to be composted has already been digested; because the material is partially stabilized, there is less potential for generation of odors, and the sludge is easier to handle. Although composting provides a beneficial reuse of sludge, it is usually not cost-effective for low sludge flows. Sludge composting facilities often consist of large covered structures to shelter the compost machinery and odor control facilities. Land areas and capital costs are usually relatively high for composting facilities.

5. **Sludge Digestion**

Digestion is a biological stabilization process that reduces the number of pathogens and the overall solids content of sludge through the use of microorganisms. The microorganisms feed on the organic material in the sludge and are utilized in two types of sludge digestion processes: anaerobic digestion and aerobic digestion. Digested sludge can be dewatered, composted, or disposed of at a regional facility. Anaerobic digestion produces methane gas that can be used as a fuel source.

Anaerobic and aerobic sludge digestion processes typically include two or more large covered tanks. Thickened sludge is fed into the tanks where anaerobic or aerobic microorganisms decompose the sludge. Mixing and aeration equipment is required to improve the digestion process and maintain either an anaerobic or aerobic environment. The digestion process also requires covered buildings to protect process equipment and odor control facilities. Sludge digestion is not cost-effective for small sludge flows.

6. **Alkaline Sludge Stabilization**

Alkaline stabilization is a process in which dewatered sludge is combined with an alkaline material, such as cement kiln dust or lime, to raise the pH, raise the temperature, and reduce the water content of the sludge. Raising the pH and temperature of the sludge creates an environment which is hostile for pathogen growth and reproduction. Alkaline stabilization, like composting, can produce a material that meets MassDEP's requirements for distribution to the public.

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The facilities required for alkaline stabilization include enclosed areas for storing alkaline materials, processing the sludge-alkaline material mixture, and storing the final product. Equipment requirements include screw conveyors for transferring the alkaline materials, a mixing unit that combines dewatered sludge and alkaline material, and a drying process for the blended material. Land area requirements and capital and operations costs are comparable to those of a composting facility. Alkaline stabilization is typically not cost-effective for small sludge flows in areas where there is not a strong market for the final product.

7. **Sludge Heat Treatment and Drying**

Heat treatment and drying are thermal stabilization processes that involve heating sludge under pressure to disinfect and dry the sludge. The resulting material is easier to dewater and may be dried to produce a powdered or pelletized product, which can be used as a fertilizer or soil conditioner.

These processes generally have high capital costs, high level of complexity, high energy usage and operation costs, and can be poorly received by the public due to air emissions.

Sludge stabilization has the following advantages:

- Certain processes, such as composting and alkaline stabilization, produce a material that can be distributed to the public, providing a beneficial reuse of the sludge and potential reduction of transportation and disposal costs.
- Processes are often easily expanded to accommodate increased sludge flows.
- These processes produce a sludge that is easy to dispose of because the sludge material is biologically more stable and less likely to decompose and generate odors.
- Anaerobic digestion produces methane gas which, if produced in large enough volumes, can be used as a supplementary energy source.

Sludge stabilization has the following disadvantages:

- Stabilization processes, particularly thermal processes, generate odors and require the construction of odor control facilities.
- High land area requirements to provide space for equipment and materials.
- Composting, alkaline stabilization, and heat treatment alternatives require extensive permitting and monitoring for MassDEP and USEPA approval prior to distribution of the finished material.
- Energy use for mixing and processing equipment would be high, resulting in high O&M costs.
- Requires high level of skill for operation and maintenance of the complex machinery.

8. **Thickening and Disposal at a Regional Facility**

This alternative would involve the transportation and disposal of thickened sludge at a regional facility. Primary and waste activated sludge could either be thickened together or separately. This would require the construction of sludge storage and thickening facilities. The Uxbridge WWTF has an existing gravity thickener that could be reused for this purpose. The thickened sludge would be transported to a regional facility for disposal. Thickened sludge is currently transported to the New England Treatment Company sewage sludge incinerator in Woonsocket, Rhode Island.

This alternative has the following advantages:

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- The sewage sludge incinerator in Woonsocket, Rhode Island is approximately 10 miles from the WWTF.
- Minimizes capital costs and equipment operational costs.

This alternative has the following disadvantage:

- Transportation costs for a highly diluted sludge stream.

9. **Sludge Dewatering and Disposal at a Regional Facility**

Using this alternative, the Uxbridge WWTF or a new facility would dewater the sludge and dispose of the sludge cake at a regional facility.

This alternative has the following advantage:

- Sludge stream would be less diluted.

This alternative has the following disadvantages:

- Belt filter presses or centrifuges are the most common and economical dewatering processes, but they are more expensive than simple thickening equipment.
- There are few regional disposal facilities that accept sludge cake and the cost savings with sludge cake disposal do not offset the higher cost to produce it.
- The sludge dewatering process provides a greater potential for release of odors.

10. **Sludge Dewatering, Composting, and Distribution to the Public**

This alternative involves the construction of sludge dewatering and composting facilities, with the primary goal to produce a material that could be distributed to the public. Although it is unknown if there would be sufficient demand for sale of these materials in Uxbridge, experience indicates that the public will pick up and use the material if it is free and of good quality.

Composting and distribution of compost would have the following advantages:

- The Town would not have to pay for sludge disposal.
- Beneficial reuse is provided.
- The Town has more control over sludge disposal and is not dependent on a regional sludge disposal facility.
- Sludge generated and thickened at multiple facilities could be dewatered and composted at one centralized location.

This alternative would have the following disadvantages:

- Construction and O&M costs are typically highest for this alternative.
- Regular sampling, analysis, and reporting to MassDEP is required.
- The potential for odors is increased and adjacent property owners may not welcome this type of process.
- High land area is required.
- It would be necessary to continue to transport sludge to this facility.

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11. **Land Application of Sludge**

This alternative involves the thickening and/or dewatering of sludge and subsequent spreading of sludge (in very controlled application rates) onto and into the land. The land is then seeded with an agricultural crop to utilize the sludge's nutrients and turn it into soil material. This type of sludge disposal is common in the Midwestern United States, where there are large farms that welcome the nutrients. It has also been used in other places to produce inexpensive topsoil for the construction of landfill caps.

Screening of Sludge Disposal/Reuse Alternatives

The screening of sludge disposal/reuse alternatives is based on the description provided for each alternative, its advantages and disadvantages, and the screening criteria established in Chapter 2 of this report. A summary of sludge disposal/reuse alternatives and a side-by-side comparison of screening criteria is included in Table 5-3.

Sludge thickening, which is the "Fix it First" alternative, is a relatively simple process with minimal operation, maintenance, and energy requirements and is retained for further evaluation. Thickened sludge can be disposed of at a number of regional facilities. Several of these regional facilities are in close proximity to the Uxbridge WWTF. Sludge from satellite or cluster facilities could also be collected and transported to the existing WWTF for thickening and disposal with the sludge generated at the facility.

Sludge dewatering and disposal at a regional facility is retained for further evaluation due to potential cost savings for transportation of a less diluted sludge.

Sludge composting has high capital and O&M costs due to construction of a covered building, high land area requirements, and the purchase and operation of complicated machinery. Public interest may be high in Uxbridge due to a design to reuse the sludge, but public acceptance is expected to be low due to the potential for odors, visual impacts both during and after construction, and a minimal market for distribution of the finished product.

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5.5.8 Odor Control

Introduction

Odorous compounds are present in all wastewaters. Compounds present in fresh wastewaters include skatoles which are organic compounds that give fecal material its distinctive odor. The compounds from wastewaters which generate the greatest number of odor complaints, however, come from conditions in which dissolved oxygen has been depleted from a wastewater, and it has become anaerobic or septic. Under these conditions, anaerobic bacteria metabolize elemental sulfur and sulfates to create hydrogen sulfide and mercaptans (sulfur-based organic compounds which have distinctive odors). There are many locations in which septic conditions can exist, including:

- Force mains with long detention times;
- Sediment deposits in slow moving portions of gravity sewers;
- Un-aerated holding tanks;
- Quiescent conditions, under which oxygen transfer is limited; and
- Sludge processing operations.

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Hydrogen sulfide is the most commonly known and prevalent odorous gas associated with wastewater treatment and collection systems. It has a characteristic rotten egg odor, and is corrosive to metals. It is also a precursor to the formation of sulfuric acid, which corrodes concrete, metals, and other materials. Hydrogen sulfide gas is highly toxic, and can pose a safety hazard to sewer and wastewater treatment personnel. Controlling the emission of hydrogen sulfide generated in wastewaters under these conditions is the key to controlling odors from them; hydrogen sulfide is easily detectable in low concentrations. It is hazardous in concentrations a few orders of magnitude higher than the detection limit, and when combined with moisture it creates sulfuric acid.

Odors emanate from various parts of a typical wastewater treatment facility. Some treatment processes have a greater potential for producing odors than others do; however, unit processes that have been found to have the highest odor producing potential are preliminary treatment processes which include grit removal and screening, primary clarification (especially around the effluent weirs), sludge holding tanks, and sludge dewatering. Processes with low odor-producing potential include the activated sludge process aeration tanks, secondary clarifiers, and effluent disinfection.

Existing Infrastructure

The facility currently does not have any odor control. The facility is not in a highly populated area and has never received any odor complaints. In its current configuration septage receiving is the most odorous process at the facility and is the only process that the Town expressed odor concerns about.

The following processes were not identified as being of concern for odors:

- Preliminary treatment – this was not identified as a source of concern
- Primary treatment – this is typically a low source of odors and was not identified as a source of concern
- Sludge storage – sludge thickener odors can be controlled by the addition of plant water to maintain fresh conditions.

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Fix It First Alternative

The fix it first alternative is to continue operation without any odor control.

Odor Control Alternatives

1. **Containment**

Enclosures or covers are used to contain odors. Dumpsters, hoppers, and certain types of equipment (such as dewatering equipment) can be enclosed, while tanks and channels are typically covered to contain foul air. Potential enclosure materials include block walls, lightweight fiberglass, or metal; the type of material used for an enclosure is specific to the application. Cover materials that have been used include coated concrete, polyvinyl chloride lined concrete, coated steel, stainless steel, aluminum, plastic, fiberglass, and fabric. Aluminum, fiberglass, and fabric covers are widely used as both tank and channel covers. Aluminum covers are lightweight, UV and weather resistant, and durable (expected to last at least 20 years). Fiberglass covers are also lightweight, UV and weather resistant, but they are more expensive and may be less durable than aluminum covers.

Circular primary clarifiers and gravity thickeners can be covered with either a domed or a flat cover. A domed cover allows access to the clarifier; but since it is considered an occupied space, the

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space requires a ventilation rate of twelve air changes per hour (ACH) per NFPA 820 standards. If all equipment is explosion proof, this option would require a high intermittent ventilation rate to accommodate occupancy. In addition to the higher ventilation rate, the total volume of air to be treated increases with a domed roof and thus a larger treatment system is required to treat the air. Although the capital costs of a dome cover may be less than a flat cover, when additional treatment volume is considered, the flat cover system is more cost effective.

A flat cover minimizes the amount of air to be treated from the tank. A flat cover does not allow entry into the tank, which can only be reached through access panels in the cover. Because it is not an occupied space a lower ventilation rate of six ACH can be used.

An alternative to covering and collecting the odorous air is to cover the tanks and provide as tight a seal as possible. This will contain most odors, until the cover is removed for inspection or maintenance at which time the build-up of odors will be released. Covering without collecting/removing the foul air can cause corrosion problems for metals and concrete due to the high concentrations of hydrogen sulfide gas that will accumulate. Thus, special coatings would be required to protect these materials. This practice is not recommended because of the potential for the release of strong odors during tank inspection and maintenance, and the potential for severe corrosion problems.

2. **Collection**

Ducts are used to convey odorous air from the source to the treatment unit. Materials used for ducts, which are large diameter pipes, include stainless steel, fiberglass reinforced plastic (FRP), and plastic. These ducts can be buried or elevated through supports.

Blowers/fans pull air from the odor source and deliver it to the treatment unit. The fans are sized to overcome the headloss in the air piping and in the treatment unit.

3. **Treatment**

The following technologies were considered for odor treatment and are described in detail below:

- Chemical Odor Control
- Packed Tower Scrubber
- Activated Carbon Filter
- Biofilter
- Activated Sludge Diffusion
- Specialty Types

Chemical Odor Control Technologies

Chemical odor control technologies fall into two categories: 1) oxidizers and 2) precipitators. Both of these technologies are discussed in the following paragraphs.

1. **Oxidizers**

Oxidizers are the most common type of odor control chemical. Potassium permanganate, hydrogen peroxide, sodium hypochlorite, and chlorine gas fall into this category. The chemical reactions and descriptions of these compounds are as follows:

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Potassium Permanganate. Potassium permanganate is available as a purple, crystalline solid, and oxidizes hydrogen sulfide through many reactions. The following equations represent the lowest and highest consumption rates per unit weight of hydrogen sulfide:

(1) $3H_2S + 2KMnO_4 = 3S + 2H_2O + 2KOH + 2MnO_2$

(2) $3H_2S + 8KMnO_4 = 3K_2SO_4 + 2KOH + 2H_2O + 8MnO_2$

Generally, several reactions between the two extremes may occur, yielding elemental sulfur, as in Equation 1; though thionates, dithionates, and manganese sulfate are other possible sulfur chemicals created, depending upon the characteristics of the particular waste stream. The lb/lb ratio of $KMnO_4$ to H_2S in Equation 1 is 3:1. In Equation 2, the ratio is 12.4:1.

Potassium permanganate is such a strong oxidant that it tends to react with any oxidizable substance, for instance, leaving little or no residual to react with sulfides as they are formed.

The advantages of potassium permanganate:

- No tankage required for storage.
- Can be transported in standard cars or trucks.
- Easily measured, mixed, and applied to odor-producing areas.
- Reacts quickly and thoroughly with water-borne sulfides.

The disadvantages of potassium permanganate are:

- High chemical cost per pound of hydrogen sulfide consumed.
- Effects of sulfide reduction are local: little residual effect downstream of application point.

Hydrogen Peroxide. Hydrogen peroxide is generally available in a 50 percent solution. It oxidizes sulfides to elemental sulfur, which is insoluble in water.

$H_2O_2 + H_2S = 2H_2O + S$

In addition to oxidizing sulfides, hydrogen peroxide also oxidizes organic compounds, such as mercaptans, reducing odor emissions. Hydrogen peroxide is such a strong oxidant that it tends to react with any oxidizable substance as it is introduced into a waste stream.

The advantages of hydrogen peroxide are:

- No chemical residuals.
- Small amounts of additional sludges produced when compared with precipitants.
- Moderate cost per pound of hydrogen sulfide consumed.

The disadvantages of hydrogen peroxide are:

- Special precautions required for storage.
- Effects of sulfide reduction are local: little residual effect downstream of application point.
- Chemical is very hazardous.
- Maintenance and repair of hydrogen peroxide systems require special training (most of the time, work is contract-operated by suppliers.)

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Sodium Hypochlorite. Sodium hypochlorite is available in solution, with the most common concentration being 13 percent as available chlorine. It oxidizes hydrogen sulfide through the following reactions:

- Dissociation of sodium hypochlorite in water into sodium hydroxide and hypochlorous acid

  NaOCl + H2O = Na+ + OH- + HOCl

- Oxidation of sulfur

  8Na+ + 8OH- + 8HOCl + H2S = 8NaCl + 6H2O + $SO4^{2-}$ + 6OH-

Theoretically, the lb NaOCl/lb H_2S stoichiometric ratio is 17.5:1; however, consumption of sodium hypochlorite by organic compounds present in the solution may increase the dosage ratio to 22:1 for complete oxidation of H_2S.

The advantages of sodium hypochlorite are:

- Highly effective as long as there is sufficient residual.

The disadvantages of sodium hypochlorite are:

- High expense per pound of hydrogen sulfide consumed.
- Requires additional tankage.
- Sodium hypochlorite loses its strength over time by releasing chlorine gas.

Chlorine Gas. Chlorine gas is a very strong oxidant and is typically used in water and wastewater disinfection processes. Chlorine gas is generally stored in gas form and dissolved in aqueous solution before application. Chlorine acts to oxidize hydrogen sulfide in the following manner:

$$HS^- + 4Cl_2 + 4H_2O = SO_4^{-2} + 9H^+ + 8Cl-$$

In accordance with the above equation, 8.3 pounds of chlorine is required for each pound of H_2S oxidized. However, due to interferences with other compounds, the ratio is typically slightly higher.

The advantages of chlorine gas are:

- Highly effective and very strong oxidant.
- Kills sulfate-reducing bacteria.

The disadvantages of chlorine gas are

- Chlorine gas is very dangerous and can be lethal.

2. **Precipitators**

The most common precipitators are iron salts: 1) ferrous sulfate and 2) ferric chloride. These are the least expensive of the chemicals used for sulfide control and are a byproduct of the steel finishing industry. They precipitate H_2S as ferrous sulfide. By taking dissolved oxygen from solution, the second part of each reaction creates ferrous hydroxide, which settles more readily.

- Ferrous sulfate $H_2S + FeSO_4 = FeS + H_2SO_4$
- Ferrous chloride $H_2S + FeCl_2 = FeS + 2HCl$

The reactions are similar for ferric chloride and ferric sulfate. The reactions are pH dependent and can reverse, releasing H_2S from solution if the pH becomes slightly acidic. Generally, the buffering capacity of wastewaters prevents this from occurring.

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If all the ferrous sulfate is not removed in primary settling, additional oxygen will be required to convert the remaining ferrous sulfate to ferric hydroxide. The process may deplete dissolved oxygen and can create a problem by creating a greater oxygen demand. If a surplus of iron salts is available, the reaction will continue as more H2S is produced by the anaerobes in the sewage, up to the point that all of the iron salts are used.

The advantages of iron salts are:

- Least expensive of all sulfide-consuming compounds.
- Iron sludges can enhance settling properties of existing sludges.

The disadvantages of iron salts are:

- Requires additional tankage and building for tank protection.
- Creates additional sludge for disposal.
- Corrosive to ferrous metals.
- Maximum practical reduction of hydrogen sulfide down to 1 mg/L in solution.
- Can result in excessive BOD removal in primary settling tanks which will impact BNR processes if overdosed.

Packed Tower Scrubbers

Packed tower scrubbers consist of an FRP or PVC tower, filled with plastic packing. A chemical solution is evenly spread over the top of the tower packing while the odor-laden air is introduced into the bottom of the tower and flows up, against the flow of the solution. The solution is a combination of a caustic (sodium hydroxide) and an oxidant (sodium hypochlorite). The caustic raises the pH of the solution, which increases its tendency to bring hydrogen sulfide and other odorous compounds into solution, and the odorous compounds are oxidized by the sodium hypochlorite. Solution is re-circulated back to the top of the scrubber. The pH is monitored to control the wasting rate of old solution and the addition of new solution. For the removal of ammonia gas, water is injected into a packed tower scrubber to force the ammonia into solution. All liquid waste products are typically sent back to the head of the plant for treatment.

Packed tower scrubbers are best for high strength odors. When they are used for low strength odors, the low strength odor may be replaced with a chlorine odor which, depending on the situation, may be nearly as objectionable as the original low strength odor. Therefore the technology is best suited for odors with an ED50 (Effective Dosage at 50th percentile) greater than 100.

The advantages of packed tower scrubbers are:

- Treats only the sulfides and other odorous compounds released to the air rather than the total sulfide content of the waste stream. Uses less chemical than waste stream treatment of sulfides.
- Able to treat stronger odors than either soil compost filters or activated carbon adsorbers.
- More space efficient than soil compost filter or tankage for liquid chemical feed.
- Does not need to be taken down for periodic regeneration or element replacement.

The disadvantages of packed tower scrubbers are:

- Not effective on low strength odors.

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- May give off slight chlorine odor.
- Requires heated area for chemical storage and sump.
- Not effective on odorous compounds which are not water soluble.

Activated Carbon Filters

Activated carbon filters remove odorous compounds from incoming air through adsorption. For the case of air containing high concentrations of hydrogen sulfide (5 mg/L or more), a caustic is added to the carbon to remove the hydrogen sulfide and prevent it from using all the adsorption sites on the carbon. The carbon must be regenerated periodically, or replaced if economics dictate. Life span is generally three months to a year for the carbon in a properly sized unit. However, unusually strong odors may considerably shorten the life of a carbon charge.

The advantages of activated carbon adsorbers are:

- Very effective on low strength odors.
- No chemical storage or feed required (except for regeneration.)
- Radial flow design requires small footprint.

The disadvantages of activated carbon adsorbers are:

- May not be effective on large-chain odor molecules.
- Requires periodic regeneration or replacement of activated carbon charge.
- High-strength odors may shorten the life of the carbon.

Biofilter

In a biofilter, odorous air flow passes through a media that supports biologically active organisms. Organisms specific for the degradation of the specific odorous compounds accumulate on the media and multiply. The biofilter can either be made of soil amended with compost to remove odors or a manufactured system that utilizes an inorganic media.

The process is more complex than any of the previously mentioned devices because, in addition to adsorption of odorous compounds by the media, odors are also removed biologically. Microbes inhabiting the media bed metabolize the odor-producing compounds adsorbed on the filter particles. To maintain the biological process, several parameters such as moisture content, pH, and bed density must be maintained within relatively narrow ranges. Moisture content is the most important parameter because if the bed is too dry, adsorption will not be possible and the biota will not survive; and if too wet, anaerobic conditions will be present in the bottom of the filter and it may become a source of odors itself. Biofilter leachate is collected and sent to the head of the plant for treatment.

There are two basic types of biofilter: 1) soil compost units and 2) pre-engineered units. Construction of a soil compost filter is fairly simple. It consists of a header and distribution ducts surrounded by crushed stone with approximately three feet of soil amended with compost, covered with chipped wood or bark to retard moisture escape.

The lifespan of a soil compost biofilter is approximately three to five years, after which the soil-compost amendment should be replaced. The ultimate determination of replacement time is by either increased headloss through the filter or by reduced effectiveness of the filter.

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The media in a manufactured or pre-engineered biofilter does not typically need to be replaced but does need to be supplemented with additional nutrients.

The advantages of biofilters are:

- Very simple technology.
- Very effective with low strength odors

The disadvantages of biofilters are:

- Requires large ground area for construction, except for pre-engineered units.
- Relatively sensitive to variations in pH and moisture.
- May not be suitable for very strong odors.
- Effectiveness decreases at low temperatures.

Activated Sludge Diffusion

In activated sludge diffusion the odorous air is piped, by ductwork to the WWTFs existing activated sludge tanks. Before the air enters the activated sludge tanks it needs to be pretreated through a series of filters and a moisture removal mechanism. The air then enters the tanks through diffusers, helping offset some of the air that is introduced to the system for aeration. An additional odor treatment system may also have to be implemented at the WWTF if the amount of odorous air is greater than what the activated sludge tanks can accept (especially when minimum air requirements are considered).

Specialty Types

There are various types of specialty odor control units. Purafil, for example, is a dry scrubber that converts odorous compounds into salts via chemisorption. This type of unit is commonly found in small installations such as at individual pump stations.

Screening of Alternatives

The installation of a bio-filter at septage receiving (and any other process that may be deemed to require odor control in the futue)) is recommended for further evaluation due to its effectiveness with low strength odors, simplicity and cost effectiveness.

5.5.9 Pump Station Alternatives

Existing Infrastructure

The existing collection system has five pump stations. The Main Pump Station, West River Pump Station, and Liberty Estates Pump Station are owned and operated by the Town. The former two were both constructed in the 1970's and have mechanical equipment well past its useful life. In addition, the West River Pump Station is in a 100 year flood zone.

Though the Town does not own either the Taft School or High School Pump Station, they provide monitoring services for both of them.

Alternatives for the two pump stations with identified needs are discussed below.

"Fix it First" Alternative

1. **Main Pump Station**

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The mechanical equipment is well past its useful life and needs to be replaced. However the building was found to be in good condition and could be reused. Reusing the existing building and replacing the mechanical equipment is recommended for further evaluation.

2. **West River Pump Station**

The mechanical equipment is well past its useful life and needs to be replaced. Additionally the structural integrity of the steel entrance tube is not known. During a flooding event water was observed entering the wet well through conduits and rising around the station to within a couple inches of the top of the entrance tube. Water also flooded the nearby Highway Department Building which houses the pump stations emergency generator and electrical equipment. Due to the unknown structural condition of the entrance tube, the "Fix it First" alternative of replacing the mechanical equipment in the station is not recommended for further evaluation.

West River Pump Station Alternatives

Since the structural integrity of the entrance tube is not known, replacing the mechanical equipment within the existing structure is not recommended for further evaluation.

The existing station is a wet pit/dry pit pump station. The station could either be replaced in kind or with another type of station, such as a suction lift station. The entrance tube to the new station will need to be designed to provide adequate freeboard in the 100 year floods zone. Additionally the electrical equipment and generator, currently in located in the Highway Department Building, need to be relocated out of the 100 year flood zone.

5.5.10 Screening of Alternatives

Main Pump Station

The "Fix it First" alternative is recommended for further evaluation.

West River Pump Station

Replacing the West River Pump Station in its entirety is recommended for further evaluation.

Liberty Estates Pump Station

The "Fix it First" alternative is recommended for further evaluation.

5.6 Satellite Wastewater Treatment

Satellite wastewater treatment facilities are typically designed to treat and discharge wastewater flows greater than 10,000 gpd and are typically of a size less than 300,000 gpd. These treatment systems serve many properties and require a wastewater collection system, as well as a treated water recharge system.

Satellite treatment facilities typically utilize processes that are compact in size and more mechanized than individual and multiple-home, on-site-type systems. These facilities can provide treatment that meets the Class I permitted standards of 30 mg/L BOD_5, 30 mg/L TSS, and 10 mg/L nitrate-N. They typically produce average total nitrogen concentrations in the 5 to 7 mg/L range. When properly designed and operated, they can provide even better treatment.

A satellite treatment facility typically incorporates aspects of both the individual home I/A systems and the larger scale centralized processes. A satellite system can either scale up an individual-

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home I/A technology for a larger flow scheme, or scale down one of the processes discussed in this chapter for a slightly smaller flow.

Since no concentrated, problematic areas for on-site wastewater disposal were identified in the Draft Needs Assessment Report it was concluded that the most cost-effective wastewater alternatives for properties not currently on the centralized system are to continue to utilize individual on-site wastewater disposal systems or to connect to the centralized system if the property is within close proximity of the existing sewer system (infill properties). However general indicators for potentially unsuitable areas for on-site wastewater disposal do exist. If, during future development, a concentrated area unsuitable for on-site wastewater disposal is identified, a satellite wastewater treatment facility could be considered.

5.6.1 Regulatory Impacts and Treatment Standards

Wastewater discharges greater than 10,000 gpd require a groundwater discharge permit under the Massachusetts Groundwater Discharge Permit Program and the Reclaimed Water Permit Program and Standards described in 314 CMR 5.00 and 20.00, respectively. These regulations were discussed in the Draft Needs Assessment Report. *"Guidelines for the Construction, Operation, and Maintenance of Small Treatment Facilities with Land Disposal"* have been published by MassDEP specifically governing these types of treatment facilities. These guidelines provide detailed design criteria for treatment and discharge facilities.

5.6.2 System Components for Satellite Wastewater Treatment Facilities

Several system components are common to all satellite wastewater treatment facilities. These components are required by MassDEP's design guidelines or are required as part of a well-equipped treatment facility that can be easily operated and maintained during its design life. The main components of a satellite wastewater treatment facility are very similar to the components necessary for a larger municipal (centralized) facility and are briefly described below.

Primary Clarifiers

Primary clarifiers are settling tanks that reduce the organic loading to the treatment process by removing settleable solids and floatable material. The raw wastewater flows through the clarifier (typically large septic tanks for satellite wastewater treatment facilities) and the solids settle to the bottom, where they are collected and removed for disposal. MassDEP's design guidelines require the installation of primary clarifiers on all small wastewater treatment facilities (some suspended growth processes, such as an SBR, may be an exception to this requirement).

Flow Equalization

Flow equalization is required to provide steady and relatively consistent daily wastewater flows and associated loadings to a satellite wastewater treatment facility. A flow equalization tank stores the variable flows that occur periodically during the day, and equalization pumps convey a relatively constant flow from the equalization tank to the biological treatment process.

Biological Nitrogen Removal

This process utilizes a large concentrated population of microorganisms to treat the wastewater. As discussed previously, these processes are categorized by the physical configuration used to promote microbial growth, such as suspended growth, attached growth, or a combination. Similar to larger municipal facilities, satellite treatment facilities may require chemical addition to accomplish the biological processes.

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Secondary Clarifiers

Secondary clarifiers are an integral component of some of the more common fixed-film and suspended growth nitrogen removal processes. These clarifiers are used to separate the biological solids (sludge) from the treated water, and they operate similarly to the previously described primary clarifiers.

Effluent Filtration

This is typically required by MassDEP following the biological nitrogen removal process. This process filters the treated water to remove most remaining particulate matter. The facilities include sand or other media filters and the necessary pumps and reservoirs to periodically backwash the filters and pump the dirty backwash water back to the biological treatment process. Depending on the technology/process chosen, effluent filtration is provided as part of the standard design or is not required due to the treatment process.

Effluent Disinfection

Disinfection may be required prior to recharging the treated water to the groundwater. Disinfection can be accomplished by any of the disinfection methods discussed previously. Disinfection is not typically required when subsurface leaching fields are used for recharge unless it occurs within a Zone II. Disinfection may be required when sand infiltration beds (open to the atmosphere), well injection, or recharge to a surface water body are used.

Treated Water Recharge

As with any treatment system, whether individual on-site systems, cluster systems, satellite systems, or large municipal systems, treated water needs to be recharged somewhere. Two methods are commonly used, including sand infiltration beds and subsurface leaching, although there are other options that are discussed in detail in Chapter 6. When sand infiltration beds are used, the treated water is piped to a sand bed, where the water percolates into the ground through the open sand surface. Maintenance of the beds is relatively easy and solids can be removed from the top of the sand beds. When subsurface leaching is used, the water is piped to a subsurface perforated drain field, where it percolates into the ground. Maintenance of these systems is more difficult because the leaching field is not exposed to the surface and solids cannot be easily removed. Leaching fields have the advantage of being able to be located under a parking lot or other large open area that may have another use; therefore, it could potentially require little or no additional space. The selection of treated water recharge facilities must be performed on a site-by-site basis.

Support Structures

An operations building is required to shelter process equipment, store supplies, and operate and maintain the various treatment processes.

5.6.3 Biological Nitrogen Removal Processes

Biological treatment processes are divided into two general classifications: suspended growth processes and attached film processes. A third classification, especially for satellite treatment facilities, involves a combination of one of the two processes with a physical process such as filtering. Plant based wastewater treatment systems can also be considered for satellite treatment facilities.

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Suspended Growth Biological Wastewater Treatment

Suspended growth processes use the concentrated microorganism population suspended in the wastewater via mechanical mixing or injection of compressed air. Carbonaceous removal, nitrification, and denitrification are accomplished in one or more tank compartments during the process, and the microorganisms are settled from the wastewater to be reused in the process or are removed for disposal. Typical suspended growth processes for satellite treatment facilities include general processes such as sequencing batch reactors or activated sludge processes.

Attached Growth (Fixed Film) Biological Wastewater Treatment

Fixed-film processes utilize a concentrated microbial population that adheres to a supporting media. The wastewater is circulated through tank compartments that contain the microorganism-coated media. At the end of the process, the wastewater is typically settled or filtered to remove any microorganisms that have sloughed from the media. Typical fixed-film processes for satellite treatment facilities include rotating biological contactors, recirculating sand filters, wood chip filters and I/A systems such as Bioclere®, Amphidrome®, and FAST systems. Descriptions of the majority of these technologies have been presented in Chapters 4 and 5. A description of wood chip filters and the Amphidrome System® is provided below:

1. **Wood Chip Filters**

Wood chip beds are a new approach to denitrifying filters that was developed for individual on-site systems but have since been used for a small number of small treatment plant applications. They are comprised of wood chips (or other forms of waste wood) impregnated with alkaline material. They do not need supplemental carbon addition because the wood chips provide the organic carbon for the denitrifying bacteria. Similar to other filters, they can provide a high level of nitrogen removal. Unlike other denitrifying filters, they do not provide much process control with respect to backwash or organic carbon feed rates. The wood chip beds do need to be replaced after time and because they are such a new and developing technology, the replacement time is unknown (10 to 20 years has been estimated). They include the proprietary system NITREX®.

Denitrifying filters have the following advantages:

- Reliable technology to meet a total nitrogen limit of 3 mg/L.
- Familiar technology, as it is similar to other types of effluent filters.
- No significant environmental or public acceptance concerns.
- Potential for air emissions is minimal, as filters are typically enclosed in buildings.

They have the following disadvantages:

- Moderate capital costs for new facilities and building enclosures.
- High O&M costs.
- Large headloss, necessitating pumping of effluent.
- Methanol addition and stripping are required for all but the wood chip filters.
- Wood chip filters provide little process control.

2. **Amphidrome® Process**

The Amphidrome® process is an attached growth, sequencing batch-type process designed for nitrogen removal at small treatment facilities. It uses relatively complex controls to circulate the

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water being treated back and forth through filter media as aerobic and anoxic conditions are being cycled. Figure 5-19 illustrates the configuration of this process.

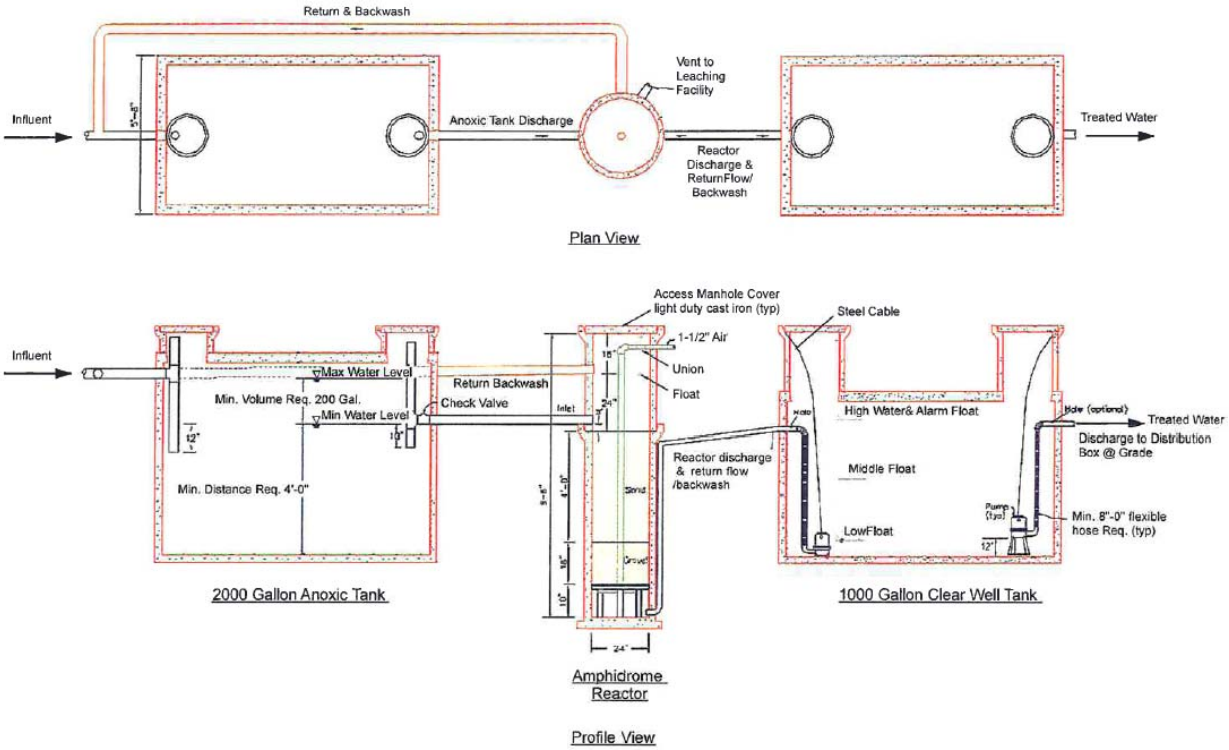

Figure 5-19 Amphidrome® System

The Amphidrome® process has the following advantages:

- No final settling tanks are required.
- Tanks are typically placed below ground; therefore, visual impacts are minimal.
- Allows secondary treatment and nitrogen removal in a single reactor.
- Potential for air emissions is minimal, as filters are enclosed and below ground.

The Amphidrome® process has the following disadvantages:

- It is a relatively new treatment configuration and there are few large installations to assess long-term performance.
- Large headloss and below-grade installation requires effluent pumping.
- Treatment flow is complicated and relies on automatic controls.

Plant-Based Wastewater Treatment Systems

1. **Hydroponic Systems**

Hydroponic systems involve the use of marshes, sunlight and naturally occurring plants, and bacteria and fish to remove nitrogen. Such systems are experimental and would need pilot testing. These systems have not yet demonstrated that a high level of nitrogen removal can be reliably achieved on a large or long-term scale. Approval of such systems by regulatory agencies at this stage of development is unlikely without extensive pilot testing.

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2. **Constructed Wetlands**

Constructed wetlands consist of an artificial biofilter (receiving water and vegetation) to treat surface and subsurface water flow. Vegetation used in treatment includes duckweed, water hyacinths, cattails, rushes, and reeds. Vegetation must be harvested to efficiently manage the system. Removal and disposal of the vegetation is a significant consideration in the design and operation of the wetland systems. Backup systems are required due to natural seasonal and decay cycles and to provide active treatment sites while harvesting. Treatment efficiency in northern climates may be subject to seasonal variations, thereby necessitating large storage basins. A diagram of a constructed wetland system is shown in Figure 5-20.

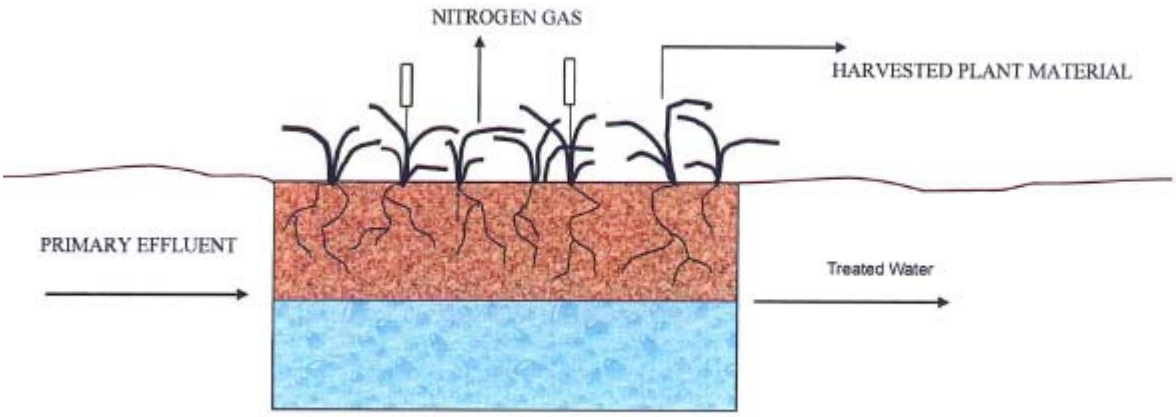

Figure 5-20 Constructed Wetlands

3. **Solar Aquatics**

Solar aquatic systems utilize greenhouses, fish tanks, wetlands, etc. for wastewater treatment. Wastewater is first allowed to settle to remove large solids and is then treated in stages with different types of living organisms, usually plants or algae. Sunlight is required to supply light to the plants and heat for the overall system. The final effluent is then discharged to a leaching area. A diagram of a solar aquatics system for large wastewater flows is included as Figure 5-21. Energy requirements are the main disadvantage when compared with other plant and biological systems.

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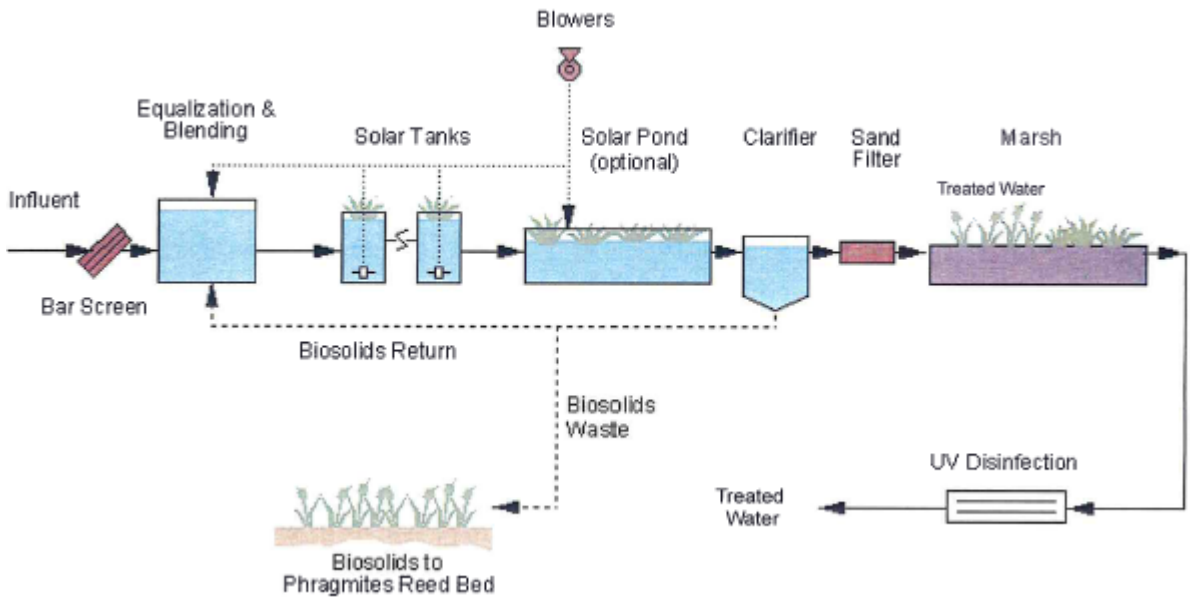

Figure 5-21 Solar Aquatic Systems

4. **Lagoons**

Lagoons are lined aerated ponds and could be considered for nitrification; however, they have a number of inherent limitations. Typically, lagoons have a detention time of several days; consequently, they are too large to be well mixed and active microorganisms are deposited on the bottom of the lagoon. There is insufficient contact of the nitrifiers with wastewater to obtain efficient nitrification.

Cold weather operation results in reduced performance due to decreased microbial activity. With long detention times, lagoon temperatures are less than those for activated sludge processes. Mixing and recirculation of effluent can be provided to improve performance; however, a large land area is required, and public nuisances and odors are a concern.

An aerated lagoon cannot be used for denitrification; therefore, a second process would be required following the lagoons.

Facultative lagoons with algal harvesting have the potential to remove nitrogen. The surface layers must be aerobic to achieve nitrification and the bottom layers and deposits must be anoxic or anaerobic to achieve denitrification. The algal biomass must be removed from lagoon effluent or will increase effluent solids levels above permit limits, necessitating effluent filtration or other effluent polishing steps. Solids accumulations in the bottom of the lagoon and pass-through of solids in final effluent have been a recurring problem with such systems in the part. A major design concern is operation in winter in northern climates due to the reduction in microbial activity and lack of process control to manage the system.

Plant and biological treatment systems have the following advantages:

- Appropriate for small rural communities.
- Typically require little operational control.
- Relies on use of natural ecosystems.

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- Minimal energy requirements (except for Solar Aquatics).
- Processes can have high public acceptance and appeal due to their use of plant material.

Plant and biological treatment systems have the following disadvantages:

- Large land area requirements due to long wastewater retention times.
- Cold weather performance is questionable.
- Design information and performance data are limited.
- Nitrogen removable efficiency is not readily predictable or controllable.
- Harvesting and disposal of vegetation is required.
- Prefiltration or effluent polishing may be required.
- Pilot testing may be required.

The advantages and disadvantages for the various systems and processes were discussed either previously in this chapter or in Chapter 4. The same advantages and disadvantages discussed in those sections would also apply here.

5.6.4 Residual Treatment and Disposal for Satellite Treatment Facilities

Satellite wastewater treatment facilities typically do not have sludge treatment or processing facilities. Liquid sludge is usually transported off site for treatment and disposal at a larger facility. The Uxbridge WWTF would be the probable destination for the sludge produced by a new small wastewater treatment facility, or the sludge could be shipped directly to a regional disposal facility such as Woonsocket, Rhode Island. A small quantity of screenings could be produced at a small wastewater treatment facility, and these screenings would be expected to be disposed of as a special waste in a regional landfill.

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5.6.5 Sizing and Land Area Considerations for Satellite Treatment Facilities

The land area required for a satellite wastewater treatment facility is determined by three primary factors:

1. Land area needed for process equipment and operations building.
2. Land area needed for treated water recharge facilities, such as sand infiltration beds or leaching beds.
3. The necessary buffer area to visually screen the facility from neighboring properties.

The land area of the process equipment and operations buildings is approximately the same for the different biological nitrogen removal processes identified. The RBC process may require slightly more area and the SBR process may require slightly less area, but these incremental increases are small when compared to the land area requirements for treated water recharge facilities and buffer area. Treated water recharge area requirements are based on the use of sand infiltration beds that require the least space and are the easiest to maintain. Subsurface leaching beds typically have a larger area requirement, but may have an advantage if they can be located under a parking area or other open space that has a multiple use. The buffer areas required for a particular small wastewater treatment facility will depend on the site selected and the neighboring properties. The buffer areas estimated are based on a separation distance of 100 feet between the property boundary and the process facilities. This separation distance is greater than the distances required

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by MassDEP's guidelines, but would allow space for a driveway access and sufficient planting to provide a visual screen from adjoining properties. Even greater space is often needed to gain approval from neighboring residential properties.

5.6.6 Evaluation of Satellite Wastewater Treatment for Use in Uxbridge

As documented in the Draft Needs Assessment Report, conventional Title 5 systems are expected to continue to provide adequate treatment for the portion of the Town that is not connected to the centralized collection system. The remainder of the technologies summarized in this section should be considered only if, during future development in the Town, concentrated areas are found to be unsuitable for on-site wastewater disposal through a conventional Title 5 system.

5.6.7 Identification of Wastewater Treatment Sites

Satellite treatment systems receive wastewater flow from many properties and would need to be sited in the neighborhoods and/or regions of the town that they serve. They may recharge the treated water at the same site where they are located or they could pump the treated water to a remote infiltration site.

The Draft Needs Assessment Report did not identify any concentrated, problematic areas for on-site wastewater disposal that may require a satellite system.

5.7 Alternatives for Treatment System Expansion and Upgrade at the Uxbridge WWTF

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As discussed in the Draft Needs Assessment Report, the Uxbridge WWTF was originally designed to provide treatment for a maximum monthly average wastewater flow of 2.5 million gallons per day and a peak hourly flow of 6.6 million gallons per day. Although this hydraulic capacity is adequate to meet the Town's projected wastewater treatment capacity needs through the year 2035, the facility was not designed to provide the degree of wastewater treatment necessary for consistent and reliable compliance with new effluent limits for total nitrogen and total phosphorus that have been added to the facility's discharge permit.

The new effluent limits will require additional wastewater treatment to reduce the maximum monthly average concentration of total nitrogen in the WWTF effluent to 8 milligrams per liter or less during the period of May 1 through October 31. For consistent and reliable compliance with the total nitrogen limit, the facility should be designed to provide year-round nitrification (ammonia removal). The reason for this is to avoid the need to reestablish nitrification in advance of the May 1 start date for nitrogen removal. Reestablishing nitrification in advance of May 1 would require an extended period of time due to the significant impact that cold wastewater temperatures have on the growth rate of bacteria responsible for nitrification.

In addition, the new permit effluent limits also require additional treatment to reduce the maximum monthly average concentration of total phosphorus in the WWTF effluent to 0.2 milligrams per liter or less during the period of April 1 through October 31. Consistent and reliable compliance with this limit will require a high degree of solids removal in addition to a significant increase in chemical addition for precipitation of phosphorus, which is largely present in soluble (dissolved) form in municipal wastewater.

Based on the screening criteria presented in Chapter 2, the following alternatives are recommended for further evaluation.

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Centralized Treatment

Preliminary Treatment

- Replacement of grinder and coarse bar screen with two fine screens and replacement of all other mechanical equipment that is well past its useful life

Primary Treatment

- Replace mechanical equipment well past its useful life in kind.

Secondary/Advanced Treatment

- A conventional approach that utilizes a suspended growth biological wastewater treatment process, such as the Modified Ludzack-Ettinger (MLE) or Bardenpho process (4-stage or 5-stage), coupled with dual point chemical addition for phosphorus removal and tertiary effluent filtration for enhanced solids removal. This approach is similar to the activated sludge process currently provided at the Uxbridge WWTF, but will require expanding the aeration tank volume and configuring the tanks to create "swing" zones that may be used as pre-anoxic zones during the portion of the year when nitrogen removal is required and as aerobic zones during the portion of the year when nitrogen removal is not required. In addition, because nitrogen and phosphorus removal has an adverse impact on the settling characteristics of the mixed liquor, the hydraulic and solids handling capacity of secondary clarifiers is typically less. Fortunately, the Uxbridge WWTF was designed with provisions for adding one additional secondary clarifier of similar size to the three existing clarifiers. For planning purposes, detailed evaluation of the alternatives will be based on costs for upgrade of the Uxbridge WWTF to an MLE process configuration. Based on the size of the existing aeration tanks and current site constraints, the MLE process configuration appears more suitable for the Uxbridge WWTF.
- An integrated fixed-film activated sludge (IFAS) approach that utilizes fixed-film media (fixed or floating) within the reactors (aeration tanks) to enhance biological treatment for nitrogen removal coupled with dual point chemical addition for phosphorus removal and tertiary effluent filtration for enhanced solids removal. This approach would reduce, or perhaps eliminate, the need for expanding aeration tankage by using fixed-film media within the aeration tanks to provide conditions suitable for the development of additional biomass necessary for year-round ammonia and seasonal nitrogen removal. Under this option it would still be necessary to reconfigure the tanks to create "swing" zones that would operate as anoxic zones during the period of the year when nitrogen removal is required and aerobic zones when nitrogen removal is not required. In addition, the construction of one additional secondary clarifier would also be needed.
- A high mixed liquor suspended solids concentration approach that utilizes a membrane bioreactor (MBR) or ballasted settling process, such as the BioMag® process marketed by Evoqua Water Technologies, to provide enhanced biological wastewater treatment for nitrogen removal coupled with chemical addition for phosphorus precipitation. This approach would reduce, or perhaps eliminate, the need to increase aeration tank volume by allowing for operation at high mixed liquor suspended solids concentrations. In addition, the cost of constructing an additional secondary clarifier would be avoided as a result of the use of membrane filtration or ballasted settling. For planning purposes, cost estimates will be developed based on a BioMag® installation.

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Each of the secondary/advanced treatment approaches selected for detailed evaluation will include costs for constructing a cloth media effluent filtration system for tertiary phosphorus and suspended solids removal. This system will include provisions for chemical addition for precipitation of soluble phosphorus and flocculation.

Disinfection

- Chlorination
- UV Disinfection

Post Aeration

- Mechanical post-aeration

Support Facilities

- Replace mechanical equipment that is past its useful life in kind.

Residuals Management

- Sludge Thickening
- Sludge Dewatering

Odor Control

- Installation of a biofilter

Pump Stations

- Replace mechanical equipment well past its useful life.

Satellite Wastewater Treatment Systems

Since no concentrated problematic areas for on-site wastewater disposal were identified in the Draft Needs Assessment a satellite wastewater treatment system is not recommended for further evaluation.

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6. Treated Water Recharge Technologies and Alternative Sites

6.1 Introduction

All wastewater treatment facilities (centralized, satellite, and cluster) require a means of recharging treated water back to the groundwater system, and the treated water recharge technology needs to be selected to minimize the impacts on nearby surface waters and groundwaters.

The Uxbridge WWTF currently has a surface water discharge to the Blackstone River, as allowed by its NPDES permit. This discharge will continue to be used in the foreseeable future. The following discussion is provided for future satellite facilities. As discussed in chapter 5 the Draft Needs Assessment did not identify any need for a satellite treatment facility. However, in the event of a future need due to remote, concentrated development or another future issue, options for recharge technologies for satellite facilities will be reviewed.

Potential impacts of large treated water recharge flows include groundwater mounding which may cause flooding on adjacent properties and an increase in pollutant concentrations in downgradient, or downstream, water bodies. As a result, the following items should be considered when identifying new treated water recharge technologies and sites:

1. The treated water recharge would preferably be located outside of a contributing area to a public water supply to reduce risks to public health; reduce the perception that “drinking waters would be contaminated by wastewater;” and reduce the cost of additional treatment technologies needed to permit treated water recharge in a water supply area.
2. When recharging to the ground and the groundwater system, treated water recharges must be located where the increased hydraulic loading will not cause flooding at the site or at adjacent properties. This requires sufficient separation between the ground surface and groundwater table so the resultant “groundwater mound” caused by the recharge will not break out above the land surface. Also, the soils at the discharge site must be sufficiently permeable to pass the treated water to the groundwater system without being backed up and flooding the site.
3. When discharging through the existing outfall to the Blackstone River, effluent requirements outlined in the NPDES permit must be met.

This chapter identifies and screens potential treated water recharge technologies, and identifies potential sites for more detailed evaluation in the next phase of the project.

6.2 Identification of Treated Recharge Technologies Used to Recharge to the Groundwater System

6.2.1 Sand Infiltration Beds

Sand infiltration beds are open basins designed to allow treated water to flow across the bottom of the basin and percolate through the sand bed, through the unsaturated zone, and then to the groundwater. Bed maintenance is relatively easy because the bed is exposed at the surface and the sand surface can be raked or replaced if the sand becomes plugged with fine solids. Hydraulic loading rates of 5 gallons per day per square foot (gpd/sf) of bed area are typically allowed by

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MassDEP unless hydraulic tests demonstrate a greater infiltration loading capacity at the specific site.

Treated water recharge in sand infiltration beds has the following advantages:

- Bed construction is relatively simple and typically less expensive than other methods.
- Operation and maintenance (O&M) is relatively easy and O&M costs are lowest.
- Hydraulic loading rates are typically higher than other recharge methods, which allow the beds to take up less area.

Treated water recharge in sand infiltration beds has the following disadvantages:

- Construction of new beds requires the clearing of large areas of land, which may have a visual and environmental impact.
- Infiltration beds do not have secondary uses, such as parking lots and recreational areas.
- Disinfection is typically required.

6.2.2 Subsurface Infiltration

Large–scale subsurface infiltration facilities typically utilize pump and piping systems to pressure dose infiltration areas (trenches, beds, or galleys) where the treated water percolates to the groundwater. Maintenance and cleaning of these systems is more difficult because the infiltration area is not exposed to the surface and effluent solids cannot be easily removed. Subsurface infiltration beds can have secondary uses, such as parking lots, lawns, playing fields, and recreational areas. Hydraulic loading rates of 2.5 gpd/sf (of trench or galley base plus side walls) are typically allowed by MassDEP unless hydrogeologic tests demonstrate a greater infiltration capacity at the specific site.

Subsurface infiltration facilities have the following advantages:

- Disinfection is typically not required prior to discharge unless it is in a water supply recharge area.
- Facilities are contained underground and can have a secondary use, such as parking lots and recreational areas.

They have the following disadvantages:

- Large land areas are required (larger than sand infiltration beds) due to lower hydraulic application rates.
- Pressure dosing is typically required for large systems, which adds capital and O&M costs.
- Extensive site work may be required for construction, particularly if the site is forested.
- Limited access for cleaning and maintenance which can result in high maintenance and repair costs.
- Effluent filtration is typically required to reduce the risk of plugging the subsurface beds over time. However, because effluent filtration and disinfection will likely be required by the discharge permit, this is not necessarily a limitation in this application.

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6.2.3 Spray Irrigation

Spray irrigation facilities are typically comprised of treated water pumps, distribution piping, and a spraying system consisting of risers and spray nozzles. Treated water is pumped through various distribution lines and discharged via spray nozzles to the surrounding surface area. Spray irrigation systems have often been used at golf courses and in large remote fields. Application rates for non-golf course areas are typically 2 inches per acre per week. Application rates for golf courses are typically based on the turf management needs.

Treated water recharge using spray irrigation has the following advantages:

- Allows for secondary use of land (i.e., golf courses) as regulated by MassDEP.
- Provides irrigation, reducing clean water demands.
- Provides nitrogen uptake by plant life and reduces need for fertilizers at golf courses.
- Evapotranspiration reduces infiltration volume, thereby creating less potential for groundwater mounding.

Treated water recharge using spray irrigation has the following disadvantages:

- Difficult to find locations suitable for or willing to use spray irrigation.
- Limited cold weather use due to potential freezing problems.
- Spray nozzles may be subject to clogging.
- Requires secondary means of treated water recharge or storage during winter months or at times when the sites' secondary use (i.e., golfing) is needed.
- Must meet more stringent MassDEP treatment requirements for reclaimed water use.
- Large areas are needed.

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6.2.4 Well Injection

Well injection involves the recharge of treated water to groundwater by pumping the treated water through wells that extend into permeable and saturated geologic strata. When discharged into saturated strata, this type of discharge can be compared to the reverse of extracting water from a well.

Wells can be designed to recharge a range of flows depending on site conditions such as depth to groundwater and geological conditions. A potential concern with well injection is the mounding of groundwater in low elevation areas. As a result, well injection requires testing prior to design and construction. This would include hydraulic conductivity tests, hydrogeologic surveys, and pilot testing.

Well injection for treated water recharge has been implemented on a limited basis throughout the United States, and there is limited information on the proper siting, design, construction, and operation of the wells. Discussions with MassDEP indicate minimal support for the development of this technology because it often utilizes chlorination, which can create secondary impacts to the groundwater such as the formation of disinfection byproducts that can pose potential health risks.

Treated water recharge with well injection has the following advantages:

- The land area required would be much less than the area required for infiltration beds, subsurface infiltration, and spray irrigation.

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- The treated water recharge would be occurring below the surface, causing minimal surface disruption.
- Recharge points (wells) could be spread over a large area to minimize groundwater mounding.

It has the following disadvantages:

- Total organic carbon (TOC) removal is needed to minimize plugging in the wells and to meet MassDEP regulations.
- Relatively unproven technology in Massachusetts.
- Energy costs for pumping are higher.
- Limited performance data is available.
- Extensive pilot testing would typically be required.

6.2.5 Wick Well Technology

Wick technology is a relatively new approach to treated water recharge. Wick technology entails the use of larger (3- to 6-foot diameter) wells dug into the aquifer. The wells are filled with stone; treated water is recharged over (or adjacent to) the stone to infiltrate via gravity flow into the underlying aquifer.

Treated water recharge with wick wells has similar advantages and disadvantages to injection wells. Advantages include:

- The land area required would be much less than the area required for infiltration beds, subsurface infiltration, and spray irrigation.
- The discharge would occur below the surface, causing minimal surface disruption.
- Discharge points (wells) could be spread over a large area to minimize groundwater mounding.

Disadvantages include:

- TOC removal is needed to minimize plugging in the wells and to meet MassDEP regulations.
- Relatively unproven technology in Massachusetts. Limited performance data is available.

A variation of this technology can be used to increase the capacity of sand infiltration beds. If the beds are limited with their infiltration capacity, wick wells can be installed in the beds to convey the water through the soil layers that have lower transmissivity. The upper layers of the bed will still be used for infiltration and initial filtering, and the filtered water will find the wick wells that will act as a drain to the basin.

6.2.6 Drip Irrigation

Drip irrigation is a subsurface version of spray irrigation. Subsurface piping is laid out approximately 6 to 12 inches below the surface in areas to be irrigated. Recharge of treated water occurs through emitters that are spaced 12 to 24 inches apart; the laterals are spaced at 12- to 24-inch intervals. Water is pumped through the lines under pressure and is discharged slowly through the emitters. The intent of the system is to recharge the water into the root zones of the plants where an irrigation and nutrient-uptake benefit can occur.

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Advantages include:

- Can be used in rolling terrain conditions.
- Is associated with water reuse because water can be recharged into the root zone of plants or crops.
- Ease of construction if the application is in a large vegetated area with fine-grained soils (few rocks).
- Low delivery rate to minimize water table elevation impacts.

Disadvantages include:

- Difficult to monitor emitter performance.
- Periodic backflushing is required.
- May not operate or be practical in very cold conditions.
- Facilities must be protected from damage from heavy vehicles.

6.2.7 Surface Water Discharge

This alternative involves the siting, construction, and operation of a new surface water discharge for effluent disposal into the Blackstone River or one of its tributaries in Uxbridge. This technology would likely have the least impact on drinking water supplies.

Treated surface water discharge has the following advantages:

- The land area required would be much less than the area required for infiltration beds, subsurface infiltration, and spray irrigation.
- Proven technology.

It has the following disadvantages:

- Extensive design and permitting requirements depending on the location of the discharge.
- Possible high public opposition.
- Potential reduction in aquifer recharge.
- Reserve area may be required.
- Effluent disinfection is required.
- Depending on site location could require a long force main to reach a discharge point.

6.3 Screening of Treated Water Recharge Technologies

The screening of treated water recharge technologies is based on a general description of each technology, the respective advantages and disadvantages, and the screening criteria established in this report. The following text provides a brief discussion of the screening process.

Sand infiltration beds are a simple and reliable effluent discharge technology with relatively low operating costs.

Subsurface infiltration facilities are well understood and reliable. These facilities are constructed below ground and therefore have minimal visual impacts, reduced potential for odors, and can provide for secondary use of the land. However, treated water recharge in subsurface infiltration

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facilities has higher land area requirements and the facilities are not easily cleaned. Therefore, the life of the facilities will be dependent on the quality of the effluent.

Spray irrigation and drip irrigation are simple and reliable treated water recharge technologies. In addition, they can provide nitrogen uptake and removal.

Treated water recharge through well injection has relatively low land requirements and construction costs. Well injection has the potential of plugging at the injection point due to build-up of fine solids and biofouling. MassDEP resistance to support and permit this technology reduces its feasibility. For this reason it is not recommended for further evaluation.

Treated water recharge through wick wells is a variation of well injection and has similar advantages and disadvantages. Both operational experience and regulatory acceptance of this technology are being gained in Massachusetts, and more complete acceptance is contingent on long-term demonstration of effectiveness. This technology is not recommended for further evaluation.

Treated surface water discharges have minimal land requirements and groundwater impacts.

The Uxbridge WWTF currently discharges through a surface water discharge to the Blackstone River, as allowed by NPDES Permit No. MA0102440. It is recommended that the Town continue to use this discharge for the Uxbridge WWTF.

The Draft Needs Assessment Report showed no concentrated, problematic areas for on-site wastewater disposal. However, since general indicators do exist in the Town, it is possible that during future property development, regions unsuitable for individual on-site disposal system may be found. If a new wastewater treatment facility (either centralized, cluster, or satellite) is being considered, the following treated water recharge technologies are recommended for further evaluation:

1. Sand infiltration beds
2. Subsurface leaching
3. Spray irrigation and drip irrigation
4. Treated surface water discharge

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7. Collection System Technologies

7.1 Introduction

The purpose of this chapter is to identify and screen collection system alternatives that could be used to extend sewer service. Although no environmental need was identified in the Needs Assessment, sewers may be extended to accommodate population growth in the future. A detailed description of the existing collection system can be found in Chapter 5 of the Draft Needs Assessment Report.

7.2 Collection System Alternatives

The layout and design of a collection system depends on several factors. The key factors include the type of collection system technology, the topography of the service area, utilities located in the road right-of-way (ROW), groundwater elevations, and the location of the treatment and treated water recharge site(s). Some of these factors will be decided at the end of this study, while many of the site-specific factors would be decided when a system is designed.

The installation of a wastewater collection system in the road ROW is disruptive to traffic activity. The use of trenchless technology to install a collection system must be considered during the planning and design processes to minimize disruptions. Trenchless technology is technology that allows installation of wastewater collection and transmission mains without digging a trench in the road ROW.

At the beginning of the planning process for a potential collection system, the system coverage must be estimated to calculate system length and system costs. Each type of collection system technology offers some flexibility on how (or where) individual sewers are installed, but the overall system coverage for the various technologies will generally be the same.

Several types of sanitary sewer collection systems are in use throughout the United States, each with advantages and disadvantages. Careful analysis must be performed during design in the area being sewered to determine the feasibility of a particular collection system. The purpose of this chapter is to identify and screen collection system alternatives which could be used to provide sanitary sewer service to the planning area(s) identified in the Draft Needs Assessment Report. This chapter presents several different types of collection systems and the associated advantages and disadvantages of each.

7.2.1 Gravity Sewers and Lift Stations

The most prevalent type of collection system is a traditional gravity sewer. This type of system involves the installation of sewers at a constant downhill gradient. The slope is designed to maintain a sufficient velocity within the sewer line to ensure that all solids stay suspended within the waste stream. The minimum size of a typical sanitary sewer is 8 inches. The pipe size increases proportionally with the expected wastewater flow.

The sewer is installed at a constant slope until its depth becomes so great that a sewage pumping station (lift station) is needed to “lift” the flow to a wastewater treatment plant or to another gravity sewer. In flat terrain, several lift stations may be required before the flow is pumped to a treatment facility.

In most situations, homes along a gravity sewer connect into the system with gravity service connections from the building to the collector sewer. Houses that are below the street elevation use

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small pumps and a small diameter force main (1½ to 2 inches) for discharging to the collector sewer.

The installation cost and ease of construction of a gravity sewer depends greatly upon the topography within a particular area and on the specific soil types. In areas where topography is consistently increasing or decreasing, the sewers can be installed close to minimum depth. In very hilly areas, deep sewers and/or lift stations may be required. This can significantly increase construction costs when compared with other options.

Advantages of gravity sewers include the following:

- A properly designed and installed gravity sewer requires little maintenance.
- A gravity system can be easily expanded to serve additional areas.
- The potential for odors in a properly designed gravity sewer is low.
- A gravity system is reliable, since it is not dependent upon electrical power for operation. When lift stations are used on collector sewers, electrical generators are provided to supply power during a power outage.

Disadvantages of gravity sewers include:

- Gravity sewers are installed at a constant slope, and thus can require deep excavations as the topography changes. They also have practical limitations in depth.
- If not installed properly, gravity sewers are prone to infiltration from groundwater, which reduces the wastewater carrying capacity of the pipe, increases pumping costs, and can affect treatment capacity and process effectiveness at the downstream treatment facility.
- May be limited by availability of appropriate lift station locations.

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7.2.2 Low Pressure Sewers with Grinder Pumps

This type of collection system requires the installation of grinder pumps to serve each building or group of buildings. Wastewater flows by gravity into a pump chamber, where the sewage is shredded and pumped into a low pressure sewer, eventually discharging to a gravity main or directly to a treatment facility. This type of technology has become more widely used over the past 10 years, and is particularly suited to areas where there is a need to minimize excavation.

The typical pressure in this type of system is 5 to 40 pounds per square inch (psi). Pressure systems can be expanded to serve additional areas up to a design limit of 60 psi. Typically, systems can be expanded to serve a large number of additional homes, but the overall expansion capability tends to be less than that of a gravity sewer.

When connecting the pressure sewer lines into a gravity line or directly to a lift station, odor control systems may be required at the discharge point to mitigate odors created in the pressure sewer pipe. Also, manholes at the discharge point should be protected from corrosion resulting from high hydrogen sulfide concentrations.

Advantages of a pressure sewer include the following:

- The collection main is installed at a relatively shallow depth and is independent of grade changes. This allows shallower excavation, lower piping construction costs, and less overall disruption to the area due to a shorter installation construction period.
- A pressure sewer can serve areas of hilly terrain or marginal slope.

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- The pressure sewer in the street is not subject to infiltration as a gravity sewer would be.
- The shredding action of the pump eliminates the need for a larger-size collection system. Pressure sewers tend to be much smaller diameter than a typical sanitary sewer, ranging from 1½ to 4 inches, depending upon the expected design flow.

Disadvantages to this type of system include the following:

- Each building or group of buildings in the system would have to be equipped with a pump unit, which increases operation and maintenance requirements. Spare parts must be maintained for these units to minimize disruption of service.
- Each pump unit is dependent upon electrical power for proper operation; since the pumps are located at individual homes, municipal backup electrical power is typically only provided with mobile generators. Storage capacity is typically built into each pump chamber (normally 60 gallons). However, in a prolonged power outage, it would be possible for the wastewater flow to exceed this capacity and back up into the pipelines within the structures. This can be remediated by providing electrical connections on each pump unit to allow a service crew to connect a portable generator (the mobile generators identified previously) and pump out each unit during times of prolonged power outage.
- This system is more sensitive to seasonal flow conditions than a gravity sewer. In areas with extreme seasonal fluctuations, minimum flow conditions must be carefully quantified to be sure the sewage flow can properly travel through the system. If inadequate flow exists, solids can harden within the sewer and cause blockages.

7.2.3 Septic Tank Effluent Sewers

Septic tank effluent sewers use either new or existing water-tight septic tanks and are designed to transport septic tank effluent to a treatment facility. The use of septic tanks prevents a large portion of solids and grease from entering the sewer.

Septic tank effluent sewer systems require septic tank maintenance, including routine pumping and treatment of septage. Each septic tank should be inspected during sewer construction to replace those tanks that provide inadequate service. Inadequate tanks include those that are prone to infiltration, are insufficient in size, have inappropriate inlets or outlets, or do not meet current Title 5 requirements.

When connecting septic tank effluent into existing gravity systems, odor control systems may be required at the discharge point and downstream pump stations to mitigate odors caused by the hydrogen sulfide content in the effluent. Manholes at the discharge point should be protected from corrosion, which can occur as a result of the high hydrogen sulfide concentrations.

There are two types of septic tank effluent collection systems: (a) septic tank effluent pump systems; and (b) septic tank effluent gravity systems. A discussion of each system is presented in the following sections.

Septic Tank Effluent Pump (STEP) System

The STEP system involves the installation of an effluent pump immediately downstream of the septic tank (or in the septic tank), which pumps the effluent to a pressure sewer. Thus, the system is very similar to a pressure system.

The STEP system has the following advantages:

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- The system can serve in areas of hilly or flat terrain.
- The piping can be installed at shallow depths, reducing construction costs and overall disruption associated with excavation.
- The pressure sewer in the street is not subject to infiltration, as a gravity sewer could be.
- Septic tank effluent pumps tend to be less expensive than grinder pumps because the need for a shredder is eliminated.
- Few solids are transported in the system, which reduces the potential for sewer blockages caused by solids deposition.

The STEP system has the following disadvantages:

- The septage must be periodically pumped from the individual septic tanks and transported to a WWTF for treatment.
- The system relies on electrical power to operate the pumps and will not function during power outages.
- A large number of pumps are required, which creates greater maintenance requirements of this system when compared to a gravity sewer.
- Hydrogen sulfide buildup is common within these pipelines, increasing the potential for odors and corrosion.
- A treatment plant that receives flow from this type of system must be carefully designed because it will not receive the higher organic loading that is needed for biological nitrogen removal treatment processes.

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Septic Tank Effluent Gravity (STEG) System

The STEG system can be used to transport effluent from septic tanks to a pumping station or treatment facility. Layout of the system is very similar to a gravity system.

Advantages of STEG sewers include the following:

- A flatter slope can be maintained in comparison with gravity sewers, because most of the larger solids have been removed in the septic tank. The flatter slope will allow the piping to be installed at shallower depths.
- The lack of solids allows smaller diameter pipes to be installed. Sizes typically range from 4 to 6 inches versus 8 inches or greater for a typical gravity sewer.
- Cleanouts can be installed instead of manholes, reducing installation costs.
- Very little maintenance is required on this type of system when compared to a pressure or vacuum system unless lift stations are used.

The STEG system has the following disadvantages:

- The septage must be periodically pumped from the individual septic tanks and transported to a WWTF for treatment.
- Hydrogen sulfide buildup is common within these pipelines, which increases the potential for odors and corrosion.
- They are not adaptable to hilly terrain.

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- A treatment plant that receives flow from this type of system must be carefully designed because it will not receive the higher organic loading that is needed for biological nitrogen removal treatment processes.

7.2.4 Vacuum Sewers

Vacuum sewers are typically smaller in diameter than traditional gravity sewers and rely upon a vacuum created within the pipeline to draw the sewage towards a lift station. A vacuum pump located at the lift station pumps air out of the sewer, creating a vacuum inside the sewer. Sewage from individual homes flows by gravity to a vacuum valve pit. As sewage fills a chamber in the bottom of the valve pit, a sensor activates an automatic vacuum valve. When the valve opens, sewage is drawn into the sewer because of the pressure difference between the sewer and atmospheric pressure outside the valve. Each subsequent opening of the valve draws the sewage further downstream until it reaches the lift station, where it is pumped to a gravity sewer or treatment facility.

Advantages of vacuum sewers include:

- Vacuum sewers can be installed at shallow depths, which can reduce installation costs and excavation time.
- The infiltration potential tends to be low. Infiltration can occur if a pipe leaks or breaks in areas where the line is completely submerged in groundwater.
- Vacuum stations can be equipped with emergency generators, which allow the system to remain in operation during power outages.

A vacuum system has the following disadvantages:

- A vacuum must be constantly maintained in the pipeline for the system to work. Malfunctions in the line can affect the entire system and must be fixed quickly to keep the system operational. Leaks or malfunctions may also be difficult to locate.
- There is potential for odor generation at the lift station due to the vacuum pump air flow. This air flow must be treated to minimize odors.
- This type of system is not readily adaptable to hilly terrain.
- To design a properly operating system, the design flows must be estimated as accurately as possible, and a detailed route survey must be performed. Vacuum systems are sized for specific cases and cannot be easily expanded to serve additional homes.
- Careful design of pipe materials is needed to avoid vacuum pipe breakage problems.
- Careful design of valve pit venting is needed to avoid valve freezing problems that have occurred in northern climates.

7.2.5 Combination of Technologies

In many cases, the combination of terrain, soil conditions, and congestion of an area prevents one single type of sewer system from being cost-effective. In these situations, the combination of two or more methods may achieve an optimum solution. The combination most widely used is pressure sewers discharging to gravity sewers.

In some cases, it is not feasible to combine methods due to the inherent characteristics of the specific technology. Septic tank effluent systems are designed to transport only liquids using a small

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diameter pipe. Thus, any other type of system which carries solids should not be able to connect into this system. Also, septic tank effluent systems are designed to lessen the organic loading to a treatment plant, and this advantage would be minimized if a septic tank effluent system discharged into a sewer carrying all the solids.

When considering a combination of technologies during design, a careful review should be made of the local conditions, and cost estimates should be prepared which include construction as well as operating and maintenance costs.

7.2.6 Screening of Collection System Technologies

The screening of collection system technologies is based on the description provided for each technology, the respective advantages and disadvantages, and the screening criteria established earlier in this report. A summary of collection system technologies and a side-by-side comparison of screening criteria are included in Table 7-1.

Wastewater collection with gravity sewers and lift stations is a widely used, simple, and reliable technology. The majority of the existing collection system in the Town of Uxbridge is comprised of gravity sewers. Gravity sewers can easily be expanded to accommodate additional flows. The relative cost of gravity sewers depends on environmental conditions and increases with the number of lift stations required and depth of excavations.

Pressure sewers are less widely used than gravity sewers, but have relatively low construction costs and are adaptable to changes in topography. Public acceptance of pressure sewers may be low due to the need for a pump at each individual home or business. In addition, pressure sewers rely on electrical power, and flow backup can occur during power outages if mobile generators are not utilized.

The main advantage of septic tank effluent systems (both STEP and STEG) is the reduced amount of solids transported in the collection system and the reduced potential for sewer blockage caused by solids deposition. Unfortunately, the lack of organic solids in the sewage delivered to the treatment plant will make the nitrogen removal process more difficult. These systems also require periodic pumping of the individual septic systems, which adds a high operational cost and potential for odor generation. They also do not lend themselves to being added to existing collection systems that transport all the solids.

Vacuum sewers have maintenance requirements similar to low pressure systems and require significant staff training for implementation and operation. Vacuum sewers are not easily expandable and require accurate flow estimates prior to construction. The capital costs of vacuum sewers are comparable to gravity systems.

The following collection system technologies are identified for possible future use in Uxbridge:

1. Gravity sewers and lift stations.
2. Pressure sewers with grinder pumps.

As discussed previously, these technologies are typically selected during preliminary design or detailed design of the system based on site-specific considerations of topography, depth to groundwater, potential traffic impacts, and flow variations in the neighborhoods being served.

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8. Flow and Loading Reduction Alternatives

8.1 Introduction

The identification of flow and loading reduction alternatives for water and sewer services is important in order to minimize the expense of new (or modified) facility construction. These alternatives can also conserve water and minimize impact to natural resources. Reduction of wastewater flows and loadings to on-site septic systems can also reduce the impact of pollutant discharges to groundwater and surface waters downgradient of recharge areas.

The purpose of this chapter is to review methods that could be utilized to reduce the wastewater volume and pollutant loadings generated by residential and non-residential sources.

8.2 Infiltration and Inflow (I/I) Reduction

8.2.1 Summary of I/I Evaluations

The 2006 I/I analysis conducted by Beta Group Inc. is described in detail in the Draft Needs Assessment Report. Though excessive infiltration rates were not found in the system the following recommendations were made at the conclusion of the report:

- Inflow investigation of two subareas to identify potential sources of inflow into the system.
- Repair select pipe defects identified in the report.
- Repair all manhole defects identified in the report.
- Conduct a Town-wide manhole inspection and repair program

It is recommended that the sub-areas identified in the 2006 report be investigated further. Though the estimated current I/I flows are comparable to those estimated in the I/I analysis, it should be noted that the analysis is approximately 10 years old and the system may have deteriorated further during the time that has elapsed since the study.

Regular cleaning, inspection, and maintenance on the collection system will help reduce I/I and maintain a high treatment capacity at the facility.

8.3 Reduction of Household Water Consumption

8.3.1 Plumbing Codes and Water Reduction Devices

Water use and wastewater flows from households may be reduced through the utilization of household water-saving devices. Some of the devices available are water saver toilets, reduced flush toilets, vacuum flush toilet systems, washwater recycling systems for toilet flushing, faucet aerators, flow limiting valves, and pressure reducing valves.

Approximately 70% of the total volume of wastewater generated within the average home is derived from the toilet, laundry, and bath. The most substantial water-saving and wastewater reductions can be made in these areas. Water saving toilets, reduced flush devices, and restricted flow showerheads are common water-saving devices.

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Water-saving devices are more expensive than standard fixtures and would probably not be installed by homeowners without external incentive. However, the use of such devices by individual customers should be encouraged in new construction or as replacements for improperly functioning devices. State building codes now require the installation of low-flow devices during new construction.

8.4 Pricing Policy for Water and Wastewater Service

Pricing policies for water and wastewater service are currently structured to discourage water consumption (wastewater generation). The Town plans to continue this current water pricing rate, which tends to encourage water conservation and therefore discourage water consumption.

The 2012 Massachusetts Water Conservation Standards recommend that water users be billed at least quarterly (if not more frequently) so that customers are better able to keep track of their water usage and seasonal variations in order to make adjustments to their water use accordingly. The Town of Uxbridge should continue its current practice of billing on a quarterly cycle.

8.5 Wastewater Reuse and Recycling

Lawns could potentially be watered with reclaimed wastewater to conserve the use of clean water and minimize the amount of treated water that needs to be recharged. Currently, reclaimed water use is regulated by MassDEP and the reuse of treated wastewater is allowed for irrigation, recreational use, industrial or commercial cooling or air conditioning, toilet flushing, agricultural use, creation of wetlands, commercial laundries, carwashes, industrial boiler feed, silviculture, snowmaking, fire protection, dust control, soil compaction, street cleaning, and aquifer recharge.

Golf courses and Town-owned properties can be irrigated with treated effluent if the effluent is adequately treated and proper precautions are taken to avoid human contact with the irrigation water, as regulated by 314 CMR 20 Reclaimed Water Permit Program and Standards. This approach conserves clean water that would have been used for this same use. However, it does not eliminate the need for other treated water recharge facilities, because redundant facilities are required when golf courses and public lands are being used by the public and during time periods when irrigation cannot be used.

Treated wastewater is often also used as process water for local industries. This scenario is not promising in Uxbridge, since there are no large industries that utilize large volumes of process water.

8.6 Reduction of Wastewater Loadings

The opportunities for reducing wastewater pollutant loadings are limited to the non-sanitary components of wastewater. The loadings associated with food wastes are added into wastewater when garbage grinders are installed in kitchen sinks. The wastewater loading associated with food can be significant. This load could be reduced by disposing of food waste as a solid waste or using a household composting unit. The use of garbage grinders in homes with septic systems contributes additional nitrogen to the groundwater and increases the solids loading to the septic tank, requiring more frequent pumping.

Commercial and industrial businesses may also have opportunities to reduce wastewater loadings to the Uxbridge WWTF (or their own septic systems) by reprocessing of non-sanitary waste byproducts from their operations. Individual businesses need to determine if any wastes could be recycled, reused, or disposed of as a solid waste instead of adding them to the wastewater flow.

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8.7 Waterless Toilets

Waterless toilets (composting and incinerating toilets) were discussed in Chapter 4. These toilets provide flow and loading reductions because they do not utilize water and they convert sanitary wastes to solid waste or to a usable soil conditioner. As discussed in Chapter 4, these toilets are not considered a feasible solution for watershed-wide application because there is usually poor public acceptance of handling composted or incinerated human waste. A public health threat could occur if the systems were implemented on a large scale without proper operation, management, and waste disposal. These systems may be suitable for isolated areas and informed individuals who are willing to take on the significant responsibility of the systems.

8.8 Growth Management Regulation

Following sewer installations in any of the planning areas, increased growth could conceivably occur as a direct result of the removal of the current growth limitation that on-site systems may have provided. Currently, Title 5 regulations control the number of bedrooms allowed per acre. If these areas are sewered, the Title 5 regulations may no longer apply. To counteract this potential increased growth, zoning modifications could be instituted to regulate development. These zoning modifications could include increasing the allowable minimum lot sizes and establishing restrictions on building sizes and uses.

The State Revolving Fund (SRF) regulations (310 CMR 44) encourage towns to adopt landuse controls to limit wastewater flows from sewered areas. These landuse controls are often called "Growth Neutral" or "Flow Neutral" requirements. The landuse controls are subject to review and approval of MassDEP in consultation with the Department of Economic Development (MassDED) as a prerequisite for a 0% low interest loan from the SRF. If the landuse controls do not meet MassDEP or MassDED requirements, the Town is eligible for a higher interest rate (typically 2%) depending on the other funding rules at the time of the SRF application.

These regulations are a result of the "Environmental Bond Bill" Chapter 313 of the Acts of 2008 (also known as the O'Leary Bill) to allow towns to receive 0% low interest loans for wastewater infrastructure projects that meet specific requirements such as the Flow Neutral requirement identified above. The four other primary requirements are:

1. The project must be primarily intended to remediate or prevent nutrient enrichment of a surface water body or a source of water supply
2. The applicant is not currently subject, due to a violation of a nutrient related total maximum daily load standard or other nutrient based standard, to a MassDEP enforcement order, administrative consent order or unilateral administrative order, enforcement action by the United States Environmental Protection Agency, or subject to a state or federal court order relative to the proposed project.
3. The applicant has a CWMP approved pursuant to regulations adopted by MassDEP.
4. The project has been deemed consistent with the regional water resources management plans if one exists.

Applicants need to demonstrate that they meet the five requirements through an application process. The Town has been evaluating this issue and is interested in adopting a sewer use regulation to limit future growth in the planning area. This work is ongoing.

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8.9 Summary

The Town of Uxbridge has policies in place that encourage the conservation of water. Opportunities to reduce wastewater loadings are mainly the reduction of food wastes or other non-sanitary wastes. Regular sewer inspections and repairs will help minimize I/I in the system. It is recommended that the Town continues with its policies encouraging water conservation and proceeds with Growth Neutral Controls.

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9. Alternative Plan Identification and Future Evaluations

9.1 Introduction

The first phase in developing a CWMP for the Town of Uxbridge involved assessing the Town's wastewater treatment capacity needs for the next 20 years. Findings, conclusions, and recommendations resulting from the assessment of wastewater treatment capacity needs were presented in the previously submitted Draft Needs Assessment Report. Major conclusions outlined in that Report are summarized as follows:

- Analysis of areas of the Town where sanitary sewer service is currently not provided did not identify any concentrated areas where on-site wastewater disposal appears problematic. The lack of specific indicators such as septic system failures or areas of impaired groundwater quality suggest that these areas appear to be suitable for continued long-term use of on-site wastewater disposal systems.
- Although analysis of wastewater flow projections indicates that the Uxbridge WWTF has sufficient hydraulic capacity to support population growth projections for the Town over the next 20 years, new effluent limits added to the facility's discharge permit by MassDEP will require upgrading the degree of treatment provided for removal of nutrients (nitrogen and phosphorus).
- In addition, now that the Uxbridge WWTF has been in service for more than 30 years, many of the mechanical and electrical equipment, instrumentation, and control systems are either approaching, or have already reached, the end of their useful life. Since buildings and structures still have significant value, replacement of the components that have reached the end of their useful life is recommended for continued long-term reliable and cost-efficient service.

This Alternatives Screening Analysis Report documents the second phase in developing a CWMP for the Town. Alternatives selected for further detailed evaluation will be evaluated in further detail in the next phase of CWMP development. The next phase will include analysis of estimated life-cycle costs for each alternative. Life-cycle costs will include estimates of initial costs for capital improvements as well as annual costs for long-term operation and maintenance. In addition, the further detailed analysis of alternatives will also consider non-monetary factors.

The purpose of this chapter is to summarize the alternative plans selected for detailed evaluation. In addition, the "no action" alternative is discussed for the purpose of identifying the monetary and non-monetary costs of doing nothing to address the Town's projected wastewater treatment capacity needs.

9.2 Discussion of the No Action Alternative

9.2.1 Areas of the Town Serviced by Centralized Treatment

The No Action alternative for centralized treatment involves continued long-term operation of the Uxbridge WWTF with no improvements to either upgrade the degree of wastewater treatment provided or to replace mechanical and electrical equipment, instrumentation, and control systems that have reached the end of their useful life.

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If no action is taken, the cost of operating and maintaining existing mechanical and electrical equipment, instrumentation, and controls will continue to become more difficult as equipment becomes obsolete and replacement parts become more difficult and costly to obtain. The frequency of equipment failures can be expected to increase, which will increase operating costs and make continued compliance with discharge permit effluent limits more and more difficult to achieve.

In addition, because the Uxbridge WWTF was not designed to provide the degree of wastewater treatment necessary for consistent and reliable compliance with the new effluent limit for total nitrogen and the more stringent effluent limit for total phosphorus, permit non-compliance can be expected. Permit non-compliance may cause or contribute to degradation of water quality conditions in the Blackstone River, which would likely expose the Town to potential legal enforcement actions by MassDEP, USEPA, and environmental groups.

For these reasons, selection of the No Action alternative for properties serviced by centralized treatment is not recommended.

9.2.2 Areas of the Town Which Utilize On-Site Wastewater Disposal

Under the No Action Alternative portions of the Town not serviced by centralized treatment would continue to utilize on-site wastewater disposal. Since the Draft Needs Assessment did not identify any concentrated areas of the Town that are problematic for on-site wastewater disposal the continued use of on-site wastewater disposal is a feasible and cost effective option.

9.3 Alternatives Evaluated For Potential Future Needs

While the Needs Assessment Report found no site specific data indicating concentrated, problematic areas for on-site wastewater disposal the following technologies were evaluated in the event of a future need due to remote concentrated development or another future issue:

- Individual on-site and cluster systems
- Treated water recharge
- Collection systems
- Satellite treatment systems

None of the technologies are recommended for further evaluation at this time. However if, in the future, a need is identified for these technologies, the following alternatives should be considered for further evaluation:

Individual On-Site System and Cluster System Alternatives

- Conventional Title 5 septic systems
- I/A systems for size constrained sites

Treated Water Recharge Technologies

- Sand infiltration beds
- Subsurface leaching
- Spray irrigation
- Drip irrigation

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Collection System Technologies

- Gravity sewers and lift stations
- Pressure sewers with grinder pumps
- Vacuum sewers

Collection System Technologies

- Suspended Growth Biological Treatment
- Attached Growth (Fixed Film) Biological Treatment
- Plant Based Wastewater Treatment Systems

9.4 Alternatives Recommended for Further Evaluation

The following section outlines alternatives recommended for further evaluation for the centralized treatment system. Alternatives are divided into the following two categories:

- Processes for which the "fix it first" alternative is recommended
- Processes for which evaluation of a new process is recommended – either because the existing process no longer meets current design standards or does not provide the degree of treatment required by the new NPDES permit.

"Fix It First" Alternative

The "Fix it First" alternative looks at reusing as much of the Town's existing infrastructure as feasible by repairing and/or upgrading existing equipment. This alternative is recommended for the following processes:

- Main Pump Station
- Primary clarifiers
- Grit chamber
- Chlorine contact tanks
- Secondary clarifiers (3 existing)
- Support facilities

Each of these processes are adequate to meet the requirements of the new permit (though additional tankage is required for some of these processes) but each process has mechanical parts well past their useful life that need to be replaced. For these processes the most cost-effective option is to replace mechanical equipment in kind and reuse as much of the existing tankage as possible.

Pump Station Alternatives

The following pump station alternatives are recommended for further evaluation:

- Replacement of the West River Pump Station

Preliminary Treatment Alternatives

The following preliminary treatment alternatives are recommended for further evaluation:

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- Replacement of grinder and coarse bar screen with two fine screens and replacement of all mechanical equipment which is past its useful life.

Secondary/Advanced Treatment Alternatives

The following secondary/advanced treatment alternatives are recommended for further evaluation:

1. **MLE.** This alternative involves upgrading the Uxbridge WWTF to provide additional treatment for consistent and long-term compliance with the new effluent limits for total nitrogen and total phosphorus. The upgrade will include expanding the volume of aeration tanks necessary for achieving seasonal nitrogen removal using a Modified Ludzack-Ettinger (MLE) configuration for biological wastewater treatment. The upgrade will also include construction of one additional secondary clarifier as well as facilities for dual-point chemical addition for precipitation of soluble phosphorus and for tertiary effluent flocculation, and filtration using a cloth media filter system and a post aeration system. In addition, the alternative will include replacement of existing mechanical and electrical equipment, instrumentation and control systems that have reached the end of their useful life.
2. **IFAS.** This alternative is essentially the same as Alternative 1, except for the means of upgrading the existing biological wastewater treatment system for nitrogen removal. Instead of using an MLE configuration, this alternative will utilize an integrated fixed-film activated sludge approach that will reduce the additional volume of aeration tanks needed for nitrogen removal. The approach will utilize fixed or floating fixed-film media within the aeration tanks to provide additional biomass necessary for nitrogen removal.
3. **BioMag.** This alternative is the same as Alternative 1, except for the means of upgrading the existing biological wastewater treatment system for nitrogen removal. Instead of using an MLE configuration, this alternative will utilize a high mixed liquor suspended solids approach using a ballast material (magnetite) to assist with settling. This alternative will allow further reduction of the additional volume of aeration tanks needed for nitrogen removal and may reduce, or eliminate, the need for constructing the additional secondary clarifier.

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Disinfection Alternatives

The following disinfection alternatives are recommended for further evaluation:

- Chlorination
- UV Disinfection

Post Aeration Alternatives

The following post aeration alternatives are recommended for further evaluation:

- Mechanical Post Aeration

Residuals Management Alternatives

The following residuals management alternatives are recommended for further evaluation:

- Sludge thickening
- Sludge dewatering

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Odor Control Alternatives

The following odor control alternatives are recommended for further evaluation:

- Biofilter

Sustainability Alternatives

The following sustainability considerations are recommended for further evaluation:

- Water Conservation
- Energy Efficiency
- Energy Recovery
- Alternative Energy

Flow and Loading Reduction Alternatives

The following flow and loading reduction alternatives are recommended for further evaluation:

- Conduct further investigations on the recommendations of the I/I analysis
- Continue policies encouraging water conservation
- Proceed with Growth Neutral Controls

9.5 Next Steps

The first phase of the Project was the identification of the Town of Uxbridge's wastewater management needs, as documented by the Draft Needs Assessment Report. This Alternatives Screening Analysis Report documents the second phase. The third (and final) phase of the Project will provide a detailed evaluation of the screened alternatives retained for further evaluation. Detailed evaluation will include cost-effectiveness comparisons using present worth evaluation and evaluation of non-monetary factors. The third phase will conclude with the Recommended Wastewater Management Plan.

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Town of Uxbridge, MA

DRAFT – Recommended Plan

Comprehensive Wastewater Management Planning (CWMP) Project

December 2015

Executive Summary

ES.1 Background

The Town of Uxbridge (Town) is completing this Comprehensive Wastewater Management Planning (CWMP) Project to provide a comprehensive strategy for wastewater management in Uxbridge, Massachusetts for a 20-year planning period; and with a perspective on the ultimate build-out condition of the Town. The 20-year period is 2015 to 2035.

This CWMP Recommended Plan documents the many evaluations and reports that were completed for this project. It also documents the recommended plan for Uxbridge's wastewater needs.

These documents are being prepared for review by the Massachusetts Department of Environmental Protection (MassDEP).

ES.2 Summary of Wastewater Problems and Needs in Uxbridge

The Needs Assessment Report (NAR) (GHD, 2014) was the first summary of wastewater needs and provided a detailed summary of water consumption, wastewater flows, and an evaluation of the existing wastewater treatment facility (WWTF).

The major recommendations of the NAR are summarized below:

1. Analysis of areas of the Town where sanitary sewer service is currently not provided did not identify any concentrated areas where on-site wastewater disposal appears problematic. The lack of specific indicators such as septic system failures or areas of impaired groundwater quality suggest that these areas appear to be suitable for continued long-term use of on-site wastewater disposal systems.
2. Although analysis of wastewater flow projections indicates that the Uxbridge WWTF has sufficient hydraulic capacity to support population growth projections for the Town over the next 20 years, new effluent limits added to the facilities discharge permit by MassDEP require upgrading the degree of treatment provided for removal of nutrients (nitrogen and phosphorus).
3. The Uxbridge WWTF has been in service for more than 30 years and much of the mechanical and electrical equipment, instrumentation and control systems are either approaching, or have already reached, the end of their useful life. Since buildings and structures still have significant value, replacement of the components that have reached the end of their useful life is recommended for continued long-term reliable and cost-efficient service.

Findings of this evaluation were presented at a televised Board of Selectmen (BOS) meeting in November, 2014.

ES.3 Summary of Alternative Evaluations to Remediate the Wastewater Problems

In the Alternatives Screening Analysis Report (ASAR) (GHD, 2015), alternative technologies and solutions to address the Town's wastewater needs were identified and screened in the following major categories:

- Individual on-site system and cluster system alternatives.

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- Centralized treatment system alternatives.
- Satellite treatment system alternatives.
- Treated water recharge technologies.
- Collection system technologies.
- Sustainability considerations.

Many technologies and solutions were evaluated for each of these categories. The following list identifies the alternative technologies and scenarios that were recommended for further evaluation:

1. Individual On-Site System and Cluster System Alternative
   - Continued use of conventional Title 5 disposal systems.
   - Decentralized treatment alternatives that are approved by MassDEP as part of their Innovative and Alternative (I/A) technology program for areas outside of the centralized sewer service areas in Uxbridge.
2. Preliminary Treatment Alternatives
   - Replacement of the existing grinder with a fine screen and replacement of all mechanical equipment that is past its useful life.
3. Primary Treatment Alternatives
   - Replacement of all mechanical equipment that is past its useful life.
4. Secondary/Advanced Treatment Alternatives to Attain Phosphorus Removal
   - Chemical addition and tertiary filtration.
5. Secondary/Advanced Treatment Alternatives to Attain Nitrogen Removal
   - Modified Ludzack-Ettinger (MLE) process.
   - Integrated Fixed-Film Activated Sludge (IFAS) process.
   - BioMag® process.
6. Disinfection Alternatives
   - Chlorination.
   - UV Disinfection.
7. Post Aeration Alternatives
   - Mechanical Post Aeration.
8. Support Facilities Alternatives
   - Replacement of mechanical equipment that is past its useful life.
9. Residual Management Alternatives
   - Gravity thickening.
   - Sludge dewatering.

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10. Odor Control Alternatives
    - Biofilter.
11. Pump Station Alternatives
    - Replacement of mechanical equipment that is past its useful life at the Main Pump Station.
    - Replacement of the West River Pump Station.
12. Satellite Treatment Alternatives
    - To be evaluated in the future if concentrated problematic areas for on-site wastewater disposal are found.
13. Treated Water Discharge/Recharge Alternatives
    - Continued use of existing outfall to the Blackstone River.
    - Groundwater recharge to be evaluated in the future if concentrated problematic areas for on-site wastewater disposal are found.
14. Collection System Alternatives
    - To to be evaluated in the future if concentrated problematic areas for on-site wastewater disposal are found.
15. Wastewater Flow and Loading Reduction Alternatives
    - Infiltration and Inflow (I/I) reduction to sewers.
    - Reduction of household water consumption.
    - Continued use of the existing rate structure to discourage greater water consumption and wastewater generation.
16. Sustainability Considerations
    - Water conservation opportunities.
    - Energy efficiency opportunities.
    - Energy recovery opportunities.
    - Alternative energy opportunities.

The findings of the ASAR were presented at a televised BOS meeting in January 2015.

ES.4 Summary of Recommended Plan for Uxbridge

As previously mentioned, the recommended plan is a comprehensive strategy for wastewater management in Uxbridge for a 20-year period. The 20-year period is 2015 to 2035.

The recommended plan includes the following major components:

1. Continued reliance on on-site wastewater disposal system for the three Study Areas. For sites where Title 5 septic systems are not suitable, due to site constraints or other environmental factors it is recommended that Innovative and Alternative systems be considered on a location by location basis.

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2. Implementation of the following upgrades to the existing Uxbridge WWTF in order to meet its new effluent permit and to replace aging mechanical equipment.

Administrative Recommendations

- Develop an electronic tracking system for septic pumping records and Title 5 inspections to help the Town identify future wastewater needs through the tracking of septic system issues.
- Review and update the existing sewer regulations and bylaws.
- Develop a SewerCAD model to allow the Town to identify hydraulic constraints within their existing collection system.

Pump Stations

- Replace West River Pump Station in kind.

Septage Receiving

- Process septage received at the facility with the solids stream instead of with the liquid stream.
- Replace existing septage receiving equipment.
- Install new septage holding tank which is adequately sized to treat anticipated septage volumes.

Influent Pump Station and Preliminary Treatment

- Replace mechanical equipment at influent pump station and aerated grit chamber.
- Upgrade the pumps at the influent pump station to a model that is capable of passing wipes further downstream.
- Replace comminutor with a fine screen to protect downstream secondary treatment equipment.
- Reconfigure existing preliminary treatment process to remove wipes from the liquid stream with fine screens prior to entering the aerated grit chamber.

Primary Clarification

- Replace mechanical equipment in existing primary clarifiers.

Secondary Treatment

- Expand existing tankage to provide adequate volume for MLE process.

Disinfection and Post Aeration

- Expand existing chlorine contact tank to provide adequate contact time.
- Abandon existing cascade aerator and construct a new mechanical post-aeration system.

Sludge Holding Tank and Sludge Pumping Station

- Replace mechanical equipment in Sludge Holding Tank and Sludge Pumping Station.

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Sludge Processing

- Replace mechanical equipment in existing gravity thickener.
- Construct a new gravity thickener to provide redundancy in sludge processing.

Process Building

- Architectural modifications to provide adequate working conditions for operations staff.

Ancillary Equipment

- Replace existing plant water system.

Site-Wide Support Related Improvements

- Replace HVAC equipment which is past its useful life.
- Renovate the existing Administration/Process Building to repair and improve offices, conference room and control room and to incorporate a new lab design. Expand Administration Area into the Process Area to include new locker rooms and a new training room.

Major Electrical Facilities and Backup Power

- Replace electrical components which are past their useful life.
- Replace generator which is past its useful life.

System Wide SCADA, Instrumentation, and Controls

- Replace controls which are past their useful life.
- Implement a Supervisory Control and Data Acquisition (SCADA) system for the WWTF.

Operations and Maintenance Impacts and Recommendations

The operations and maintenance costs of the upgraded facility are expected to increase approximately 16% from the FY15 budget due to the following:

- Increased power consumption.
- Increased chemical usage.
- Increased operational staff requirements.
- Increase sludge disposal quantities.

ES.5 Estimated Costs and Financing Plan

This recommended plan is a large capital investment in the Town's infrastructure. The Town of Uxbridge has comprehensive and varied capital needs involving both critical infrastructure and equipment replacement. These needs underscore the importance of viewing long-term capital financing in a broad, responsible context and maintaining a healthy financial balance on behalf of the Town's taxpayers. In order to fund the capital costs of the projects in the Recommended Plan as well as responsibly addressing the Town's other primary capital responsibilities Uxbridge proposes to use two strategies. The first and fundamental strategy is to consider issuing "new" debt when an "old" debt is paid off. The second funding strategy is to use the State Revolving Fund (SRF) loan program for the construction costs of the projects outlined in the Recommended Plan.

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The SRF loan process has specific eligibility requirements, a fixed annual timetable for deciding contract awards, a competitive selection procedure to receive an award, and a limit as to how much financial assistance through the SRF loan program can be given to a community in any one year. All of these constraints need to be taken into account in planning projects to improve water quality.

The SRF loans provided for drinking water or clean water projects (wastewater and stormwater). A standard interest rate of 2% is offered for either loan type. For wastewater projects that are primarily for the removal of nutrients, a 0% interest rate loan may be offered provided that 6 criteria are met. All SRF loans are provided based on public health benefit criteria that are used to rank submitted projects for inclusion on an annual priority list. The money available for funding each fiscal year is determined by the Massachusetts Clean Water Trust (CWT), working in conjunction with the Department of Environmental Protection. The SRF standard 2% interest rate loan is a competitive interest rate that is typically less than most municipality borrowing interest rates. Uxbridge will evaluate the ability to obtain 0% interest rate financing for the entire project. It should be stressed that without the SRF loan the Town will be burdened with higher interest rates and bond payments. The timing of issuing-new-debt-to-replace-old-debt and the receipt of an CWT SRF loan are key to Uxbridge's capacity to fund the projects in the Recommended Plan.

The estimated costs for the projects in the Recommended Plan are summarized in Table Table ES-1.

Table ES-1 Capital Costs for Recommended Plan

Cost Component	Capital Costs ($)
WWTF Improvements	$25,400,000
West River Pumping Station	$1,000,000
Contingency	$7,920,000
Total Construction Costs	$34,300,000
Fiscal, Legal and Engineering	$10,300,000
Total Capital Costs	$44,600,000

Notes:

1. Costs rounded to three significant figures and adjusted for estimated mid-point of construction.

The Financing Plan shown in Figure 3-3 simply identifies a financial opportunity. Projects within the CWMP will be sequenced as the regulatory, design, construction, voter authority, and fiscal opportunities allow.

Table 3-3 in Chapter 3 of this report lays out the big picture on financing, ballot votes and the State Revolving Fund process. Items 1 through 18 list all the presently-identified critical milestones that must take place.

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ES.6 Summary

The Recommended Plan is the result of a multi-year effort by the Town of Uxbridge, its CWMP Advisory Committee and Town Departments led by the Department of Public Works. This plan is developed to address Uxbridge's wastewater needs for the years 2015 through 2035. It represents a strong commitment by the Town to maintain a healthy environment in Uxbridge for regulatory compliance and for the Town's people enjoyment for generations to come.

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Table 2-2 Summary of Estimated Capital Costs–MLE Alternative

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Table 2-3 Conceptual Basis of Design–IFAS Alternative

Table 2-4 Summary of Estimated Capital Costs–IFAS Alternative

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Figure 2-5 Conventional MLE Schematic Flow Diagram

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Figure 2-7 Reactor Configuration - IFAS Alternative

Figure 2-8 Process Flow Schematic – IFAS Alternative

Figure 3-1 Uxbridge WWTF Upgrade – Existing Site Plan

Figure 3-2 Uxbridge WWTF Upgrade – Proposed Layout

Figure 3-3 Uxbridge WWTF Upgrade – Proposed Wastewater Liquid and Solid Schematic Diagram

Appendices

Appendix A – Plan of Study

Appendix B – MEPA Advisory Opinion

Appendix C – Decentralized Management Models

Appendix D – 2013 NPDES Permit

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Glossary of Common Acronyms

ACEC	Area of Critical Environmental Concern
ASAR	Alternatives Screening Analysis Report
BOD5	Biochemical Oxygen Demand 5-Day
BOS	Board of Selectmen
CWMP	Comprehensive Wastewater Management Plan
CWT	Clean Water Trust
DO	Dissolved Oxygen
ENF	Environmental Notification Form
gpm	Gallons per Minute
IFAS	Integrated Fixed-Film Activated Sludge
IMLR	Internal Mixed Liquor Recycle
I/A	Innovative and Alternative
I/I	Inflow and Infiltration
MassDEP	Massachusetts Department of Environmental Protection
MEPA	Internal Mixed Liquor Recycle
MGD	Million Gallons per Day
MGL	Massachusetts General Law
mg/L	Million Gallons per Liter
MLE	Modified Ludzack-Ettinger
MLSS	Mixed Liquor Suspended Solids
NAR	Needs Assessment Report
NEIWPCC	New England Interstate Water Pollution Control Commission
NPDES	National Pollution Discharge Elimination System
NREL	National Renewable Energy Laboratory
O&M	Operation and Maintenance
PV	Photovoltaic
RAS	Return Activated Sludge
RME	Responsible Management Entity
TKN	Total Kjeldahl Nitrogen
SCADA	Supervisory Control and Data Acquisition
SRF	State Revolving Fund
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
UV	Ultraviolet

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VFD	Variable Frequency Drive
WEF MOP	Water Environment Federation Manual of Practice
WWTF	Wastewater Treatment Facility

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1. Introduction

1.1 Project Identification and Purpose

The purpose of the Comprehensive Wastewater Management Planning (CWMP) Project is to provide an environmentally and economically sound plan for wastewater treatment and discharge in Uxbridge for the next 20 years and also to serve as the foundation for the Town to build upon beyond that. The CWMP Project will assess the wastewater and nutrient-related needs in the Town; evaluate appropriate mitigation measures for those needs; and develop a recommended plan for improved management systems. The primary purpose of the Project is to develop a plan to:

- Protect public health.
- Protect the water supply.
- Plan for and maintain flexibility to meet future Massachusetts Department of Environmental Protection (MassDEP) and United States Environmental Protection Agency (USEPA) requirements (as defined in the National Pollution Discharge Elimination System {NPDES} permit).
- Incorporate wastewater infrastructure and facilities planning into a cohesive document.

The purpose of this Recommended Plan Document is to summarize the significant body of work completed to evaluate the wastewater and nutrient-related needs in the Town of Uxbridge and present a recommended plan to implement a Town-wide solution to address these problems.

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1.2 Project Location

The Town of Uxbridge is located in the Blackstone River Valley. With a total land area of 30 square miles, the Town is bordered by the Massachusetts towns of Douglas, Mendon, Millville, Northbridge, and Sutton, and the Rhode Island towns of Burrillville and North Smithfield. The Blackstone River and two of its tributaries—the Mumford River and the West River—flow through the Town.

1.3 Planning Period

The CWMP will provide a recommended plan for wastewater facilities and nutrient management recommendations in Town for the 20 year planning period of 2015 to 2035.

1.4 Summary of Previous Documents Prepared for Uxbridge CWMP

1.4.1 CWMP Plan of Study

This report identified the expected steps (Project Scope) that the CWMP would take to identify the Recommended Plan. The full Plan of Study is attached in Appendix A.

1.4.2 Summary of Phase 1 Needs Assessment Report (NAR)

The Needs Assessment Report (NAR) was the first report prepared as part of the CWMP process. The report summarized information on the Town's existing and future conditions including natural resources, land use, populations, water usage and estimated wastewater flows and loadings. This information was used to identify areas of needs within the Town in addition to identifying other areas of needs- including improvements for the existing WWTF and collection system infrastructure.

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The major recommendations of the NAR are presented below:

1. Analysis of areas of the Town where sanitary sewer service is currently not provided did not identify any concentrated areas where on-site wastewater disposal appears problematic. The lack of specific indicators such as septic system failures or areas of impaired groundwater quality suggest that these areas appear to be suitable for continued long-term use of on-site wastewater disposal systems.
2. Although analysis of wastewater flow projections indicates that the Uxbridge WWTF has sufficient hydraulic capacity to support population growth projections for the Town over the next 20 years, new effluent limits added to the facility's discharge permit by MassDEP will require upgrading the degree of treatment provided for removal of nutrients (nitrogen and phosphorus).
3. In addition, now that the Uxbridge WWTF has been in service for more than 30 years, many of the mechanical and electrical equipment, instrumentation, and control systems are either approaching, or have already reached, the end of their useful life. Since buildings and structures still have significant value, replacement of the components that have reached the end of their useful life is recommended for continued long-term reliable and cost-efficient service.

1.4.3 Summary of Phase 2 Alternatives Screening Analysis Report (ASAR)

This report summarized the many possible alternative solutions that were identified and screened for use in the Project.

The following standard criteria were used for the screening process:

- Relative capital costs.
- Relative operations and maintenance costs.
- Flexibility.
- Energy use.
- Effluent quality.
- Regulatory requirements.
- Potential for air emissions.
- Land requirements.
- Anticipated public acceptance.
- Ease of implementation.
- Maintenance requirements and complexity of operation.

Since the NAR found no site-specific data indicating concentrated problematic areas for on-site wastewater disposal, no technologies were recommended for further evaluation for the following:

- Individual on-site and cluster systems.
- Treated water recharge.
- Collection systems.
- Satellite treatment systems.

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As discussed in Section 1.5.2 the NAR identified two major needs for the Town's existing centralized treatment system. Alternatives were divided in the following two categories:

- Processes for which the "fix it first" alternative (which looks at reusing as much of the Town's existing infrastructure as feasible by repairing and/or upgrading existing equipment) is recommended.
- Processes for which the evaluation of a new process is recommended, either because the existing process no longer meets current design standards or does not provide the degree of treatment required by the new NPDES permit.

In the ASAR the following alternatives were recommended for further evaluation.

"Fix It First" Alternative

The "Fix it First" alternative looks at reusing as much of the Town's existing infrastructure as feasible by repairing and/or upgrading existing equipment. This alternative is recommended for the following processes:

- Main Pump Station.
- Primary clarifiers.
- Grit chamber.
- Secondary clarifiers (3 existing).
- Support facilities.

Each of these processes are adequate to meet the requirements of the new permit (though additional tankage is required for some of these processes) but each process has mechanical parts well past their useful life that need to be replaced. For these processes the most cost-effective option is to replace mechanical equipment in kind and reuse as much of the existing tankage as possible.

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Pump Station Alternatives

The following pump station alternatives are recommended for further evaluation:

- Replacement of the West River Pump Station.

Preliminary Treatment Alternatives

The following preliminary treatment alternatives are recommended for further evaluation:

- Replacement of grinder with a fine screen and replacement of all mechanical equipment which is past its useful life.

Secondary/Advanced Treatment Alternatives

The following secondary/advanced treatment alternatives are recommended for further evaluation:

1. **MLE.** This alternative involves upgrading the Uxbridge WWTF to provide additional treatment for consistent and long-term compliance with the new effluent limits for total nitrogen and total phosphorus. The upgrade will include expanding the volume of aeration tanks necessary for achieving seasonal nitrogen removal using a Modified Ludzack-Ettinger (MLE) configuration for biological wastewater treatment. The upgrade will also include construction of one additional secondary clarifier as well as facilities for dual-point chemical

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addition for precipitation of soluble phosphorus and for tertiary effluent flocculation, filtration using a cloth media filter system and a post aeration system. In addition, the alternative will include replacement of existing mechanical and electrical equipment, instrumentation and control systems that have reached the end of their useful life.

2. **IFAS.** This alternative is essentially the same as Alternative 1, except for the means of upgrading the existing biological wastewater treatment system for nitrogen removal. Instead of using an MLE configuration, this alternative will utilize an integrated fixed-film activated sludge approach that will reduce the additional volume of aeration tanks needed for nitrogen removal. The approach will utilize fixed or floating fixed-film media within the aeration tanks to provide additional biomass necessary for nitrogen removal.

3. **BioMag.** This alternative is the same as Alternative 1, except for the means of upgrading the existing biological wastewater treatment system for nitrogen removal. Instead of using an MLE configuration, this alternative will utilize a high mixed liquor suspended solids (MLSS) approach using a ballast material (magnetite) to assist with settling. This alternative will allow further reduction of the additional volume of aeration tanks needed for nitrogen removal and may reduce, or eliminate, the need for constructing the additional secondary clarifier.

Disinfection Alternatives

The following disinfection alternatives are recommended for further evaluation:

- Chlorination.
- UV Disinfection.

Post Aeration Alternatives

The following post aeration alternatives are recommended for further evaluation:

- Mechanical Post Aeration.

Residuals Management Alternatives

The following residuals management alternatives are recommended for further evaluation:

- Gravity thickening.
- Sludge dewatering.

Odor Control Alternatives

The following odor control alternatives are recommended for further evaluation:

- Biofilter.

Sustainability Alternatives

The following sustainability considerations are recommended for further evaluation:

- Water conservation.
- Energy efficiency.
- Energy recovery.
- Alternative energy.

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Flow and Loading Reduction Alternatives

The following flow and loading reduction alternatives are recommended for further evaluation:

- Conduct further investigations on the recommendations of the I/I analysis.
- Continue policies encouraging water conservation.
- Proceed with Growth Neutral Controls.

1.4.4 Summary of Environmental Review Process (MEPA Review Process)

The Internal Mixed Liquor Recycle (MEPA) Regulations 301 CMR 11.03 require that an Environmental Notification Form (ENF) be submitted for review if a project exceeds any of the review thresholds listed in the regulations.

A MEPA Request for Advisory Opinion was submitted on December 1, 2014 requesting a determination as to whether review under MEPA would be required for the Uxbridge CWMP project. A letter (see Appendix B), dated January 12, 2015, was received from the MEPA director, stating that the project is not subject to review under MEPA and that the submission of an ENF is not required for this project.

1.5 Public Participation

An extensive public participation program has been on-going for the Comprehensive Wastewater Management Planning Project (Project) to ensure that the Town's residents, Town leaders and regulatory community are informed and are provided ample opportunity for questions and discussions. This Chapter describes the public participation process that has been implemented as part of the project. The main components are listed below.

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1.5.1 Formation of a CWMP Advisory Group

The CWMP Advisory Group was established to provide input throughout the development of the CWMP. The group is comprised of the following participants:

- Lance Anderson
- Steve O'Connell
- Wayne Tucker
- Cari Robertson

1.5.2 Regular Televised Presentation of CWMP Findings to the Board of Selectmen

At each key milestone, CWMP findings were presented to the Board of Selectmen for their review and action. The BOS meetings are televised live, and reach a wide audience thereby informing interested citizens about the progress being made on the project. These presentations are typically followed by newspaper interviews and summary articles in the local paper. CWMP presentations were made during BOS meetings on the following dates:

- July 18, 2011
- March 24, 2014
- June 11, 2014

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- July 28, 2014
- November 10, 2014
- January 12, 2015
- April 27, 2015

1.5.3 Development of a Project Web Site

A project Web site (http://www.uxbridge-ma.gov/Pages/UxbridgeMA_DPW/UxbridgeCWMP/CWMP) was created at the beginning of the project and provides project documents and brief summaries for the public review and download. The following documents are available for download on the project Web site:

- Consent Order Docket No. 14-003.
- USEPA Final Discharge Permit, dated 2013.
- Copies of the CWMP presentations to the BOS for the following dates:
  - July 18, 2011
  - March 24, 2014
  - June 11, 2014
  - July 28, 2014
  - November 10, 2014
  - January 12, 2015
  - April 27, 2015
- Draft Needs Assessment Report.
- Draft Alternatives Screening Analysis Report.

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1.6 Organization of the Recommended Plan

This report is divided into three chapters:

- Chapter 1 presents general introductory information about the CWMP project and summarizes the main findings of previous documents prepared for the CWMP.
- Chapter 2 describes the evaluation of alternatives recommended for further evaluation in the ASAR.
- Chapter 3 presents the Recommended Plan and identifies the proposed implementation schedule and financial considerations.

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2. Summary of Alternatives Evaluation

The purpose of this chapter is to evaluate the technologies recommended for further evaluation in the ASAR. Each group of technologies is presented and screened in a separate section of this chapter.

2.1 No Action Alternative

Prior to evaluating the impact of the alternatives recommended by the ASAR, the "No Action" alternative is considered. This alternative establishes an initial baseline of the project and summarizes the potential impacts if the Town were to proceed without implementing any recommended improvements to address the wastewater needs identified in the NAR.

2.1.1 Areas of the Town Which Utilize On-Site Wastewater Disposal

Under the No Action Alternative, portions of the Town not serviced by centralized treatment would continue to utilize on-site wastewater disposal. Since the NAR did not identify any concentrated areas of the Town that are problematic for on-site wastewater disposal, the continued use of on-site wastewater disposal is a feasible and cost-effective option.

2.1.2 Areas of the Town Serviced by Centralized Treatment

The No Action alternative for centralized treatment involves continued long term operation of the Uxbridge WWTF with no improvements to either upgrade the degree of wastewater treatment provided or replace mechanical and electrical equipment, instrumentation and control systems that have reached the end of their useful life.

Since the Uxbridge WWTF was not designed to provide the degree of wastewater treatment necessary for consistent and reliable compliance with the new effluent limit for total nitrogen and the more stringent effluent limit for total phosphorus, permit non-compliance can be expected. Permit non-compliance may cause, or contribute to, degradation of water quality conditions in the Blackstone River, which would likely expose the Town to potential legal enforcement actions by MassDEP, USEPA, and environmental groups.

Additionally, operating and maintaining existing mechanical and electrical equipment, instrumentation and controls will continue to become more difficult as equipment becomes obsolete and replacement parts become more difficult and costly to obtain. The frequency of equipment failures can be expected to increase, which will increase operating costs and make continued compliance with discharge permit effluent limits more and more difficult to achieve.

2.2 Areas of the Town Which Utilize On-Site Wastewater Disposal

As identified in the ASAR, several alternatives were identified and evaluated. Alternatives that were recommended for further evaluation will be analyzed further in this section.

2.2.1 Delineation of Geographic Areas

For the purposes of the CWMP Project the portions of the Town of Uxbridge that are not served by, or adjacent to, the centralized collection system were divided into three study areas, based on geographic divisions. The three study areas are shown on Figure 2-1, and are defined by the following boundaries:

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- Study Area 1 – All land in the Town of Uxbridge south of Route 146.
- Study Area 2 – Land within the Town of Uxbridge bounded by Route 146 to the west and the existing collection system to the east.
- Study Area 3 – Land within the Town of Uxbridge bounded by the Town's existing collection system to the west.

These areas were analyzed to determine if sub-areas existed within each, where continued use of Title 5 disposal systems may be problematic. Factors analyzed included soil type, high groundwater areas, 100-year flood zones, depth to bedrock, lot size, drinking water protection areas, buffer areas around water bodies and wetlands, priority estimated habitat areas and areas of critical environmental concern (ACECs), Title 5 pass/fails and groundwater quality.

Although general indicators exist in all three study areas for locations that may be problematic for on-site wastewater disposal sites, known conditions such as septic system failures and impaired groundwater quality did not indicate any portions of the Town that would be unsuitable for on-site wastewater disposal systems. Known conditions and general indicators for the three study areas are shown in Figure 2-2, Figure 2-3, and Figure 2-4.

Since the NAR found no site-specific data indicating concentrated, problematic areas for on-site wastewater disposal no decentralized wastewater technologies or major sewer extensions are recommended for further evaluation at this time.

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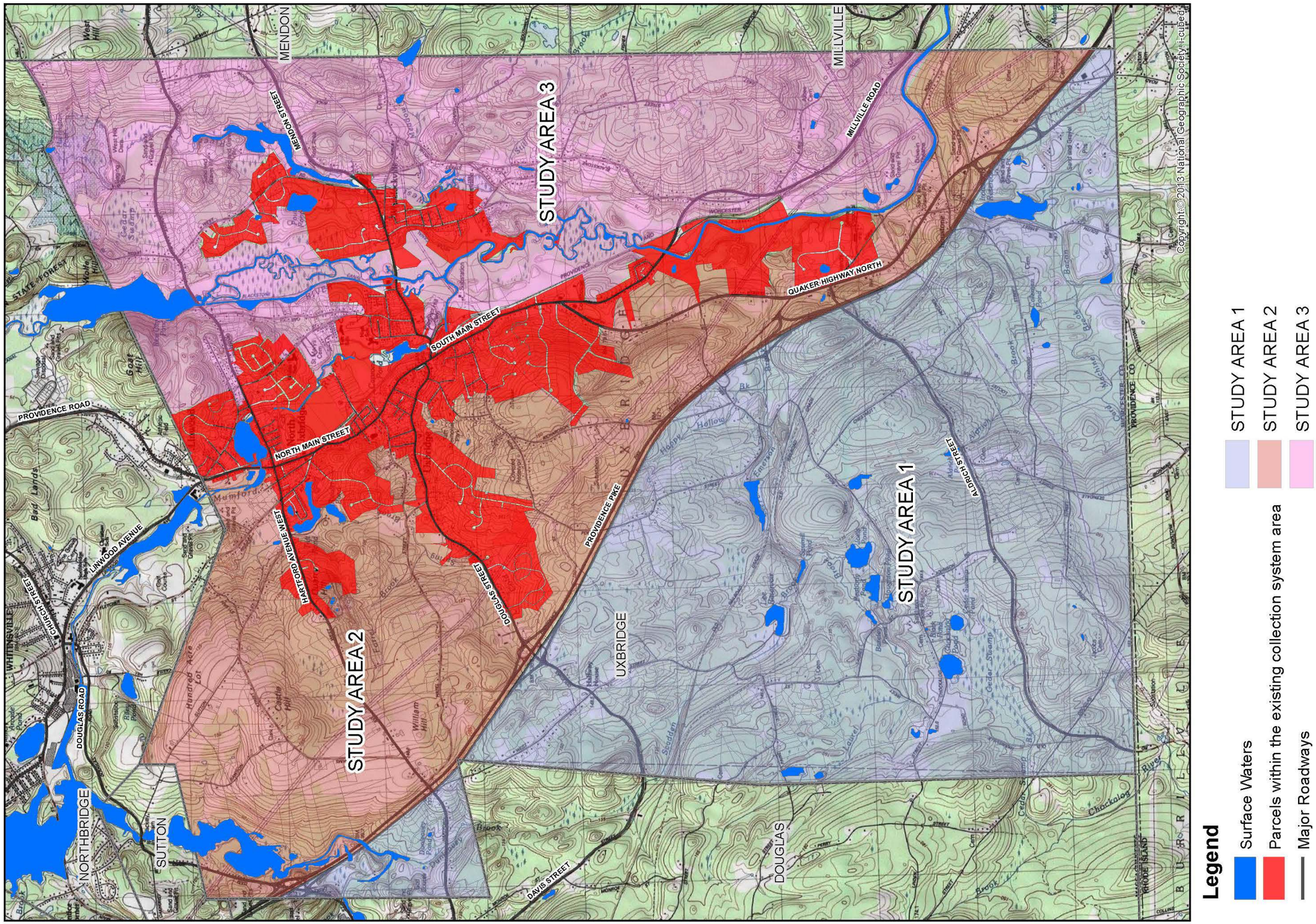

Figure 2-1 Study Areas

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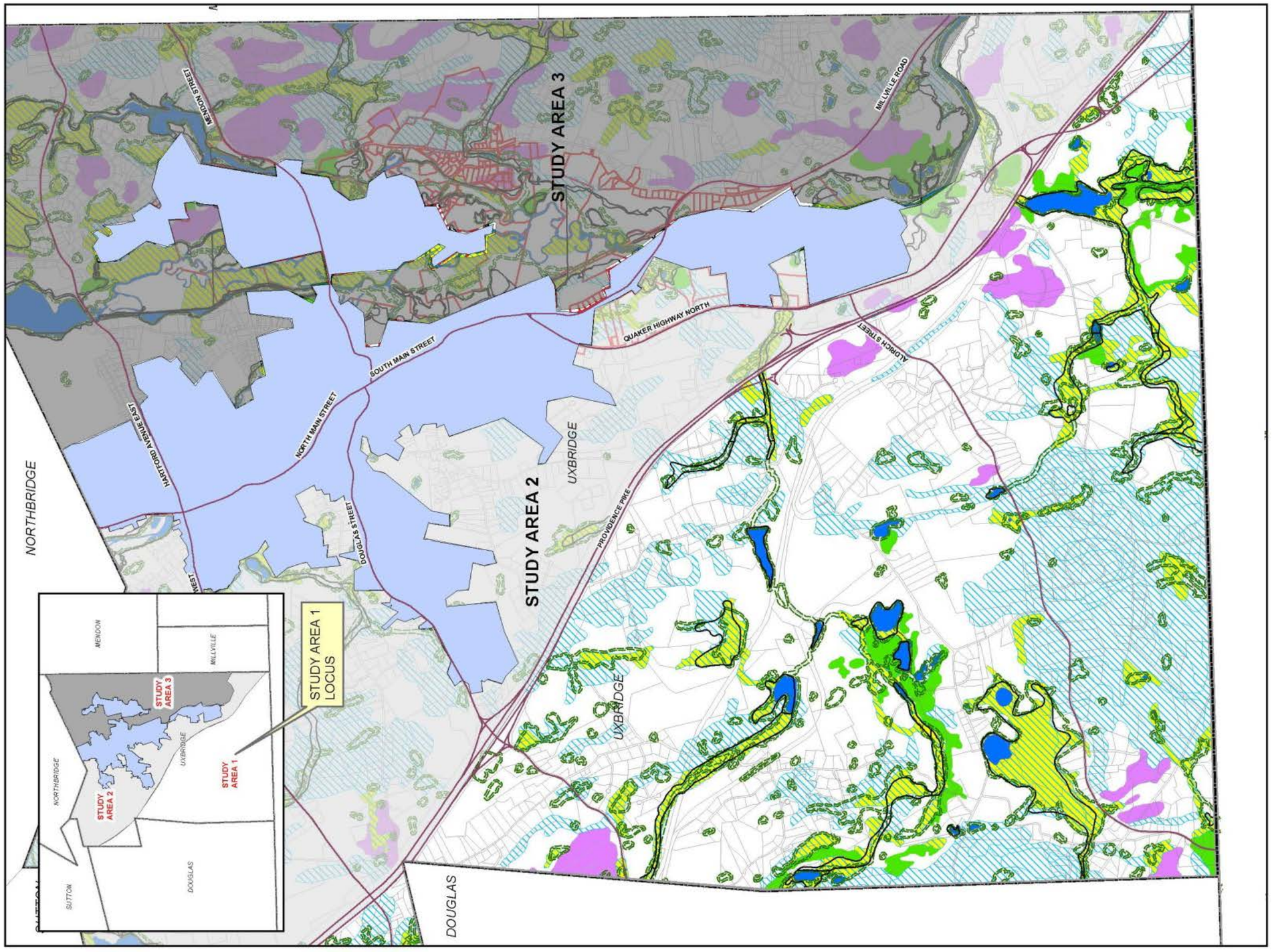

Figure 2-2 Study Area 1

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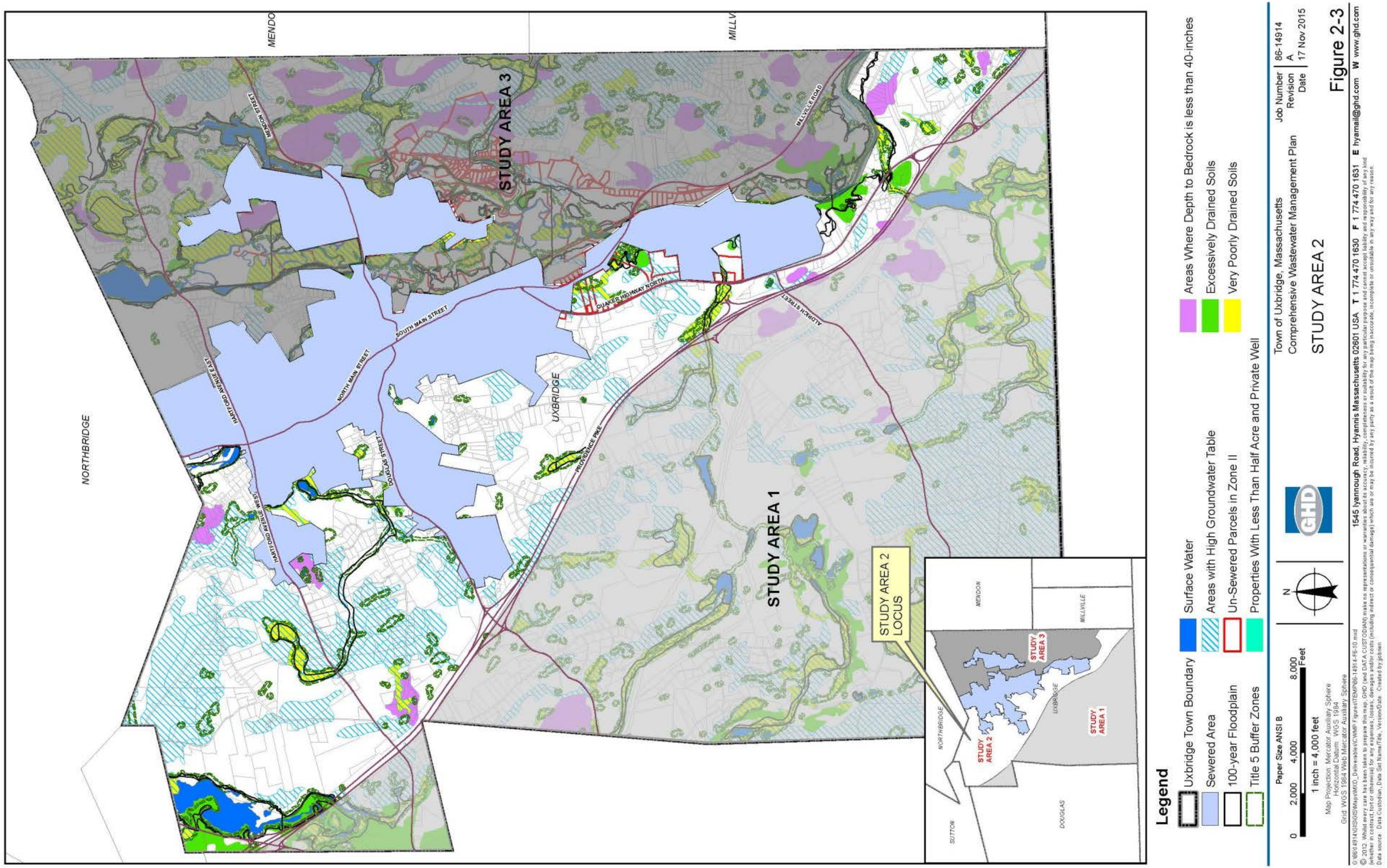

Figure 2-3 Study Area 2

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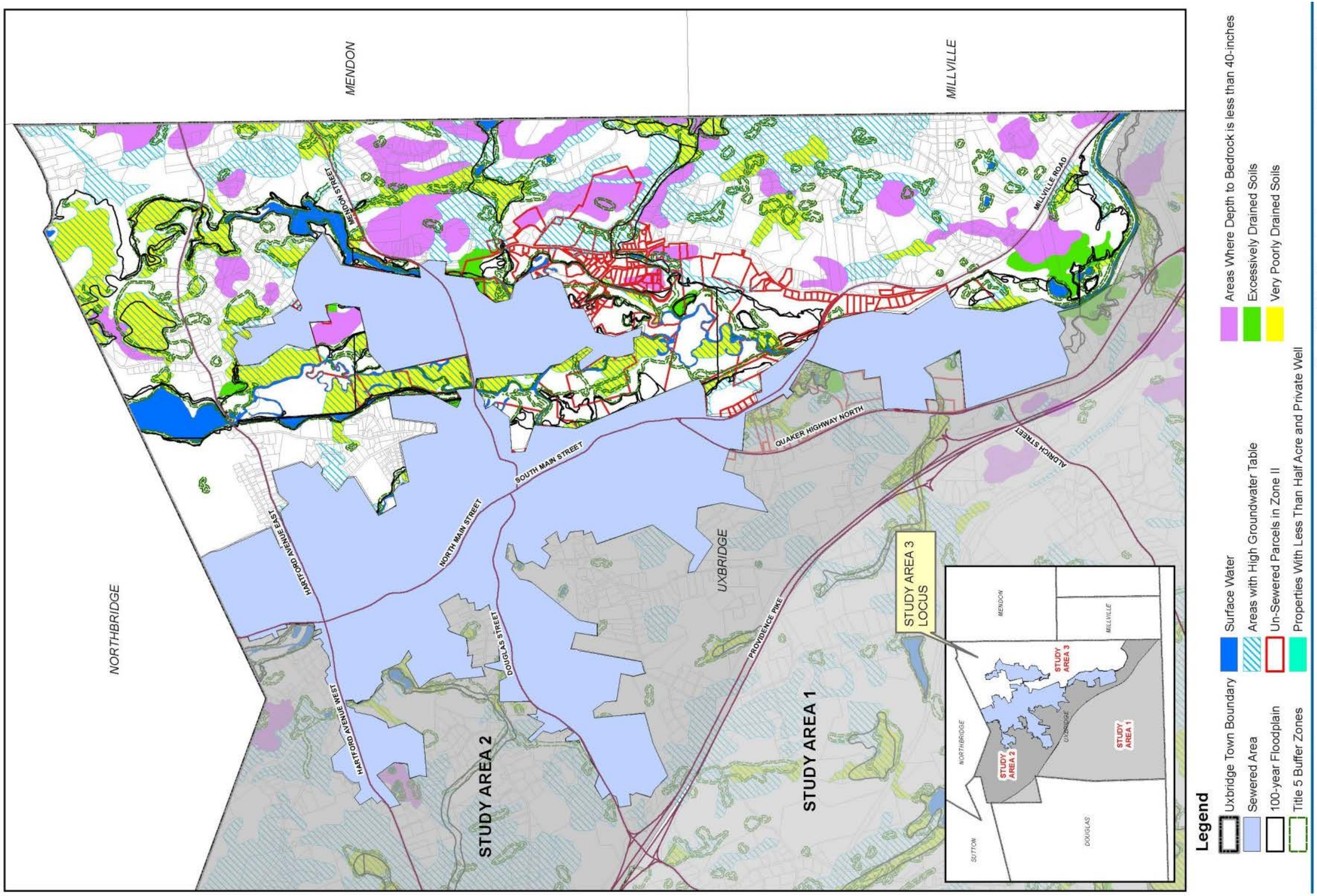

Figure 2-4 Study Area 3

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2.2.2 Description of Wastewater Solution and Estimated Capital Costs

It is recommended that the three Study Areas continue to rely primarily on Title 5 septic systems for on-site wastewater disposal. For sites where Title 5 septic systems are not suitable, due to site constraints or other environmental factors, it is recommended that Innovative and Alternative (I/A) systems be considered on a location by location basis.

If, during future development, concentrated areas unsuitable for traditional on-site disposal are discovered the following alternatives should be considered for further evaluation:

Individual On-Site System and Cluster System Alternatives

- Conventional Title 5 septic systems.
- I/A systems for size constrained sites.

Treated Water Recharge Technologies

- Sand infiltration beds.
- Subsurface leaching.
- Spray irrigation.
- Drip irrigation.

Collection System Technologies

- Gravity sewers and lift stations.
- Pressure sewers with grinder pumps.
- Vacuum sewers.

Satellite System Technologies

- Suspended Growth Biological Treatment.
- Attached Growth (Fixed Film) Biological Treatment.
- Plant Based Wastewater Treatment Systems.

Estimated capital costs should be developed after further evaluations of the alternatives on an as-needed basis.

2.2.3 Possible Future Institutional Arrangements for On-Site and/or Satellite Technology Management

This section describes possible wastewater management district formation options that exist for Operations and Maintenance of I/A systems.

Town Regulatory Body with Management Responsibility

I/A systems for site constrained locations are an investment and may require operation, maintenance and monitoring knowledge and skill above what is required for Title 5 systems. Many individual homeowners may not have the skill or desire to properly operate and maintain these systems. Most town health departments do not have the resources to regulate large-scale implementation of these systems.

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The possible formation of decentralized management districts could address the concerns about maintenance, operations and monitoring of these systems. A decentralized management district could be set up similar to a sewer or water district through special legislation in the Massachusetts Legislature. That legislation would define the limits, function and responsibility of the district. The district would be staffed to provide the following possible functions:

- On-site system records storage:
  - System pumping records.
  - System design.
  - Monitoring and performance data.
- System maintenance and repairs.
- Regulatory enforcement.
- Summary reporting on district performance.
- Monitoring on other district or watershed issues, such as fertilizer usage or stormwater system operations.

This type of district could report to the Board of Selectman, Board of Health, or other similar entities.

Options for Ownership and Management of Decentralized Facilities

In March 2003 the USEPA published the "Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems." This document presents five different management models that could be employed by a Town or Regional Management Entity. The five models identified are as follows:

1. **Model 1 – Homeowner Awareness Model.** The homeowner is educated on their system, including operations and maintenance requirements.
2. **Model 2 – Maintenance Contract Model.** The homeowner is required to contract with a maintenance company to maintain their system, usually for those onsite systems that would go beyond a standard Title 5 system in Massachusetts.
3. **Model 3 – Operating Permit Model.** This would be applicable to those properties in Uxbridge that would be required to have an I/A system based on site constraints at their location. This would be similar to a groundwater discharge permit for each individual property falling into this category.
4. **Model 4 – Responsible Management Entity (RME) Operation and Maintenance Model.** This would be similar to Model 3, except a management district would be responsible for permit compliance, however the system would still be owned by the homeowner.
5. **Model 5 – RME Ownership Model.** This is taking Model 4 to the next level where the system ownership and maintenance requirements fall on the management district and the homeowner is no longer responsible for the system.

A more detailed summary of the Management Models presented in the above referenced document is included in Appendix C.

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2.2.4 Expected Residual Generation and Disposal for On-Site Technologies

Residual Generation

Conventional Title 5 systems consist of a septic tank, a distribution box, and a leaching area. Wastewater is discharged to the septic tank where settleable solids sink to the bottom of the tank, and floatables (like grease and toilet paper) rise to the surface, forming a scum layer. The septic tank prevents the solids from flowing to the leaching area where they could plug the soils and cause a failed septic system (septic tank effluent rising to the ground surface where it could cause odors or disease; or causing the building drains to backup). Decomposition of the organic matter occurs in the septic tank and produces ammonia and other dissolved pollutants. The liquid effluent then flows via the distribution box to a leaching area, where it percolates through stone bedding and the soil prior to reaching the groundwater.

All individual systems, including a Title 5 system, needs to be pumped every two to five years to remove the settleable solids and floatables that have collected in the septic tank. The contents are typically taken to a regional septage receiving facility.

Residual Disposal

The Uxbridge WWTF currently accepts septage, both from the Town of Uxbridge and surrounding communities. The septage is treated at the facility, along with the wastewater from the collection system, and increases both the flow and load to the facility.

An analysis was conducted to determine whether it would be cost effective to continue to accept septage at the Uxbridge WWTF. The mechanical equipment currently used for septage receiving is over 35 years old and well past its useful life. Additionally the septage holding tank is undersized and frequently overflows to the Main Pump Station and the operators experience many issues with disposable wipes, introduced through septage, clogging pumps throughout the plant. If the facility were to continue to accept septage it is recommended that a new Septage Receiving Station be installed to provide screenings and grit removal.

The Town of Uxbridge currently charges $75 per 1,000 gallons to accept septage at its facility. The rate is cost-competitive with that charged by other area septage receiving facilities. In order to recover the costs of the infrastructure through user fees, the price charged by the facility to accept septage would need to be increased by approximately 60%—potentially making the facility not cost-competitive.

Since septage haulers do not have a contractual obligation to go to a particular septage receiving facility, the price that a facility can charge to accept septage is driven largely by what other area septage receiving facilities are charging. The Town faces the risk of not being able to recover the costs of the infrastructure, if the amount of septage brought to the facility decreases due to market competition or for any other reason.

2.2.5 Recommended Next Steps

Since no concentrated, problematic areas for on-site wastewater disposal were found in any of the three study areas it is recommended that properties in these areas continue to utilize on-site wastewater disposal systems. No major sewer extensions are recommended at this time.

If, during future development, concentrated areas are discovered to be unsuitable for conventional on-site systems it is recommended that a further evaluation is done of the decentralized options outlined in section 2.2.3 and management systems, such as district formation be considered further.

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During a Board of Selectman (BOS) meeting on September 28, 2015 the BOS voted to move forward with a treatment plant design which accommodates the ability to accept septage as a regional facility.

2.3 Areas of the Town Served by Centralized Treatment

2.3.1 Introduction

The geographic delineation of the Town's existing collection system is shown in Figure 2-1. Two major needs were identified in the NAR for the Town's existing centralized treatment system:

- The Uxbridge WWTF needs to be upgraded in order to meet the discharge requirements of its new NPDES permit.
- All of the equipment at the Uxbridge WWTF is over 30 years old and has either reached, or is approaching, the end of its useful life and is in need of replacement.

Alternatives to meet the two major needs were discussed in the ASAR and screened on a qualitative basis to determine the most viable alternatives, which were recommended for further evaluation.

In order to determine the most cost-effective solution to the two major needs identified in the NAR a cost evaluation was developed for processes where more than one alternative was recommended for further evaluation.

2.4 Cost Estimating Methodologies

The following items were considered during the development of the cost estimate:

A. Unit costs are developed to estimate construction costs for items such as concrete, excavation, backfill, mobilization, yard piping, process piping, site work, electrical, and other costs. Unit costs are developed based on a combination of the following factors:
   - Schedule of values from recently constructed jobs.
   - Past engineering experience for similar projects.
   - RSMeans Construction Cost Data Books adjusted for local conditions and the Engineering News-Record Cost Index.
   - Costs for site work, electrical and instrumentation systems, yard piping, HVAC, plumbing, and other miscellaneous work like painting are applied as percentages of total capital construction costs.

B. Equipment and associated costs for required equipment are provided by equipment suppliers. Installation costs are estimated when they are not specifically provided by the equipment suppliers.

C. Allowances for fiscal-legal-engineering and contingency costs are each estimated at 30% and applied to the total construction cost.

D. Costs are referenced to the estimated midpoint of construction (September 2018) through the use of a 2.3% per year inflation factor.

The following is a list of items considered when developing the cost estimate and is a general guide used to identify the basis of these costs (note: percentages are based on recent construction projects):

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A. **General Conditions** (including mobilization, bonds and insurance)—A cost for the contractor to mobilize his equipment (cranes, bulldozers, etc.) on site, to obtain bonds for bidding the project, to attend job meetings, prepare submittals, coordinate and develop project schedules, etc. (9% of construction costs has been used for this project based on past experience).

B. **Site Work**—Costs for clearing, grading, and seeding the site (2% of construction costs has been used for this project based on past experience).

C. **Excavation, Blasting, Backfill, etc**.—Could be a significant cost and should be determined on a unit (yd^3) basis. Costs are dependent on soil conditions (rock), hauling distance, etc.

D. **Site Dewatering**—Could be a significant cost with deep structure, high groundwater tables, proximity to rivers, aquifers, soil conditions, etc.

E. **Sheet Piling**—Could be a significant cost with deep excavations, also dependent on soil conditions.

F. **Yard Piping**—Piping from one process to another may be calculated based on length and diameter of pipe or estimated by a percent (6% has been used for this project based on past experience).

G. **Process Piping**—Piping within a process was calculated based on estimated length and diameter or pipe.

H. **Electrical and Instrumentation Costs**—Electrical and instrumentation costs can be significant and vary depending on the specifics of the project. The percentage used is typically increased with the complexity of the project (13% was used for this project based on past experience).

I. **Heating and Ventilation**—These are costs for heating and ventilating facilities and they do not include costs for odor control (3% was used for this project based on past experience).

J. **Plumbing and Painting**—Costs for plumbing and painting were estimated to be approximately 2% of the total construction cost.

K. **Demolition**—This cost was included for mechanical equipment to be replaced as part of this project.

L. **Equipment Costs**—Equipment costs were obtained from a supplier and include: delivery to site, manufacturer's representative services, and spare parts. Also included in equipment price are:

- Installation—Cost for the contractor to install the equipment. Cost will vary depending on the complexity of the equipment, typically 15 to 35% of equipment cost, possibly as high as 50%. (Typically 30% of the equipment cost is used based on previous experience; however, this percentage may be adjusted for less complicated equipment).
- Overhead and Profit—For estimating purposes 10% was used for the contractor's overhead and profit on equipment, materials, and installation.

M. **Startup and Initial Operation**—Where applicable.

N. **Special Conditions**—Any costs that are specific to the site or project should be included in the project costs.

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O. **Contingencies**—This is a general cost for items that need revisions or are added during construction. A factor of 30% of the construction cost has been used in this cost estimate.

P. **Fiscal, Legal, Administrative, and Engineering**—A factor of 30% of the construction costs has been used to estimate these costs.

The estimated construction and capital costs have been inflated to the expected midpoint of construction. It should be noted that bidding climate, world events, natural disasters, materials, and fuel costs all impact both short-term and long-term estimates.

Cost comparisons for each of the alternatives carried forth from the ASAR will be presented in the sections below.

2.5 "Fix it First" Alternatives Evaluation

For each portion of the wastewater treatment process the "Fix it First" alternative was considered. For some processes the "Fix it First alternative is to replace aging existing equipment in kind. For processes that are not capable of meeting the new discharge permit limits (such as the secondary treatment process) the "Fix it First" alternative looks at reusing as much of the existing infrastructure as possible—for example reusing existing tankage for a new treatment process.

In the ASAR the following processes were determined to meet the requirements of the new permit adequately (through additional tankage is required for some of these processes) and to provide the least costly alternative to meet the needs identified in the NAR.

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Main Pump Station

The Main Pump Station is adequately sized for expected future flows and the concrete at the station was found to be in good condition. However, the mechanical equipment in the Main Pump Station is well past its useful life. The operators have noted a high operations and maintenance requirement for the station due to the frequency of disposable wipes clogging the pumps and check valves in the station.

It is recommended that the mechanical equipment in the station be replaced in its entirety. Additionally, it is recommended that the pumps in the station be installed with upgraded impellers capable of passing wipes, which will be screened out downstream in the preliminary treatment process.

Grit Chamber

The grit chamber is adequately sized for expected future flows, however the mechanical equipment is well past its useful life. In its current configuration the grit chamber equipment frequently becomes entangled with disposable wipes. The operators have also noted issues with equipment freezing during cold weather events as the equipment is not enclosed in a building.

It is recommended that the mechanical equipment, including the grit chamber equipment, blowers and related accessories, be replaced in its entirety. It is also recommended that the preliminary treatment channel be reconfigured so that flow passes through screenings (in order to remove disposable wipes) before entering the grit chamber and that both pieces of equipment be enclosed within a building. The reconfiguration will help minimize the problem operators experience with disposable wipes entangling the grit chamber equipment.

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Primary Settling Basins

The primary settling basins are adequately sized for expected future flows and the concrete tanks were found to be in good condition. The mechanical equipment is well past its useful life.

It is recommended that the concrete tanks be reused and the mechanical equipment be replaced in its entirety.

Secondary Clarifiers

The secondary clarifiers are undersized for expected future flows and the new nutrient treatment requirements. The concrete tanks are found to be in good condition; however, the mechanical equipment is well past its useful life.

It is recommended that the concrete tanks be reused and the existing mechanical equipment be replaced in its entirety. It is also recommended that an additional secondary clarifier be constructed to provide adequate overflow capacity for expected future flows.

Support Facilities

The support facilities are all well past their useful life. It is recommended that these facilities be replaced in their entirety.

2.6 Preliminary Treatment Alternatives Evaluation

The preliminary treatment system at the Uxbridge WWTF consists of an aerated grit chamber and a comminutor. A manual bar screen is used to bypass the comminutor, if needed. Grinding influent screenings is no longer considered the standard in the industry. The technology does not work well for facilities with sensitive downstream processes. Additionally, all of the preliminary treatment equipment is almost 35 years old and well beyond its design life. The concrete in this area was found to be in good condition.

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Preliminary Treatment Alternatives

Since the existing process is not adequate to protect sensitive downstream processes the “fix it first” alternative of replacing existing equipment in kind is not recommended.

It is recommended that the comminutor be replaced with a fine screen, in order to protect downstream processes.

As discussed above, it is also recommended that the preliminary treatment channel be reconfigured so that flow passes first through the fine screen (to remove disposable wipes) before flowing to the aerated grit chamber.

2.7 Secondary/Advanced Treatment Alternatives Evaluation

As discussed in the Alternatives Screening Analysis Report, three nutrient removal alternatives were selected for detailed evaluation, including development of conceptual design and budgetary estimates of expected capital costs. For discussion purposes, the three alternatives are briefly identified as follows:

- Alternative 1 – Conventional MLE Upgrade
- Alternative 2 – Integrated Fixed-Film Activated Sludge (IFAS) Alternative
- Alternative 3 – Ballasted Biological Treatment (BioMag) Alternative

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Each alternative involves upgrading the Uxbridge WWTP to meet projected wastewater treatment capacity needs through the Year 2035. These needs include necessary improvements in the degree of wastewater treatment provided by the WWTP for removal of nutrients. The improvements in nutrient removal are necessary to achieve consistent and reliable compliance with new (more stringent) effluent limits for total nitrogen and total phosphorus that were added to the WWTP discharge permit when it was reissued by MassDEP in 2013. For total nitrogen, the discharge permit requires compliance with a maximum monthly average effluent concentration limit of 8 mg/L effective seasonally from May 1 through October 31. For total phosphorus, the new permit requires compliance with maximum monthly average effluent concentration limits of 0.2 mg/L effective April 1 through October 31 and 1.0 mg/L effective November 1 through March 31.

In addition to providing capacity to treat wastewater through 2035, each alternative also includes capacity to treat domestic septage currently received from contract haulers who serve customers located inside and outside of the Town in areas not served by municipal sewers. Septage is currently discharged to a holding basin located at the Uxbridge WWTP site. As discussed in the Alternatives Screening Analysis Report, the Town has decided to construct a new septage receiving station designed to provide adequate capacity to handle current septage quantities without overflows. In addition, the Town has decided to change the method of handling septage received for treatment. Instead of pumping septage to the grit chamber for co-treatment with the wastewater flow, the Town will pump septage to the gravity sludge thickener for co-treatment with the sludge produced by the plant. By processing septage with the sludge flow, the Town will minimize the impact of high solids and associated BOD5 and nutrient loads on the wastewater treatment system.

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2.7.1 Alternative 1 – Conventional MLE Upgrade

A schematic flow diagram illustrating this alternative is provided in Figure 2-5. As shown, this alternative includes pumping of return activated sludge from the secondary clarifiers to Diversion Chamber No 2 where it will mix with wastewater effluent from the primary settling tanks. The combined flow (mixed liquor) would then be directed to existing Aeration Tanks No. 1 and 3 using adjustable weir gates provided at the Diversion Chamber.

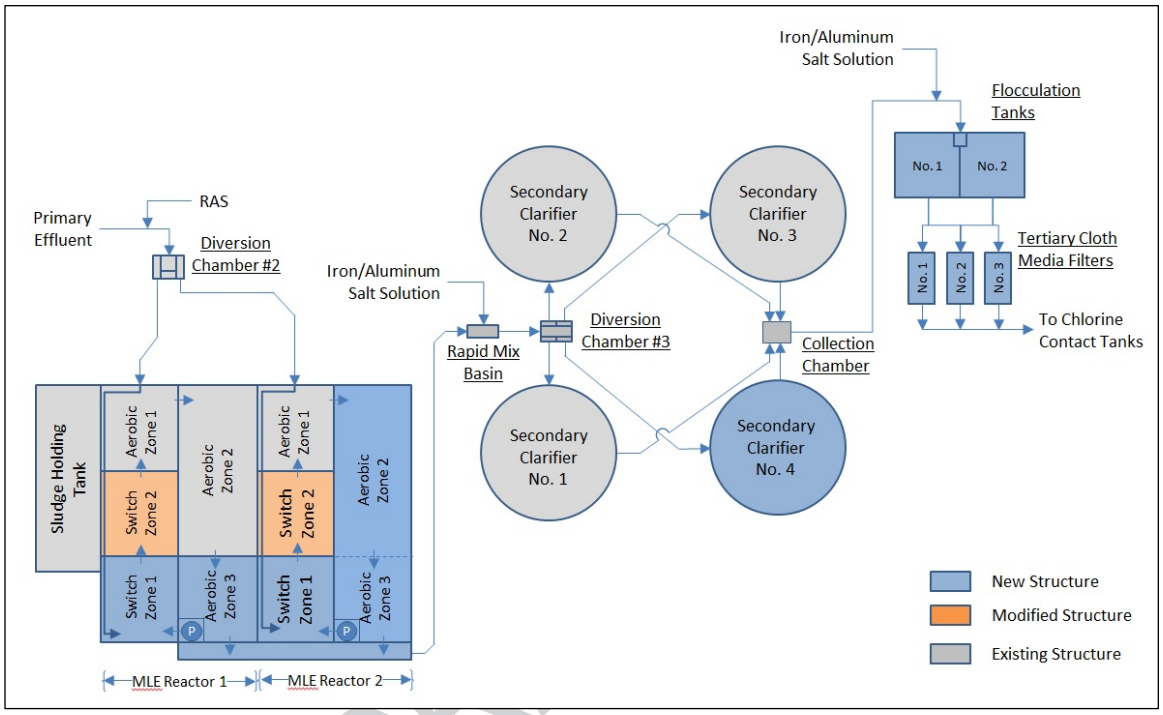

Figure 2-5 Conventional MLE Schematic Flow Diagram

This alternative involves expanding and reconfiguring the existing aeration tanks for operation in a Modified Ludzack-Ettinger (MLE) reactor configuration. For conceptual design, a two-train configuration was selected. Structural modifications would be necessary to increase the length of each aeration tank by 50% (33 feet). In addition, a 4th aeration tank would be constructed to the West of existing Aeration Tank No. 3. Existing Tunnel Access Structure No. 2 would be demolished to allow the existing piping tunnel to be extended along the North end of new Aeration Tank No. 4 and a new tunnel access structure would be constructed further to the West.

Piping would be installed to relocate the reactor influent from the North end of Aeration Tanks No. 1 and No. 3 to the South end of each tank. The wastewater would then flow from South to North in Aeration Tanks No. 1 and 3. At the North end of Aeration Tanks No. 1 and 3, new openings would be made in the walls separating Aeration Tanks 1 and 2 and Aeration Tanks 3 and 4. The openings would be designed to allow mixed liquor to pass from Aeration Tank No. 1 to Aeration Tank No. 2 and from Aeration Tank No. 3 to Aeration Tank No. 4. The new wall openings would be located at the water surface to allow any secondary scum that forms on the surface to pass from one tank to the other. Water spray nozzles would be provided at these locations to assist in directing secondary scum from one aeration tank to the other. The mixed liquor flow would then pass from North to South in existing Aeration Tank No. 2 and new Aeration Tank No. 4. After passing over an effluent weir located at the South end of the two tanks, the mixed liquor flow would be collected in a new effluent channel. New underground piping would then convey the mixed liquor from a drop box

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located at the end of the effluent channel to existing Diversion Structure No. 3 which distributes the flow to the secondary clarifiers.

Submersible mixers and fine bubble diffusers will be installed in the two switch zones provided at the influent end of each biological reactor. During warm weather operating conditions, the switch zones would be operated as anoxic zones with the submersible mixers in service and no air supply to the fine bubble air diffusers. Operation of the switch zones as anoxic zones will allow the biological wastewater treatment system to achieve nitrogen removal necessary for compliance with the discharge permit which limits the discharge of total nitrogen to no more than 8 milligram per liter or 167 lb/day on a maximum monthly average basis during the period of May 1 through October 31. A submersible pump would be installed at the effluent end of each reactor for recirculating mixed liquor containing nitrates to the anoxic zones at the influent end of each reactor. The submersible pump will be located in a compartment designed to prevent excessive recirculation of dissolved oxygen (DO).

During the part of the year when nitrogen removal is not required by the permit (November 1 through April 30), fine bubble diffusers will allow the switch zones to be operated as aerobic zones. Operation of the switch zones as aerobic zones during cold weather conditions is important to prevent washout of temperature-sensitive microorganisms (nitrifying bacteria) responsible for converting ammonia to nitrate. The growth rate of nitrifying bacteria is reduced significantly by cold wastewater temperatures. For this reason, nitrifier washout can occur if sufficient aerobic detention time is not provided. If washout occurs, it can take many weeks to redevelop an adequate population of nitrifying bacteria. Because nitrification (ammonia removal) is a prerequisite for achieving nitrogen removal, maintaining conditions suitable for year-round ammonia removal is crucial for providing consistent and reliable removal of nitrogen starting May 1 when the permit limit for total nitrogen goes into effect.

This alternative includes construction of one new secondary clarifier. For the purpose of this report, a secondary clarifier of equal dimensions to the existing three secondary clarifiers is included.

This alternative also includes a tertiary cloth media filter system for tertiary effluent total suspended solids (TSS) and phosphorus removal. Tertiary filtration is necessary for consistent and reliable compliance with the effluent concentration limit of 0.2 mg/L for total phosphorus, which is effective from April 1 through October 31. Dual point chemical addition for phosphorus removal is included. A precipitant (aluminum or iron salt such as alum or ferric chloride) will be added to the mixed liquor influent to the secondary clarifiers and to the secondary clarifier influent.

Table 2-1 summarizes the conceptual basis of design for the MLE alternative.

Table 2-1 Conceptual Basis of Design–MLE Alternative

	Conceptual Basis of Design
Primary Effluent Characteristics	
Wastewater Flow	
Maximum Monthly Average Flow	2.5 MGD
Peak Hourly Flow	5.3 MGD
Wastewater Characteristics (max month)	
BOD (5-day)	94 mg/L (1,960 lb/day)
TSS	71 mg/L (1,480 lb/day)

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	Conceptual Basis of Design
Total Kjeldahl Nitrogen (TKN)	21 mg/L (437 lb/day)
TP	4.1 mg/L (85 lb/day)
Biological Reactors	
Number of Reactors	2
Reactor Volume	
Switch Zones (2 per reactor)	242,352 gallons (30'Wx72'Lx15'SWD)
Aerobic Zones	403,920 gallons (30'Wx120'Lx15'SWD)
Total Reactor Volume	646,272 gallons
Hydraulic Retention Time (max month flow)	
Switch Zone	4.65 hour
Aerobic Zone	7.75 hours
Total Detention Time	12.4 hours
MLSS Concentration	3650 mg/L
Internal Mixed Liquor Recycle (IMLR) Rate	7.5 MGD (300% maximum month flow)
Return Activated Sludge (RAS) Rate	0.625-2.5 MGD (25-100% max. month flow)
Secondary Clarifiers	
Number of Clarifiers	4 (3 existing, 1 new)
Clarifier Dimensions	
Diameter	57 feet
Side Water Depth	12 feet
Total Clarifier Surface Area	10,200 square feet
Surface Overflow Rate	
Maximum Monthly Average Flow	245 gal/day/ft^2
Peak Hourly Flow	520 gal/day/ft^2
Peak Solids Loading Rate	23 lb/day/ft^2
Tertiary Filter System	
Flocculation Tanks	
Number of tanks	2
Tank Volume	31,250 gallons
Total Volume	62,500 gallons
Hydraulic Detention Time	
Maximum Month Flow Condition	36 minutes
Peak Hourly Flow Condition	17 minutes
Cloth Media Filters	
Number of Filter Units	3

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	Conceptual Basis of Design
Number of Disks Per Filter	6
Filter Area Per Disk	53.8 ft^2
Total Filter Area	968.4 ft^2
Filtration Rate	
Max. Month Flow Condition	1.8 gpm/ft^2
Peak Hourly Flow Condition	3.8 gpm/ft^2
Peak Flow (one unit out of service)	5.7 gpm/ft^2

Table 2-2 summarizes the estimated capital cost for the MLE alternative. As shown, the total capital cost for the alternative is estimated to be $8.82 million.

Table 2-2 Summary of Estimated Capital Costs–MLE Alternative

	Estimated Cost
Excavation and Backfilling	
Biological Reactors and Utility Tunnel Access	$630,000
Secondary Clarifiers	$360,000
Tertiary Effluent Filtration System	$200,000
Supplemental Carbon Storage and Feed Facility	$50,000
Buildings and Structures	
Biological Reactors and Utility Tunnel Access	$1,065,000
Secondary Clarifier	$315,000
Tertiary Effluent Filter Building	$1,480,000
Supplemental Carbon Storage and Feed	$30,000
Major Process Equipment	
Process Air Blowers	$1,140,000
Reactor Equipment (air diffusers, mixers, pumps)	$410,000
Secondary Clarifier Equipment	$1,050,000
Return Sludge and Secondary Scum Pumps	$150,000
Cloth Media Filter Equipment	$980,000
Bulk Chemical Storage and Feed Equipment	$100,000
Supplemental Carbon Storage and Feed Equipment	$300,000
Process Piping	
Biological Reactors	$320,000
Tertiary Effluent Filtration System	$200,000
Supplemental Carbon Feed	$20,000
Total Capital Cost	$8,820,000

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2.7.2 Alternative 2 – Integrated Fixed-Film Activated Sludge Alternative

This alternative is the same as Alternative 1, except for the means of upgrading the biological wastewater treatment system for nitrogen removal. In lieu of expanding the volume of the existing aeration tanks and reconfiguring the tanks to operate in an MLE configuration, this option involves installing fixed-film media within the existing aeration tanks to increase capacity for nutrient removal. For the purpose of this report, preliminary sizing and budgetary cost information was solicited from Entex Technologies for their Webitat system, which utilizes modular racks of knitted polyester fabric to enhance microbiological growth in biological reactors (see Figure 2-6).

Each aeration tank would be reconfigured to include two pre-anoxic zones, an aerobic zone in which the Webitat media modules would be placed, two post-anoxic zones, and a reaeration zone (see Figure 2-7). With the installation of the Webitat media, expansion of the aeration tanks would not be necessary.

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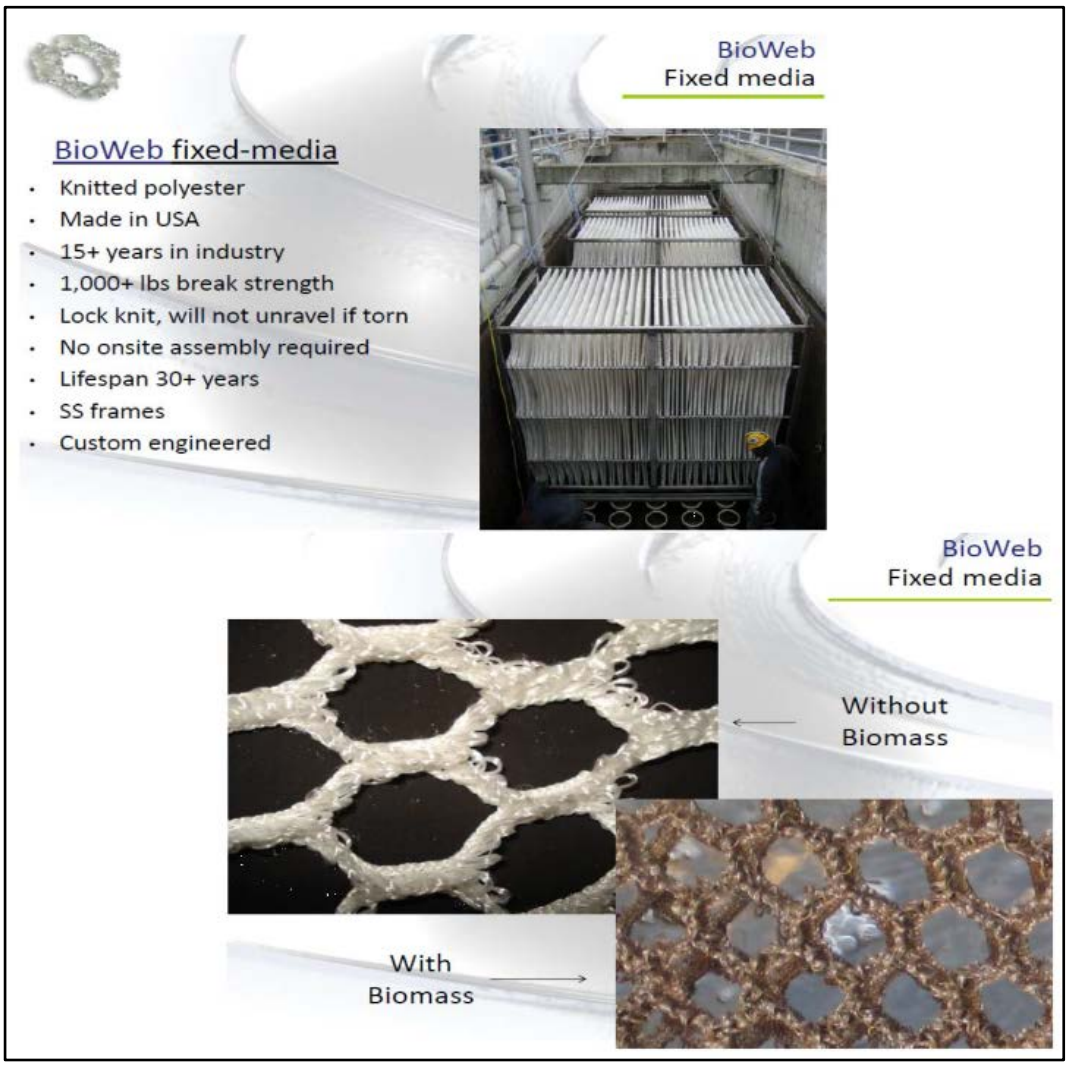

Figure 2-6 Entex Webitat IFAS Technology

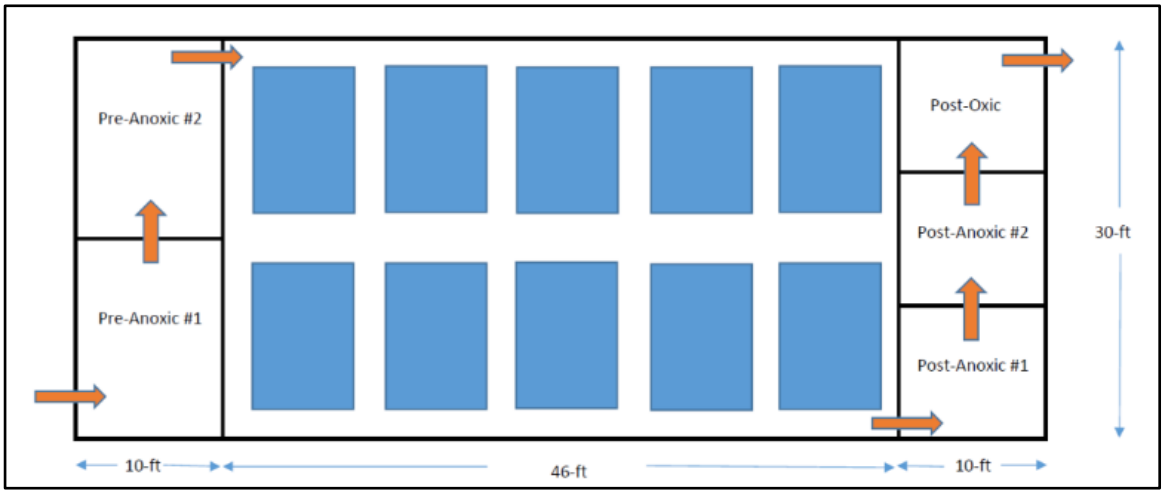

Figure 2-7 Reactor Configuration–IFAS Alternative

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Table 2-3 summarizes the conceptual basis of design for the IFAS alternative.

Table 2-3 Conceptual Basis of Design–IFAS Alternative

	Conceptual Basis of Design
Primary Effluent Characteristics	
Wastewater Flow	
Maximum Monthly Average Flow	2.5 MGD
Peak Hourly Flow	5.3 MGD
Wastewater Characteristics (max month)	
BOD (5-day)	94 mg/L (1,960 lb/day)
TKN	21 mg/L (437 lb/day)
Biological Reactors	
Number of Reactors	3
Reactor Volume	
Pre-Anoxic Zones (2 per reactor)	33,660 gallons (2@10'Wx15'Lx15'SWD)
Aerobic (IFAS) Zone	154,836 gallons (30'Wx46'Lx15'SWD)
Post-Anoxic Zones (2 per reactor)	22,440 gallons (2@10'Wx10'Lx15'SWD)
Re-Aeration Zone	11,220 gallons (10'Wx10'Lx15'SWD)
Total Reactor Volume	222,156 gallons
Hydraulic Detention Time (max. month flow)	
Pre-Anoxic Zones	1.0 hour
Aerobic (IFAS) Zone	4.4 hours
Post-Anoxic Zone	40 minutes
Reaeration Zone	20 minutes
Total Detention Time	6.4 hours
Fixed-Film Media	
Number of Modules (each reactor)	10
Bioweb Media (each reactor)	111,000 square feet
MLSS Concentration	
Suspended Growth Concentration	3,000 mg/L
Fixed-Film Media (equivalent conc.)	5,300 mg/L
Total Equivalent Concentration	8,300 mg/L
Nitrate Recycle Rate	7.5 MGD (300% maximum month flow)
RAS rate	0.625-2.5 MGD (25-100% max. month flow)
Secondary Clarifiers	
Number of Clarifiers	4 (3 existing, 1 new)
Clarifier Dimensions	

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	Conceptual Basis of Design
Diameter	57 feet
Side Water Depth	12 feet
Total Clarifier Surface Area	10,200 square feet
Surface Overflow Rate	
Maximum Month Flow Condition	245 gal/day/ft^2
Peak Hourly Flow Condition	520 gal/day/ft^2
Peak Solids Loading Rate	19 lb/day/ft^2
Tertiary Filter System	Same as Alternative 1

Table 2-4 summarizes the estimated capital cost for the MLE alternative. As shown, the total capital cost for the alternative is estimated to be $10.3 million.

Table 2-4 Summary of Estimated Capital Costs–IFAS Alternative

	Estimated Cost
Excavation and Backfilling	
Secondary Clarifier	$360,000
Tertiary Effluent Filtration System	$200,000
Supplemental Carbon Storage and Feed Facility	$50,000
Buildings and Structures	
Biological Reactors and Utility Tunnel Access	$145,000
Secondary Clarifier	$315,000
Tertiary Effluent Filter Building	$1,480,000
Supplemental Carbon Storage and Feed	$50,000
Major Process Equipment	
IFAS Equipment (media, mixers, diffusers, blowers, pumps)	$4,400,000
Nitrate Recycle Pumps	$120,000
Secondary Clarifier Equipment	$1,100,000
Return Sludge and Secondary Scum Pumps	$160,000
Cloth Media Filter Equipment	$980,000
Bulk Chemical Storage and Feed Equipment	$100,000
Supplemental Carbon Storage and Feed Equipment	$300,000
Process Piping	
Biological Reactors	$320,000
Tertiary Effluent Filtration System	$200,000
Supplemental Carbon Feed	$20,000
Total Capital Cost	$10,250,000

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2.7.3 Alternative 3 – Ballasted Biological Treatment (BioMag) Alternative

This alternative is the same as Alternative 1, except for the means of upgrading the biological wastewater treatment system for nitrogen removal. In lieu of expanding the volume of the existing aeration tanks and reconfiguring the tanks to operate in an MLE configuration, this option involves a high MLSS approach with addition of an inert ballast material to assist with settling of the biological floc. For the purpose of this report, preliminary sizing and budgetary cost information was solicited from Evoqua Water Technologies for their BioMag™ system, which utilizes the addition of magnetite to facilitate settling of biological floc in secondary clarifiers. The system includes equipment (shear mill and magnetic drum separator) to recover the magnetite from the waste sludge (see Figure 2-8). The recovered magnetite is added back to the reactor influent. The system also includes ballast feed equipment (storage silo, dry feeder, and ballast mix tank) for periodically adding additional ballast to the system to replace ballast that is not recovered.

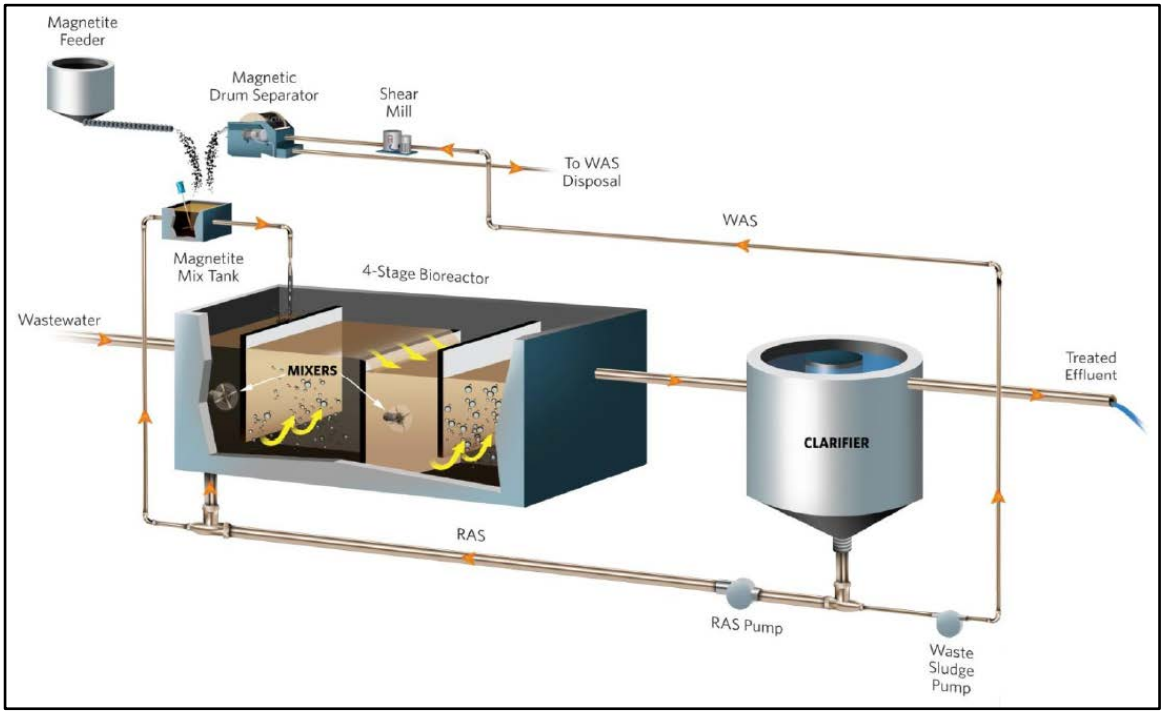

Figure 2-8 Process Flow Schematic—IFAS Alternative

This alternative uses magnetite, a finely ground, inert, non-abrasive iron ore that has a high specific gravity, to improve the settling characteristics of the biological mixed liquor. The improved settling characteristics allow the system to be operated at a higher mixed liquor suspended solids concentration than would be possible in a conventional, suspended growth biological wastewater treatment system. The higher mixed liquor suspended solids concentration means that more treatment can be provided in a smaller volume. The BioMag wastewater treatment technology is currently marketed in the U.S. for municipal wastewater treatment by Evoqua Water Technologies, Inc. of Waukesha, Wisconsin.

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Table 2-5 Conceptual Basis of Design–BioMag Alternative

	Conceptual Basis of Design
Primary Effluent Characteristics	
Wastewater Flow	
Maximum Monthly Average Flow	2.5 MGD
Peak Hourly Flow	5.3 MGD
Wastewater Characteristics (Max Month)	
BOD (5-day)	94 mg/L (1,960 lb/day)
TKN	21 mg/L (437 lb/day)
Biological Reactors	
Number of reactors	3
Reactor Volume	
Pre-Anoxic Zones (2 per reactor)	33,660 gallons (2@10'Wx15'Lx15'SWD)
Aerobic Zone	154,836 gallons (30'Wx46'Lx15'SWD)
Post-Anoxic Zones (2 per reactor)	22,440 gallons (2@10'Wx10'Lx15'SWD)
Re-Aeration Zone	11,220 gallons (10'Wx10'Lx15'SWD)
Total Reactor Volume	222,156 gallons
Hydraulic Detention Time (max. month flow)	
Pre-Anoxic Zones	1.0 hour
Aerobic Zone	4.4 hours
Post-Anoxic Zone	40 minutes
Reaeration Zone	20 minutes
Total Detention Time	6.4 hours
MLSS Concentration	4200 mg/L
Nitrate Recycle Rate	7.5 MGD (300% maximum month flow)
RAS Rate	0.625-2.5 MGD (25-100% max. month flow)
Secondary Clarifiers	
Number of Clarifiers	3 (existing)
Clarifier Dimensions	
Diameter	57 feet
Side Water Depth	12 feet
Total Clarifier Surface Area	7,650 square feet
Surface Overflow Rate	
Maximum Month Flow Condition	330 gal/day/ft^2
Peak Hourly Flow Condition	690 gal/day/ft^2
Peak Solids Loading Rate	36 lb/day/ft^2
Tertiary Filter System	Same as Alternative 1

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Table 2-6 summarizes the estimated capital cost for the BioMag alternative. As shown, the total capital cost for the alternative is estimated to be $10.6 million.

Table 2-6 Summary of Estimated Capital Costs–BioMag Alternative

	Estimated Cost
Excavation and Backfilling	
Ballast Recovery and Nitrate Recycle Pump Station	$25,000
Tertiary Effluent Filtration System	$200,000
Supplemental Carbon Storage and Feed Facility	$50,000
Buildings and Structures	
Ballast Recovery Building	$560,000
Nitrate/RAS Pump Station and Reactor Modifications	$185,000
Tertiary Effluent Filter Building	$1,480,000
Supplemental Carbon Storage and Feed	$50,000
Major Process Equipment	
Process Air Blowers	$1,140,000
Jet Mixing Equipment	$1,670,000
Submersible Mixers and Nitrate Recycle Pumps	$300,000
BioMag Equipment	$2,040,000
Secondary Clarifier Equipment	$790,000
Return Sludge and Secondary Scum Pumps	$160,000
Cloth Media Filter Equipment	$980,000
Bulk Chemical Storage and Feed Equipment	$100,000
Supplemental Carbon Storage and Feed Equipment	$300,000
Process Piping	
Biological Reactors	$320,000
Tertiary Effluent Filtration System	$200,000
Supplemental Carbon Feed	$20,000
Total Capital Cost	$10,570,000

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2.7.4 Cost Comparison

Table 2-7 summarizes Total Capital Costs for the three options. As shown, alternative having the lowest capital cost is Alternative 1 (MLE Alternative).

Table 2-7 Summary of Estimated Capital Costs–Secondary/Advanced Treatment Alternatives

	Estimated Capital Cost
Alternative 1 – MLE Alternative	$8,820,000
Alternative 2 – IFAS Alternative	$10,250,000
Alternative 3 – BioMag Alternative	$10,570,000

2.8 Disinfection/Post Aeration Alternatives Evaluation

The Uxbridge WWTF currently uses sodium hypochlorite for chlorine disinfection of treated water. After disinfection, flow passes through a cascade aeration system for post-aeration and is discharged to the Blackstone River.

The existing chlorine contact tanks are in good condition, but do not have adequate volume to provide the TR-16 Guides for the Design of Wastewater Treatment Works recommended minimum thirty minute contact time during future peak flow events. The ASAR recommended chlorination and UV disinfection as disinfection technologies for further evaluation.

The existing cascade aeration system is undersized and cannot meet the effluent dissolved oxygen permit requirements under low flow summer conditions. Additionally a portion of the structure is located within the 100-year flood zone. The ASAR recommended that the system be replaced with a mechanical post aeration basin.

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Disinfection/Post Aeration Alternatives

The following two disinfection/post aeration alternatives were recommended for further evaluation in the ASAR:

1. Expand the existing chlorine contact basins and continue to use sodium hypochlorite for chlorine disinfection. Construct a new basin for mechanical post-aeration.
2. Convert the existing chlorine contact basins into tankage for a UV disinfection system and a mechanical post aeration system. Preliminary manufacturer proposals indicate that the footprint of a UV disinfection system is less than what is needed for chlorination and that the existing basin could be converted to hold both the UV and a mechanical post aeration system.

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Cost Comparison

Table 2-8 summarizes Total Capital Costs, Operation and Maintenance (O&M) Costs, and an estimated present worth for both options.

Table 2-8 Summary of Disinfection and Post Aeration Alternative Treatment Costs

Technology	Estimated Capital Cost	Estimated O&M Present Worth	Estimated Present Worth
Chlorination	$530,000	$710,000	$800,000
UV Disinfection	$1,490,000	$420,000	$1,360,000

Table 2-9 summarizes other advantage and disadvantages (outside of the costs previously discussed) for the two technologies.

Table 2-9 Disinfection Technology Comparison

Technology	Advantages	Disadvantages
Chlorination	• The process can be controlled for feed dosages and chlorine residual. • Minimal energy cost. • Uxbridge WWTF operators are familiar with operation of a chlorination system.	• The storage and handling of sodium hypochlorite can be a safety hazard. • Sodium hypochlorite has a limited shelf life. • Chlorine compounds can produce trihalomethanes.
UV Disinfection	• No adverse environmental impacts. • Minimal space requirements due to the required short contact time. • Ease of operation and maintenance. • Cost competitive with other disinfection techniques. • Well proven effectiveness.	• Suspended solids, turbidity and color can interfere with the effectiveness of disinfection. • High quality treated water is required prior to UV disinfection. • Periodic cleaning and replacement of bulbs is required. • Does not produce a monitorable residual. • A chlorine system may be needed to prevent regrowth in the plant water system. • Ferric chloride added for phosphorus removal can interfere with the effectiveness of the UV system.

Recommended Alternative

The estimated present worth costs for UV and chlorine disinfection are comparable. Due to operator familiarity and preference for chlorine disinfection it is recommended that the existing chlorine contact tank be expanded and that the facility continue to utilize chlorination for disinfection.

2.9 Odor Control Alternatives Evaluation

The facility currently does not have any odor control. The facility is not in a highly populated area and has never received any odor complaints. In its current configuration, septage receiving is the

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most odorous process at the facility and is the only process for which the Town expressed odor concerns.

It was recommended that the construction of a bio-filter be further evaluated in the ASAR.

Odor Control Alternatives

Due to the remote location of the facility it is recommended that space should be designated on the site for a future bio-filter installation, to be constructed in the future, if needed.

2.10 Residuals Disposal Alternatives Evaluation

The Uxbridge WWTF currently utilizes a gravity thickener for sludge thickening. Sludge is thickened and hauled for off-site disposal at the New England Treatment Company sewage sludge incinerator in Woonsocket, Rhode Island. The concrete of the existing gravity thickener was found to be in good condition; however all of the mechanical equipment is well past its useful life.

Two sludge processing management alternatives were recommended for further evaluation in the ASAR:

- Gravity thickening and transport to a regional facility for disposal or reuse.
- Sludge dewatering and transport to a regional facility for disposal or reuse.

Under either of these alternatives, the new sludge processing facilities could be constructed at the Uxbridge WWTF.

Cost Comparison

Table 2-10 summarizes Total Capital Costs, O&M Costs and an estimated present worth for both options.

Table 2-10 Summary of Residuals Disposal Alternatives

Technology	Estimated Capital Cost	Estimated O&M Present Worth	Estimated Present Worth
Sludge Thickening	$680,000	$3,000,000	$3,700,000
Sludge Dewatering	$1,660,000	$3,100,000	$4,800,000

Due to the close proximity of off-site disposal for thickened sludge the O&M costs of these options are very close to the O&M costs of sludge dewatering, which typically has a lower O&M cost since less water is hauled off-site with when sludge is dewatered.

Recommended Alternative

Sludge thickening is a relatively simple process with lower capital costs and lower operation, maintenance and energy requirements than sludge dewatering. Thickened sludge can be disposed of (or reused) at a number of regional facilities. Sludge thickening is the first step required for the more complicated sludge management processes of sludge dewatering and composting and other stabilization processes; therefore these additional processes could be added in the future if desired as sludge flows increase.

Thickened sludge is believed to be the most practical, and cost effective, sludge disposal/reuse alternative and is the recommended sludge management alternative. As the wastewater flows increase, and if energy costs and disposal costs increase significantly, this strategy could be re-evaluated for higher flows.

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2.11 Collection System Alternatives Evaluation

Pumping Station

The West River pumping station is located in the 100-year flood plain. The mechanical equipment at the station is well past its useful life and needs to be replaced. Additionally the structural integrity of the steel entrance tube is not known. During a flooding event, water was observed entering the wet well through conduits and rising around the station to within a couple inches of the top of the entrance tube. Water also flooded the nearby Highway Department Building, which houses the pump stations emergency generator and electrical equipment. Due to the unknown structural condition of the entrance tube the "Fix it First" alterative of replacing the mechanical equipment in the station was not recommended in the ASAR for further evaluation.

The existing station is a wet pit/dry pit pump station. A cost comparison was done to determine whether it would be more cost effective to replace the station in kind or with another type of station, such as a suction lift station. The comparison of capital costs, inflated to the midpoint of construction, is outlined in Table 2-11.

Table 2-11 West River Pumping Station Alternatives—Capital Costs

Type of Pumping Station	Capital Costs
Replace in kind (pre-engineered wet pit/dry pit)	$1,800,000
Suction Lift Pumping Station	$1,900,000

Due to the unknown structural integrity of the existing pumping station, it is recommended that the West River Pumping Station be replaced in its entirety.

Collection System

2.11.1 Collection System Extensions

Since no concentrated areas problematic to on-site wastewater disposal were found in the NAR, no large sewer extensions are recommended as part of this project.

If during future development a concentrated area unsuitable for on-site wastewater disposal is identified, the following technologies are recommended for further evaluation:

- Gravity sewers and lift stations.
- Pressure sewers with grinder pumps.
- Vacuum sewers.

2.11.2 Existing Collection System

The Town has identified several hydraulic constraints in its existing collection system. It is recommended that a SewerCAD model is developed for the system to assist the Town in identifying additional hydraulic constraints that may exist in the system.

2.12 Sustainability Alternatives Evaluation

There are many opportunities to incorporate sustainability considerations into the wastewater treatment process, thereby reducing the carbon footprint of the facility and realizing operations savings through the minimization of wasted power.

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The sustainability alternatives discussed in this section are considered either good practice, or better than standard practice. The alternatives have been evaluated and categorized as one of the following options:

- Measure to be considered in preliminary and final design—more analysis is required on these items to determine whether these are recommended items.
- Not recommended measure—these items are not recommended for implementation.

2.12.1 Water Conservation

Installation of Reduced Flow Plumbing

Water usage can be minimized through the installation of reduced flow plumbing such as water-saving toilers, reduced flush devices and restricted shower heads. **This is an item to be considered in final design.**

Reduced Infiltration and Inflow

Locating and repairing sources of inflow and infiltration in the collection system helps minimize the amount of water that needs to be pumped to and treated by the Facility. An I/I analysis was conducted by Beta Group Inc. in 2006, which recommended several sections of the existing collection system for further investigation. **It is recommended that these targeted investigations be conducted, in order to identify whether cost effective I/I reduction measures existing within the existing collection system.**

Reclaimed Wastewater Reuse

Potable water usage can be minimized through the reuse of effluent water (plant water) for non-potable purposes. The facility currently uses plant water for spray wash on the clarifiers, for the gravity thickener, grit washing and pump seal system. An assessment should be conducted to determine where there are any other economic effluent reuse opportunities at the facility. **This is an item to be considered in final design.**

Landscaping

Landscaping water conservation measures can be accomplished through the planting of native species to eliminate supplementary watering needs and use of landscaping features, such as open-grid pavers. **This is an item to be considered in final design.**

2.12.2 Energy Efficiency

Energy Audit

An energy audit is used to determine if the equipment at a facility is properly sized for a process. The existing mechanical equipment at the facility is well past its useful life and in need of replacement. **Because much of the equipment is in need of outright replacement, it is not recommended that an energy audit of existing equipment be conducted at this time.**

Optimizing Existing Infrastructure

It is possible that existing infrastructure, which is scheduled to be demolished, can be reused in future construction. **This is an item to be considered in preliminary and final design.**

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Sub Metering

Energy usage can be minimized through system monitoring. Sub-metering will allow the facility to track the energy usage of individual processes and equipment. Installing DO probes in aeration systems allows operators to closely match the air supplied by the blowers to the system's need, thereby reducing excess energy consumption. **This is an item to be considered in final design.**

Energy Management System

Energy management systems are used to lock out specified process operations during periods of peak energy demand in order to minimize demand charges from the local utility. The Uxbridge WWTF is currently participating in an incentivized program to reduce energy consumption to a pre-determined amount when needed. **Implementing a similar program at the upgraded facility is an item to be considered in preliminary and final design.**

Upgrade Existing Motors to Variable Frequency Drives

Variable frequency drives (VFDs) should be considered for all major equipment at the facility. **This is an item to be considered in final design.**

Process Optimization

Most WWTFs are designed with oversized equipment in order to account for uncertainty in influent variations, to provide additional capacity for future growth and to meet State and local regulatory criteria. Process models can be used to develop operational strategies for the current influent flow conditions. Process optimization may include upgrading the existing coarse bubble diffuser with a more energy efficient system, replacing the existing blowers with turbo blowers and installing process instrumentation to allow for finer control of process air requirements. **This is an item to be considered in final design.**

Reduce Ventilation and Heating Requirements

Codes should be examined for provisions that allow for lower heating requirements and fewer air changes when an area is unoccupied in order to reduce energy consumption for ventilation and heating. High-efficiency HVAC equipment should be considered at the facility. **This is an item to be considered in final design.**

Implementation of Instrumentation and Control Systems

Instrumentation and control systems, such as Supervisory Control and Data Acquisition (SCADA), are used to help match supply with demand. SCADA can be used to monitor energy usage trends and to remotely optimize process control through the measurement of variables such as liquid and gas flow rates, chemical residual and dissolved oxygen concentrations. **This is an item to be considered in final design.**

Optimize Lighting

Energy efficiency measures to be considered for the lighting system include adding motion sensors on lights in non-process buildings, using high-efficiency fixtures and maximizing the use of natural light through the use of windows, translucent panels, skylights, etc, to reduce reliance on artificial lighting. In order to limit light pollution, light sensors or light timers should be considered and exterior lighting should be limited to what is required by local codes or for safety. **This is an item to be considered in final design.**

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Optimize Building Envelope

Upgrading building envelope requirements, through the use of upgraded insulation and window requirements, should be considered at the facility. **This is an item to be considered in final design.**

2.12.3 Energy Recovery

Hydroelectric Potential

If adequate head is present in an effluent pipe, a hydro-turbine could be utilized to recover a portion of the potential energy in the flow with a low head generation device. **This is an item to be considered in preliminary and final design.**

Anaerobic Sludge Digestion

Anaerobic sludge digestion is a process in which microorganisms break down organic materials in the absence of oxygen. A byproduct of the process is the production of methane gas, which can be harvested and used as a biogas. The biogas can be used to power boilers, generators, pumps or blowers. **Due to the high infrastructure costs of anaerobic digestion it is not recommended that anaerobic digestion be retained for further evaluation as part of this project.**

Effluent Heat Recovery

Typical wastewater effluent contains enough heat, extractable through a heat exchanger, to be considered as a building heating source. Effluent heat pumps have a relatively low impact on energy consumption at a facility. **This is an item to be considered in preliminary and final design.**

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2.12.4 Alternative Energy

Solar

The Town could consider solar photovoltaic (PV) systems to produce renewable energy onsite. PV systems can either be roof-mounted or ground-mounted depending on site conditions. South facing roofs with minimal shadow interference provide the most ideal conditions for a roof-mounted solar array. **This is an item to be considered in preliminary and final design.**

Wind

The Town could consider the installation of a wind turbine installation to produce renewable energy onsite. The Uxbridge WWTF is located on a site that is shown to have poor to marginal winds on the 50m Wind Power map produced by the National Renewable Energy Laboratory (NREL). If the Town wishes to consider a smaller installation Water Environment Federation Manual of Practice (WEF MOP) 32 recommends that the potential site be monitored for wind potential for at least a year to determine its suitability for a wind turbine installation. **Since this site is not an ideal location for wind energy it is not recommended that wind energy is pursued further at this time.**

Geothermal

Geothermal systems use the nearly constant temperature of the earth to act as a heat source and heat sink to heat and cool building through a heat pump and a heat exchanger. A heat exchanger is

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a system of pipes buried in the shallow ground near the building. **This is an item to be considered in preliminary and final design.**

2.12.5 Site Considerations

Low Pollution Generator

The Town should consider the installation of a low-polluting emergency generator at the facility. **This is an item to be considered in preliminary and final design.**

2.12.6 Summary

Table 2-12 summarizes the sustainability considerations that are recommended to be considered during preliminary and final design.

Table 2-12 Recommended Sustainability Considerations

Water Conservation	Energy Efficiency	Energy Recovery	Alternative Energy	Site Considerations
Installation of reduced flow plumbing	Optimizing existing infrastructure	Hydroelectric potential	Solar	Low-polluting generator
Reduced I/I	Sub-metering	Effluent heat recovery	Geothermal	
Reclaimed WW reuse	Energy management systems			
Landscaping	Upgrade existing motors to VFDs			
	Process Optimization			
	Reduce ventilation and heating requirements			
	Implement instrumentation and control systems			
	Optimize lighting			
	Building envelope upgrade			

2.13 Flow and Loading Reduction Evaluations

2.13.1 Introduction

The identification of flow and loading reduction alternatives for centralized water and sewer services is important to minimize the expense of new, or upgraded, facility construction. These alternatives can also conserve water use and minimize impact to natural resources. Reduction of wastewater flows and loadings to on-site septic systems can also reduce the impact of pollutant discharges to groundwater and surface waters down gradient of recharge areas. The objective of this section is to review methods that could be utilized to reduce the wastewater volume and pollutant loadings generated by residential and non-residential sources.

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2.13.2 Infiltration and Inflow (I/I) Reduction

An I/I Analysis was conducted by Beta Group, Inc. in 2006. The report, which is described in detail in the NAR, concluded that excessive infiltration rates were not found in the system and provided the following recommendations for further study:

- Inflow investigation of two subareas to identify potential sources of inflow into the system.
- Repair select pipe defects identified in the report.
- Repair all manhole defects identified in the report.
- Conduct a Town-wide manhole inspection and repair program.

It should be noted that the I/I Analysis, which was conducted in 2006, is approximately 10 years old and that the system may have deteriorated further during the time that has elapsed since the study was conducted.

The report recommends two additional investigations that should be conducted on the system:

1. Inflow investigation in Sub Areas 5 and 6 (as identified in the Report) including smoke testing, dyed water tracing, and dyed water flooding to identify potential public and private sources of inflow from catch basins, roof leader, manhole corbels, and covers.
2. Town-wide manhole inspection.

It is recommended that these two investigations are completed. Additionally, the Town should inspect the sewers regularly and repair the largest leaks (points of infiltration). Also, the Town should make an effort to notify sewer users that basement sump pumps and roof leaders should not be connected to the sewer.

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2.13.3 Pricing Policy for Water and Wastewater Service

As discussed previously in the NAR, the Town uses an increasing block rate structure, which encourages conservation because the customer is charged a higher rate as their water usage increases. The Town also bills on a quarterly cycle, which makes it easier for customers to keep better track of their water usage and seasonal variations and to adjust their water usage accordingly.

It is recommended that the Town continue to implement both of these practices.

2.13.4 Growth Management Regulation

Currently site restrictions associated with Title 5 septic systems often limit the number of bedrooms allowed for a property. If these areas are sewered, the Title 5 regulations no longer apply. In order to preserve its existing community essence, it is recommended that the Town review its existing zoning and consider implementing zoning modifications, which could include increasing the allowable minimum lot sizes and establishing restrictions on building sizes and uses.

The State Revolving Fund (SRF) regulations (310 CMR 44) encourage towns to adopt landuse controls to limit wastewater flows from sewered areas. These landuse controls are often called “Growth Neutral” or “Flow Neutral” requirements. Implementing landuse controls is a pre-requisite to the Town potentially qualifying for a 0% interest loan from SRF.

The “Environmental Bond Bill” Chapter 313 of the Acts of 2008 (also known as the O’Leary Bill) allows towns to receive 0% interest loans on wastewater infrastructure projects that meet specific

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requirements, such as the Flow Neutral requirement identified above. The other four primary requirements are:

1. The project must be primarily intended to remediate or prevent nutrient enrichment of a surface water body or a source of water supply.
2. The applicant is not currently subject to a MassDEP enforcement order, administrative consent order or unilateral administrative order, enforcement action by the United States Environmental Protection Agency, or subject to a state or federal court order relative to the proposed project due to a violation of a nutrient related total maximum daily load standard or other nutrient based standard.
3. The applicant has a CWMP approved pursuant to the regulations adopted by MassDEP.
4. The project has been deemed consistent with the regional water resources management plans, if one exists.

It is recommended that the Town explore implementing growth management control regulations.

2.13.5 Summary

The Town of Uxbridge has policies in place that encourage the conservation of water. It is recommended that the Town periodically make adjustments to their current block rate structure, which may encourage increased water conservation.

In 2006 it was determined that I/I flow rates observed were not excessive by DEP standards. It is recommended that the additional investigations recommended in the I/I study be conducted.

It is also recommended that the Town explore implementing growth management control regulations.

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3. Recommended Plan

3.1 Introduction

This chapter identifies and presents the Comprehensive Wastewater Management Plan's Recommended Plan. The chapter is a culmination of the findings presented in the previous documents prepared as part of this project and the evaluations included in this Report. This Chapter outlines the recommended plan and a proposed schedule to implement the plan. The Chapter also discusses the financial planning efforts, future work, and other institutional considerations necessary for the plan.

The goal of the recommended plan is to provide the most cost-effective plan to address the issues identified in the NAR.

3.2 Recommendation of Areas for Collection System Extensions

3.2.1 Geographic Areas Delineated

Since the NAR found no site-specific data indicating concentrated problematic areas for on-site wastewater disposal, it is recommended that the three Study Areas continue to rely primarily on Title 5 systems for on-site wastewater disposal. For sites where Title 5 septic systems are not suitable, due to site constraints or other environmental factors, it is recommended that Innovative and Alternative systems be considered on a location by location basis.

3.2.2 Description of Sewer Extension and Estimated Capital Costs

No major sewer extensions are recommended at this time.

3.2.3 Expected Wastewater Flows Generated from Sewer Extension Areas

Sewer extensions are expected to be limited to infill properties within the boundaries of the collection system tying into the system and undeveloped properties within the boundaries of the collection system connecting to the existing collection system. No major sewer extensions are anticipated at this time.

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3.3 Recommended Wastewater Facility and Collection System Upgrades

3.3.1 Expected Wastewater Flows

Based on the existing flows and project future growth outlined in the NAR, projected design flows over the 20-year planning period are outlined in Table 3-1.

Table 3-1 Current and Projected Future Wastewater Flows

Wastewater Flow	Current Condition – 2014 (MGD)	Future Growth Capacity(MGD)	Design Condition (2035)
Annual Average	1.0	0.5	1.5
Maximum Month	1.5	0.7	2.2
Peak Day	2.3	1.1	3.4
Peak Hourly	3.5	1.8	5.3

The WWTF has a two-tiered permit with less stringent limits that the facility is required to meet until the facility reaches an annual average flow of 1.25 MGD. Based on anticipated future growth within the Town, the facility is expected to exceed the reduced flow for the first tier of the permit and needs to be designed to reliably meet the more stringent effluent limits of the second tier. A mass balance will be developed for the Uxbridge during conceptual design.

3.3.2 Description of Recommended WWTF Upgrade

A site plan of the existing WWTF is shown in Figure 3-1. The proposed layout of the upgraded facility is shown in Figure 3-2. A liquid and solid schematic diagram is shown in Figure 3-3.

The recommended approach for Uxbridge is to implement the following upgrades to the Uxbridge WWTF in order to upgrade the facility to meet its new effluent permit and to replace aging mechanical equipment. Although USEPA cannot guarantee that permit limits would not become more stringent in the future, they did not note any foreseeable changes to permit limits in the "Uxbridge Wastewater Treatment Facility – Response to Comments", which is part of the 2013 NPDES Permit (see Appendix D). Therefore it is recommended that the upgraded facility be upgraded to meet the permit limits in the 2013 NPDES permit.

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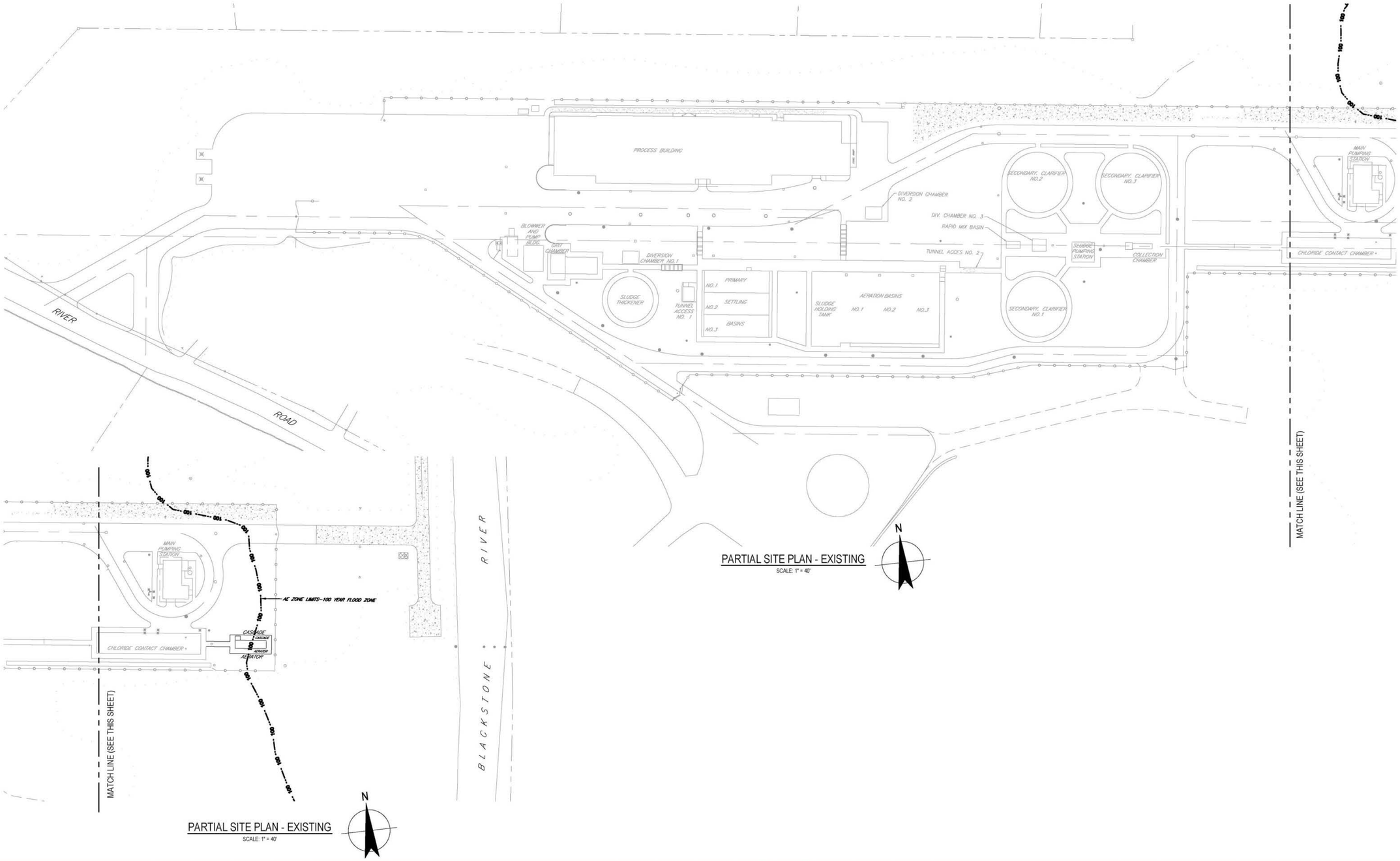

0 20 40 60 80'
SCALE 1"=40' AT ORIGINAL SIZE

TOWN OF UXBRIDGE, MA
UXBRIDGE WASTEWATER TREATMENT FACILITY
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
UXBRIDGE WASTEWATER TREATMENT FACILITY UPGRADE
EXISTING SITE PLAN

Job Number 86-14914
Revision A
Date 11/2015
Figure 3-1

Plot Date: 17 November 2015 - 11:00 AM Cad File No: G:\86\14914\CAD\86-18922-C01.dwg

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 774 470 1630 F 1 774 470 1631 E hyamail@ghd.com W www.ghd.com

Figure 3-1 Uxbridge WWTF Upgrade – Existing Site Plan

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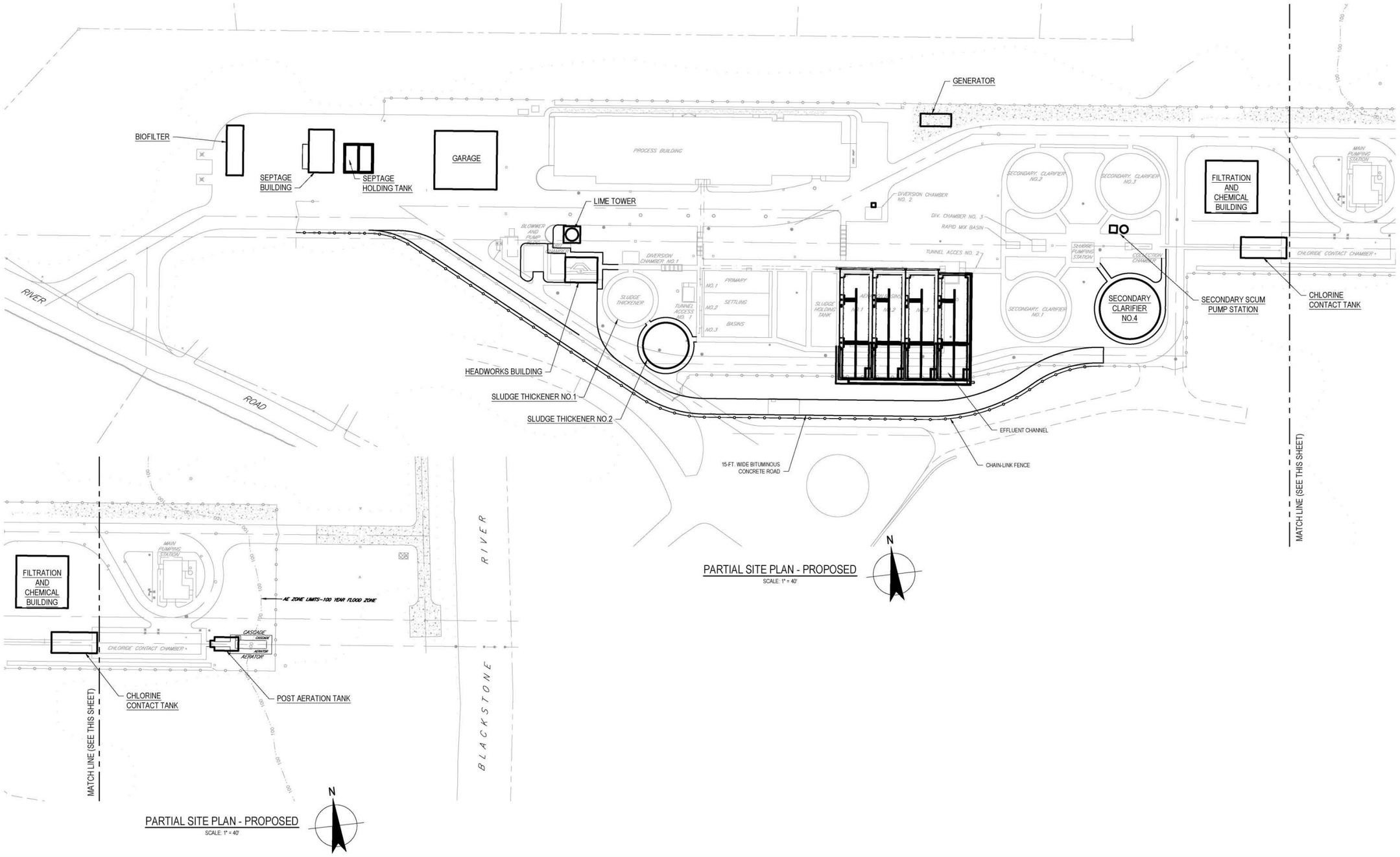

Plot Date: 17 November 2015 - 11:01 AM Cad File No: G:\86\14914\CAD\86-16922-C02.dwg

0 20 40 60 80'
SCALE 1"=40' AT ORIGINAL SIZE

TOWN OF UXBRIDGE, MA
UXBRIDGE WASTEWATER TREATMENT FACILITY
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
UXBRIDGE WASTEWATER TREATMENT FACILITY UPGRADE
PROPOSED LAYOUT

Job Number 86-14914
Revision A
Date 11/2015
Figure 3-2

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 774 470 1630 F 1 774 470 1631 E hyamail@ghd.com W www.ghd.com

Figure 3-2 Uxbridge WWTF Upgrade – Proposed Layout

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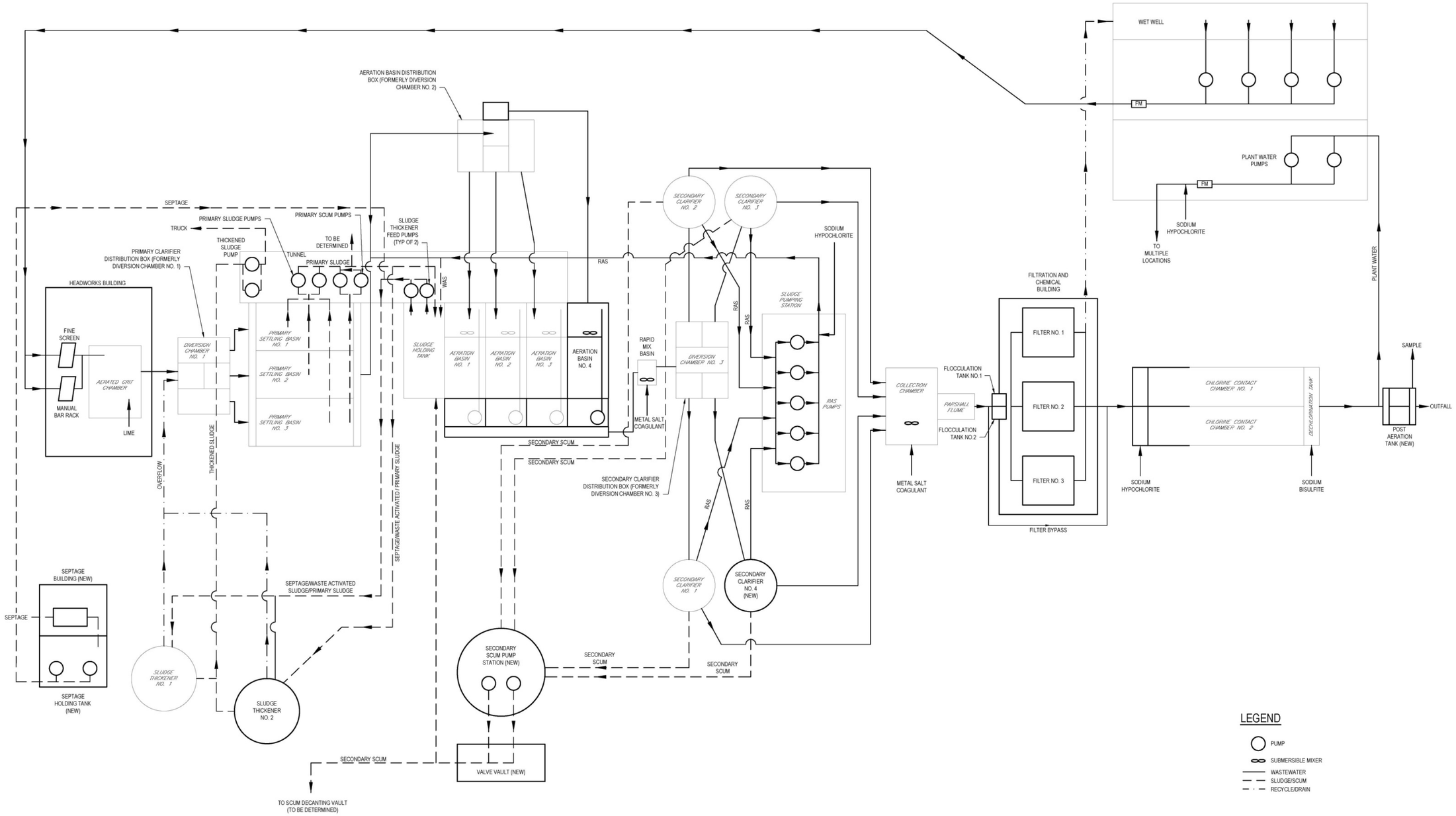

Plot Date: 17 November 2015 - 11:02 AM Cad File No: G:\86\14914\CAD\86-18922-M01.dwg

TOWN OF UXBRIDGE, MA
UXBRIDGE WASTEWATER TREATMENT FACILITY
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
UXBRIDGE WASTEWATER TREATMENT FACILITY UPGRADE
PROPOSED WASTEWATER LIQUID AND SOLID SCHEMATIC DIAGRAm

Job Number 86-14914
Revision A
Date 11/2015
Figure 3-3

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 774 470 1630 F 1 774 470 1631 E hyamail@ghd.com W www.ghd.com

Figure 3-3 Uxbridge WWTF Upgrade – Proposed Wastewater Liquid and Solid Schematic Diagram

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Administrative Recommendations

- Develop an electronic tracking system for septic pumping records and Title 5 inspections to help the Town identify future wastewater needs through the tracking of septic system issues.
- Review and update the existing sewer regulations and bylaws.
- Implement a fiscal sustainability planning system through the development of a Wastewater Asset Management Plan.
- Explore implementing growth management control regulations.

Collection System

- Develop a SewerCAD model to allow the Town to identify hydraulic constraints within its existing collection system.
- Conduct targeted I/I investigations recommended in the 2006 Beta Group Inc. Report to identify whether cost effective I/I reduction measures existing within the existing collection systems.

Pump Stations

- Replace West River Pump Station in kind.

Septage Receiving

- Process septage received at the facility with the solids stream instead of with the liquid stream.
- Replace existing septage receiving equipment.
- Install new septage holding tanks which are adequately sized to treat expected septage volumes.

Influent Pump Station and Preliminary Treatment

- Replace mechanical equipment at influent pump station and aerated grit chamber.
- Upgrade the pumps at the influent pump station to a model that is capable of passing wipes and floatables further downstream.
- Replace comminutor with a fine screen to protect downstream secondary treatment equipment.
- Reconfigure existing preliminary treatment process to remove floatables from the liquid stream with a fine screen prior to the aerated grit chamber by reversing the flow through the two structures.

Primary Clarification

- Reuse existing tanks and replace mechanical equipment in existing primary clarifier tanks.

Secondary Treatment

- Expand existing tankage, through the construction of additional tankage, to provide adequate volume for MLE process.

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Disinfection and Post Aeration

- Expand existing chlorine contact tank to provide adequate contact time.
- Abandon existing cascade aerator and construct a new mechanical post-aeration system.

Sludge Holding Tank and Sludge Pumping Station

- Replace mechanical equipment in the Sludge Holding Tank and Sludge Pumping Station.

Sludge Processing

- Replace mechanical equipment in existing gravity thickener.
- Construct a new gravity thickener to provide redundancy in sludge processing.

Process Building

- Architectural modifications to provide adequate working conditions for operations staff.

Ancillary Equipment

- Replace existing plant water system.

Site-Wide Support Related Improvements

- Replace HVAC equipment which is past its useful life.
- Renovate the existing Administration/Process Building to accommodate larger offices, conference room, control room and new lab design. Expand administration area into the Process area to include new locker rooms and a new training room.

Major Electrical Facilities and Backup Power

- Replace electrical components which are past their useful life.
- Replace generator.

System Wide SCADA, Instrumentation, and Controls

- Replace controls which are past their useful life.
- Implement a SCADA system for the WWTF.

Operations and Maintenance Impacts and Recommendations

The upgraded WWTF will require an increased operations and maintenance effort to maintain the facility. The Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants, developed by the New England Interstate Water Pollution Control Commission (NEIWPCC), was used to estimate the staffing requirements for the upgraded facility. It is recommended that approximately 7 people are needed per shift to maintain the facility.

The wastewater departments FY15 operations and maintenance budget is $1,135,332. The budget is anticipated to increase by approximately 16% to $1,320,000 for the upgraded facility. The increase is due to the following variables:

- Increase in power consumption.
- Increase in chemical costs.
- Increase in employee costs.

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- Increase in sludge disposal costs.

3.4 Institutional Considerations

The following section identifies and discusses several primary institutional considerations related to plan implementation:

- Prioritization.
- Proprietary equipment.
- Ownership and operation and maintenance considerations.
- Easements.
- Monitoring programs.

Design and Construction Issues

As the Town moves forward in implementing the recommended plan, several issues will need to be resolved during design and construction:

- Proprietary equipment/sole sourcing of equipment.
- Standardization of equipment.

The Town understands that the Commonwealth of Massachusetts requires projects be open to as many contractors and equipment suppliers/manufacturers as possible to make the process competitive and to encourage fair pricing. The Commonwealth also encourages performance-based specifications in those areas where a particular technology or piece of equipment is sought, however, the Massachusetts General Laws (MGLs) do allow for selection of a specific piece of technology if it is deemed in the best interest of the project and endorsed and documented by the Town.

The Town may also wish to standardize around a particular piece of equipment, for example grinder pump units or pumping station equipment, in order to minimize storage of spare parts for several different manufacturers and minimize operational and maintenance issues and training associated with maintaining different manufacturers equipment for the same application. The Town may have a design to standardize around a valve, pump or other equipment manufacturer for collection system and WWTF components.

These issues will be addressed by the Town during final design and implementation.

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3.5 Estimated Costs and Financing Plan

3.5.1 Summary of Capital Costs for Wastewater Management Facilities

Capital costs for the CWMP recommended plan are summarized in Table 3-2 below.

Table 3-2 Capital Costs for Recommended Plan

Cost Component	Capital Costs ($)
WWTF Improvements	$25,400,000
West River Pumping Station	$1,000,000
Contingency	$7,920,000
Total Construction Costs	$34,300,000
Fiscal, Legal and Engineering	$10,300,000
Total Capital Costs	$44,600,000

Notes:

1. Costs rounded to three significant figures and adjusted for estimated mid-point of construction (Sept 2018 Estimated ENR = 11109).

3.5.2 Financing Plan

Background

The Town of Uxbridge is committed to upgrading its existing infrastructure to reliably meet its new NPDES discharge project. Financing the capital costs of these projects poses a major hurdle to any municipality in current economic times. The ensuing operations and maintenance costs will add further expenses to already strained annual budgets.

The Town of Uxbridge has many financial needs attributed to capital projects as well as ongoing repaired and maintenance, including both critical infrastructure and equipment replacement. These needs underscore the importance of viewing long-term capital financing in a broad, responsible context, and maintaining a healthy financial balance on behalf of the Town's taxpayers. In order to fund the capital costs of the projects identified in this CWMP as well as responsibly addressing the Town's other primary capital responsibilities Uxbridge proposes to use two strategies. The first and fundamental strategy is to consider issuing "new" debt when an "old" debt is paid off. As "old" debt is paid off, "new" debt can be issued after a two-thirds vote of Town Meeting and a majority vote by ballot without raising the tax rate. The capital projects funded by the "new" debt would be carefully selected given Uxbridge's comprehensive capital needs.

The Financing Plan shown in Figure 3-3 simply identifies a financial opportunity. Projects within the CWMP will be sequenced as the regulatory, design, construction, voter authority, and fiscal opportunities allow.

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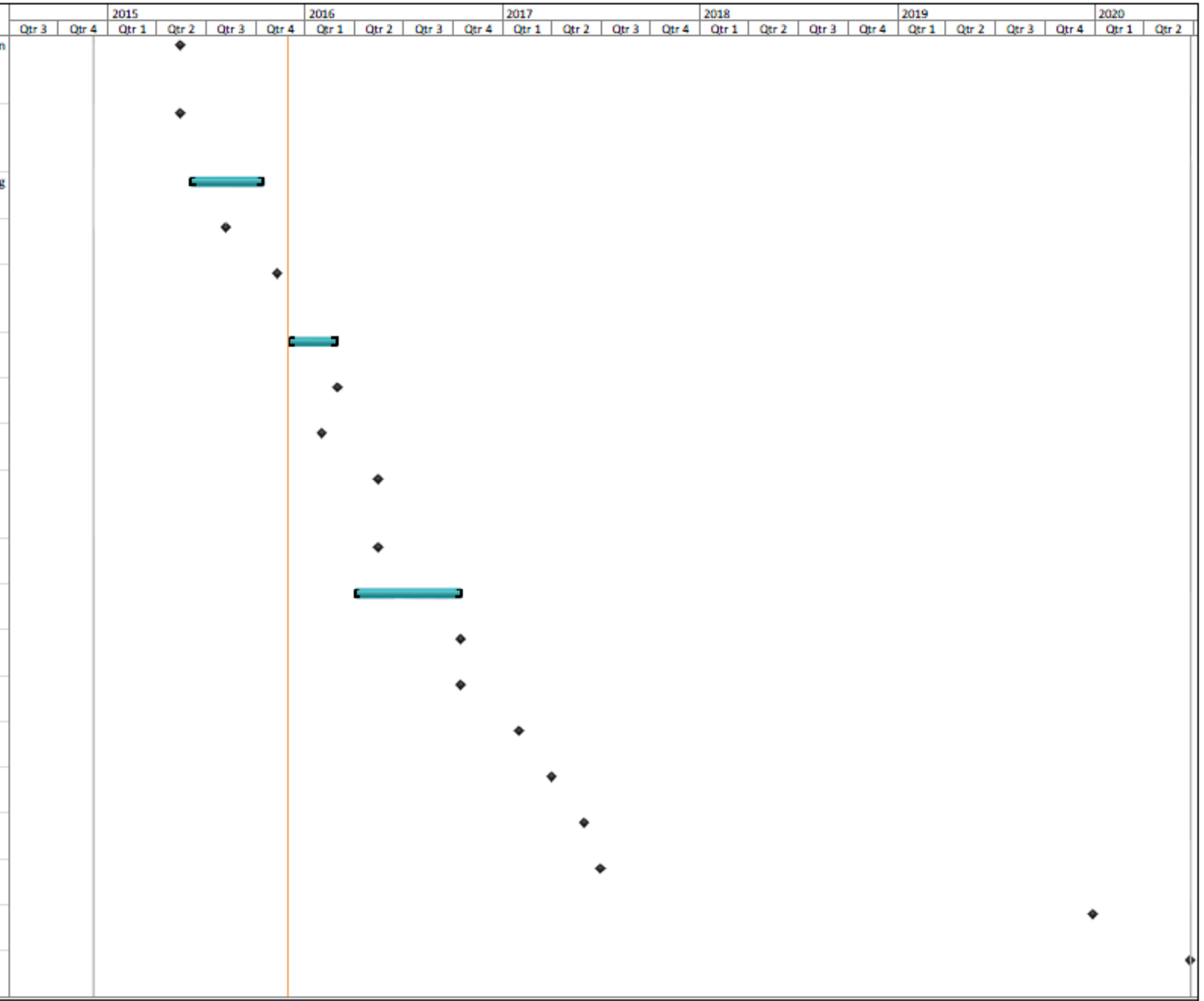
Table 3-3 Financing Plan

ID	Task Name
1	$200 K for Conceptual WWTF Upgrade Design Funding, Ballot Vote - Spring Town Meeting
2	$150 K for West River Pump Station Replacement Design, Ballot Vote - Spring Town Meeting
3	Conceptual (15%) Design & Value Engineering
4	SRF PEF Application Submittal
5	$800 K for Preliminary WWTF Upgrade Design, transfer from Enterprise Fund retained earnings - Fall Town Meeting
6	Preliminary (30%) Design
7	Draft CWMP Submittal
8	DEP Intended Use Plan Issued
9	$44.6 M Town for Construction Contingent Bond on 0% or 2% SRF loan; Ballot Vote - Spring Town Meeting
10	Flow Neutral Regulations Town Vote
11	Detailed Design for Bid Documents
12	Submit MassDEP BRP 68 Application
13	SRF Full Application Submitted
14	State SRF Commitment
15	Advertise project to bidders
16	Open bids
17	Notice to Proceed to lowest responsible bidder
18	Construction substantially complete
19	End of startup and troubleshooting period



Town of Uxbridge CWMP Financing Plan

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline			
Split		External Tasks		Inactive Summary		Manual Summary		Progress			
Milestone		External Milestone		Manual Task		Start-only					
Summary		Inactive Task		Duration-only		Finish-only					

Page 1

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The second funding strategy is to use the State Revolving Fund (SRF) loan program for the construction costs of the projects outlined in the Recommended Plan. The SRF loan process has specific eligibility requirements, a fixed annual timetable for deciding contract awards, a competitive selection procedure to receive an award, and a limit as to how much financial assistance through the SRF loan program can be given to a community in any one year. All of these constraints need to be taken into account in planning projects to improve water quality.

The SRF loans provided for drinking water or clean water projects (wastewater and stormwater). A standard interest rate of 2% is offered for either loan type. For wastewater projects that are primarily for the removal of nutrients, a 0% interest rate loan may be offered provided that 6 criteria are met. All SRF loans are provided based on public health benefit criteria that are used to rank submitted projects for inclusion on an annual priority list. The money available for funding each fiscal year is determined by the Massachusetts Clean Water Trust (CWT), working in conjunction with the Department of Environmental Protection. The SRF standard 2% interest rate loan is a competitive interest rate that is typically less than most municipality borrowing interest rates. Uxbridge will evaluate the ability to obtain 0% interest rate financing for the entire project. It should be stressed that without the SRF loan the Town will be burdened with higher interest rates and bond payments. The timing of issuing-new-debt-to-replace-old-debt and the receipt of a CWT SRF loan are key to Uxbridge's capacity to fund the projects in the Recommended Plan.

Financial Planning and Key Milestones: 2015 to 2020

Table 3-3 lays out the big picture on financing, ballot votes, and the State Revolving Fund process.

Table 3-3 lists all the presently identified critical milestones that must be met in order to design, permit and construct the projects in the Recommended Plan in accordance with the timeline stipulated in the Order of Consent.

Items 1 and 2 were voted on and approved in May 2015. Item 2, the WWTF upgrade conceptual design, is currently being developed.

Item 4, the '2016 Clean Water State Revolving Fund Project Evaluation Form – construction application', was completed and submitted in August, 2015.

Item 5 was approved at the 2015 Fall Town Meeting. The Town is requesting to transfer retained earnings from the Wastewater Enterprise Fund to finance the design outlined in Item 6.

Item 8. In January 2016, the State will publish the SRF list of projects that it intends to fund in the next funding cycle. The Uxbridge projects will be ranked along with all other projects in the State seeking funding assistance. Uxbridge will be asking for funding for a 'multi-year' project.

Item 9. In May 2016 Town Meeting will vote the construction dollars for a bond for the WWTF upgrade project and the West River Pumping Station Replacement Project, *contingent on receiving a SRF loan*. Depending on whether the 'flow-neutral regulation' passes or not (Item 10), the SRF loan request will be at 0% or 2% for nutrient related portions of the project. Non-nutrient related portions of the project will be financed through a 2% loan.

Detailed design (Item 11) will be completed in the Fall of 2016 and by October 15, 2016 a full SRF (Item 13) application will be submitted with all required items in place. A BRP WP 68, plan approval without permit modification MassDEP permit application will also be submitted at this time. In January 2017 (Item 14), the State will decide to commit funds and issue an Approval to Bid for construction of the Recommended Plan projects.

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Item 15 – 19. In the Spring of 2017 the project will be advertised (Item 15), bids opened (Item 16) and the projects awarded (Item 17). Construction is estimated for three years with a substantial completion date in December 2019 (Item 18) and a final completion date in the Summer of 2020 (Item 19). All projects in the Recommended Plan are anticipated to be completed in 2020.

3.6 Summary

The Recommended Plan is the result of a multi-year effort by the Town of Uxbridge, its CWMP Advisory Committee and Town Departments led by the Department of Public Works. This plan is developed to address Uxbridge's wastewater needs for the years 2015 through 2035. It represents a strong commitment by the Town to maintain a healthy environment in Uxbridge for regulatory compliance and for the Town's people to enjoy for generations to come.

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Appendix A – Plan of Study

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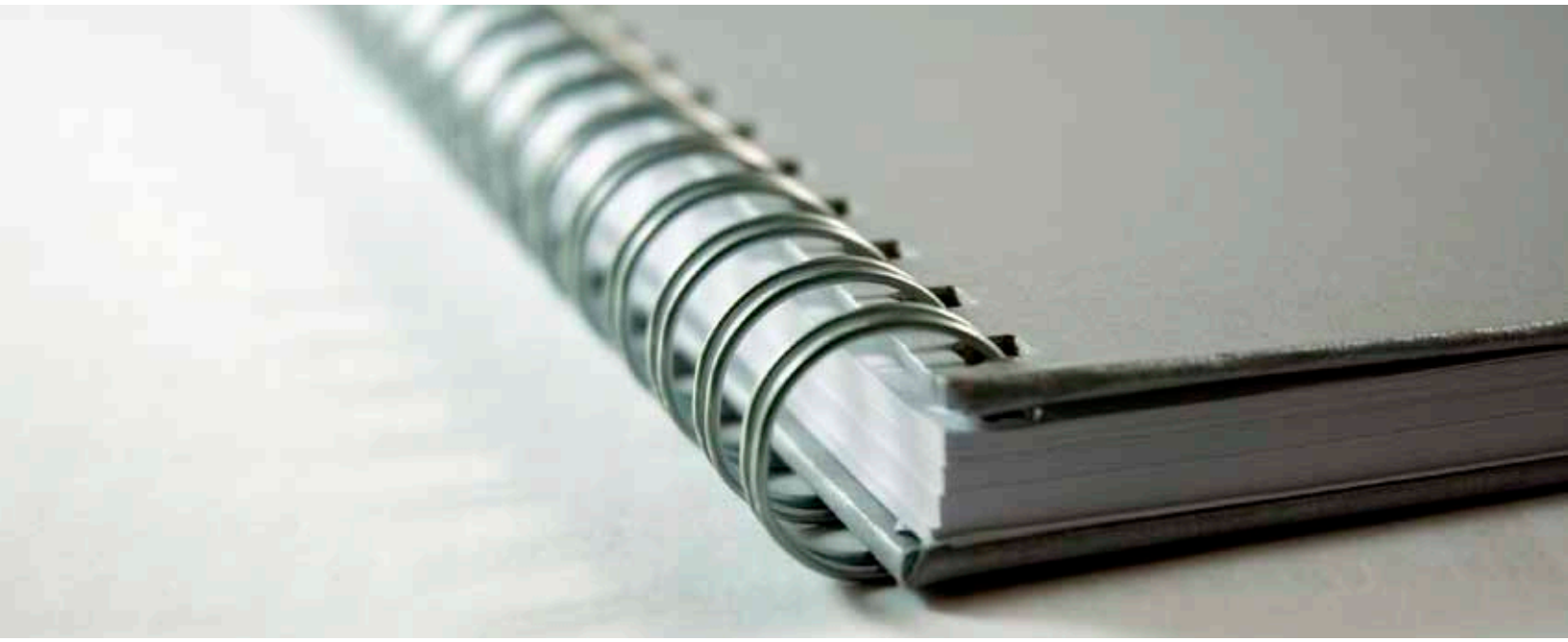

Town of Uxbridge

Comprehensive Wastewater Management Planning Project

DRAFT Plan of Study

March 2014

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2.7 Project Schedule and Costs 8

1. Introduction

The purpose of the Plan of Study is to provide a listing of the steps needed for the Comprehensive Wastewater Management Planning (CWMP) Project in the Town of Uxbridge (Town). Listing these tasks allows Town department staff, regional and state agencies, and the public to understand the CWMP process and efficiently provide input to the Project. The Plan of Study is expected to have the following main uses:

- Submittal for Department of Environmental Protection (DEP) review as required.
- Budgeting and scheduling tool for Comprehensive Wastewater Management Planning.
- Development of public education and outreach materials throughout the Project.

If determined to be needed, the following will be addressed upon completion of the CWMP:

- Development of environmental review documents for the Project through the Massachusetts Environmental Protection Act (MEPA) review process.

This document was prepared using a Massachusetts Department of Environmental Protection document entitled Water Resource Management Planning and Comprehensive Wastewater Management Planning document dated 1996.

2. Project History

The Town initiated a Wastewater Facilities Planning process in December 2011 (see Attachment A for the scope of services). In June of 2012, USEPA issued a draft NPDES discharge permit to the Town. In June of 2013, a final permit was issued by EPA. This permit was appealed by the Town in August of 2013 so that the Town could negotiate a compliance schedule. The permit requires that the Town complete a Comprehensive Wastewater Management Plan (CWMP). The Town initiated the CWMP process in January 2014 (see Attachment B for scope of services).

The CWMP Plan of Study is presented below:

2.1 Phase I – Needs Assessment

This is the first phase of Comprehensive Wastewater Management Planning and it involves the initial assessment of the wastewater needs for the Town of Uxbridge.

Uxbridge's wastewater needs will be defined by identifying the Town goals for wastewater management, evaluating the existing conditions, reviewing regulatory requirements, developing projections of the future conditions, and then comparing these goals and conditions to the wastewater limitations in the Town.

The main tasks of this phase are listed below:

2.1.1 Description of Purpose and Scope Including the Following:

1. Town-wide focus and scope.
2. Discussion on Town issues, goals, and vision including a description of why this CWMP is needed
3. Planned review process.

2.1.2 Background Including the Following:

1. Location, history, and description of the Town and planning area including a map.
    a. Major centers of population
    b. Adjacent cities and Towns
    c. Prominent surface waters
    d. Population in planning area
2. History of existing facilities including WWTF site, description of upgrades, service areas, and historical planning documents including the past facilities plan and I/I study.
3. Review of available planning/assessment documents.
4. Description of how these documents will be used.

2.1.3 Documentation of Planning and Evaluation Criteria to be Used in CWMP Including:

1. Definition of planning period.
2. Discussion of survey datum and flood levels.
3. Discussion of current and anticipated future permit limits.
4. Discussion of environmental and sustainable considerations including, but not limited to, optimizing existing infrastructure, energy efficiency, alternative energy (with reference to Commonwealth's Sustainable Development Principles, Water Policy, Water Conservation Standards, and Greenhouse Gas Reduction Policy).
5. Development of Alternatives—to include "no action", "fix it first", and, if appropriate, consideration of innovative approaches (decentralized systems, wastewater reuse) and regional solutions.
6. Evaluation criteria including screening and cost effective evaluations including the following for planning level evaluations:
    a. Relative capital costs
    b. Relative O&M costs
    c. Flexibility
    d. Environmental considerations including energy use, sensitive environmental receptors
    e. Effluent quality
    f. Regulatory requirements
    g. Potential for air emissions/odors
    h. Land requirements
    i. Anticipated public acceptance
    j. Ease of implementation
    k. Maintenance requirements and complexity of operations

2.1.4 Existing Conditions Including a Review and/or Condition Assessment of the Following:

1. Natural Environment:
    a. Climate
    b. Soils
    c. Water and Water Quality (hydrology, surface water, groundwater, water table, etc.)
    d. Habitats
2. Manmade Environment:
    a. Demographics
    b. Areas of the Town utilizing individual septic systems and their approximate age and condition. This shall include an assessment of the suitability of areas of the Town for such systems based on such factors as soils, nutrient impacts, if any. It shall also include a review of pump out records.
    c. Areas of the Town utilizing innovative/alternative septic systems (I/A systems) and their approximate age and condition.
    d. Properties with private WWTF and effluent discharge permits. This will include summaries of wastewater flows and effluent quality as available from MassDEP.
    e. Water quality problems in surface waters and drinking waters related to wastewater and treated effluent discharges to the groundwater and to surface waters.
    f. Existing Town-wide land use and zoning considerations.
3. Wastewater Infrastructure:
    a. Collection System and Pumping Stations—collection system condition shall be ascertained from Town personnel and Pump Station evaluation shall include pump stations operated by DPW
        1) Compliance with regard to SSOs shall be covered
    b. Wastewater (liquid) treatment facilities
    c. Sludge management facilities (residuals treatment, handling and disposal)
    d. Inventory of facilities
    e. Operation and maintenance including staffing, maintenance procedures, operating procedures for emergencies, and methods of finance
4. Assessment of No Action Alternative (future conditions with no action taken)

2.1.5 Flows and Loads Including:

1. Discussion of the general service area, plant rating, current and future conditions in the Town.
    a. This discussion shall include a population projection discussion (growth characteristics).
2. Review Existing Flows and Loads including septage. Consideration of the existing I/I study will be included.
3. Discussion of Compliance History.

4. Estimate land use growth in the Town during the 20-year planning period. This will be based on current zoning, land use, and available plans and discussions with the Zoning Enforcement Officer and Planning & Development office.
5. Estimate existing and projected water consumption in the Town Expansion for the 20-year planning period. This estimate will be for properties served by public water supplies.
6. Project future wastewater flows and loads including septage for the 20-year planning period. This estimate will be for properties served by public water supplies.

2.1.6 Summary of Needs

1. Outline of the elements of Needs Assessment that will be the subject of Phase III.

2.2 Phase II – Revised Needs Assessment

The purpose of this phase is to revise the Phase I—Needs Assessment Report based on comments from the Town.

2.3 Phase III – Alternatives Screening and the Recommended Plan; Development of the Comprehensive Wastewater Management Plan

Once the needs are developed, alternative solutions will be identified. These solutions are then summarized and screened to retain only the most feasible ones. Feasible solutions (technical as well as management) are then grouped into alternative scenarios for detailed evaluation. Due to the project time constraints (consent order schedule), at least the initial portion of the alternatives screening is expected to take place at the end of Phase I in order to allow the project to stay on schedule.

The final portion of this Phase is the detailed analysis of costs and non-monetary factors for the alternative wastewater management scenarios. It presents the recommended wastewater management plan to mitigate the wastewater related problems. This plan will include the scheduled implementation steps for new facilities, management structures, local regulations, and funding requirements.

The purpose of this phase is to select the most appropriate wastewater management plan for Uxbridge based on a cost effectiveness analysis and analysis of non-monetary factors. For the purposes of this scope, the term “screening” is intended in the traditional sense of the word in that it will include non-monetary factors as well as relative costs, but not detailed costs. Alternatives will be screened such that up to three options remain for detailed costing.

The main tasks for this phase are listed as follows.

2.3.1 Sewer Service Area Evaluation

Identify and consider appropriate wastewater management alternatives for “away from WWTF” wastewater management solutions for the areas of the Town that are currently not connected to the WWTF and have wastewater needs. These alternatives will include:

1 Improved septic systems.

2 Cluster septic systems (flows less than 10,000 gpd).

3 Small municipal satellite WWTF with groundwater discharges.

This evaluation will consider the general issues of each alternative with respect to the criteria listed in Section 2.1.3.

This “alternatives screening” evaluation of “away from WWTF” wastewater management solutions is expected to lead to recommendations that some parts of the Town are obvious for connection to the WWTF and will need a sewer extension. It is also expected to indicate that some parts of Town are obviously best served with “away from WWTF” solutions with groundwater discharges and no need for a sewer extension. This evaluation is also expected to indicate the need to do a more detailed cost comparison and non-monetary evaluation of some areas of the Town that could be connected to the WWTF or could be served by “away from WWTF” solutions as detailed in the next item.

2.3.2 “Away from WWTF” Detailed Evaluation

Complete a detailed evaluation for up to three areas of the Town that could be connected to the WWTF or could be served by “away from WWTF” solutions. This evaluation would include:

1 Cost comparison.

2 Non-monetary evaluation including environmental impacts.

2.3.3 Wastewater Infrastructure Screening and Detailed Evaluation

Screening and cost evaluations including capital, O&M, and salvage as appropriate as well as a ranking that includes non-monetary impacts such as environmental, flexibility, etc where appropriate for upgrade including:

1. Collection System:
    a. Sewers
    b. Pump Stations
    c. Assessment of environmental impacts
2. Wastewater Treatment:
    a. Preliminary Treatment
    b. Primary Treatment
    c. Secondary Treatment
    d. Disinfection
    e. Post Aeration
    f. All support facilities including chemical feed, plant water, etc
    g. Assessment of environmental impacts
3. Sludge Management:
    a. Activated Sludge storage and thickening
    b. Primary sludge storage and thickening
    c. Sludge disposal including dewatering
    d. Assessment of environmental impacts

2.3.4 Recommended Plan

The recommended plan will start by addressing the following:

- Environmental, public health and socioeconomic environment as well as mitigation of impacts of the Plan.
- Institutional arrangements, if any.
- Schedule—a design and implementation schedule shall be included.
- Financial arrangements.

The plan shall include site layouts, design criteria, capital, and O&M costs as appropriate.

The Plan is expected to consist of the following:

1. Recommendation of any “away from WWTF” solutions for portions of the Town that are not expected to connect to the WWTF during the 20-year planning period. The plan for these areas will include:
    a. Geographic area delineated
    b. Description of wastewater solution and estimated capital costs
    c. Town regulatory body with management responsibility
    d. Expected residuals (sludge/septage) that will be generated from these systems and would be transported to the WWTF.
    e. Recommended next steps to proceed with these areas
2. Recommendation of any sewer extensions for any portions of the Town that are expected to connect to the WWTF with a sewer extension during the 20-year planning period. The plan for these areas will include:
    a. Geographic area delineated
    b. Description of sewer extension and estimated capital costs
    c. Expected wastewater flows that will be generated from these sewer extension areas
    d. Recommended next steps to proceed with these areas
3. Recommended wastewater facility upgrades including:
    a. Collection system and Pumping Stations
    b. Liquid treatment facilities
    c. Sludge management
    d. Hydraulic evaluation and mass balance
    e. Administrative facilities
    f. Site/Civil
    g. Site-wide support-related improvements (HVAC, structural, architectural, plumbing, fire protection, etc.)
    h. Major electrical facilities and backup power
    i. System-wide SCADA, instrumentation and controls

j. Operations and Maintenance Impacts and Recommendations including staffing, procedures for predictive maintenance,

4. Discussion about specific sustainable design recommendations.
5. MEPA (tentative – see Phase VI).
6. Probable Project Costs:
   a. Capital
   b. Operation and maintenance
7. Schedule:
   a. Phasing
   b. Financing and Cash Flow
   c. Sequence of construction

2.4 Phase IV – Revised Recommended Plan; Completion of CWMP

The purpose of this phase is to revise the Recommended Plan in accordance with Town comments.

2.5 Phase V – Public Participation

This phase is the coordination of the public review process that proceeds throughout the whole project.

The public review process will contain items needed to properly disseminate information to the Town Public. Proper public education is needed to ensure that the recommended plan will be approved by Town Meeting and by the voters in any proposition 2½ override referendums.

The purpose of this phase is to create and coordinate a public review process which will inform project participants and the Town Public, and facilitate the recommended plan's approval by Town Meeting and Town voters.

The main form of public participation for this project is expected to be periodic updates to the Board of Selectmen (Water and Sewer Commissioners) including a presentation when the plan is finalized.

2.6 Phase VI - MEPA Review (Need to be Determined)

Based on preliminary discussions with the Town, this Phase is not expected to be required and thus was not included in the scope of the project. If it is later determined to be needed, the project will be amended once the extent is known and a Massachusetts Environmental Policy Act (MEPA) Review Process will be initiated. A revised Plan of Study will be submitted if this is determined to be required. The Plan of Study would be amended as follows:

Add Section 2.3.4 item 5 as follows:

1. Environmental and MEPA including assessment of no action alternative, impacts of the recommended plan, mitigation measures during construction, and permitting.

2.7 Project Schedule and Costs

The project schedule is generally expected to be as follows:

Draft Needs Assessment – 6/15/14

Complete Draft CWMP – 11/28/14

Project costs are included in Attachments A and B.

Attachment A WWFP Scope

CLIENTS | PEOPLE | PERFORMANCE

September 20, 2011

Mr. Benn Sherman, DPW Director
Town of Uxbridge
147 Hecla Street
Uxbridge, MA 01569

Re: Proposal for Professional Services
Wastewater Facilities Plan

Dear Mr. Sherman:

The following is a proposal to develop a wastewater facilities plan for the Town of Uxbridge. The intent is for this plan to evaluate the existing wastewater facilities and to recommend improvements based on the evaluation. For this project, we have identified several major tasks as follows.

SCOPE OF SERVICES

Task No.	Task Description
1.	**Develop a Wastewater Facilities Plan** which shall cover the following areas and will meet the following minimum requirements:

A. Introduction including purpose and scope.

B. Background including history of site, description of upgrades, and historical planning documents.

C. Documentation of planning and evaluation criteria to be used in the facilities plan including:

1) Definition of planning period.

2) Discussion of survey datum and flood levels.

3) Discussion of current and anticipated future permit limits.

4) Discussion of sustainable considerations including, but not limited to, optimizing existing infrastructure, energy efficiency, and alternative energy.

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5) Evaluation criteria including screening and cost effective evaluations.

D. Existing conditions including a review and/or condition assessment of the following:

1) Collection System and Pump Stations – Collection system condition shall be ascertained form Town personnel; and Pump Station evaluation shall include the five (5) pump stations including the onsite station, and the evaluation shall be limited to upgrade based on existing conditions.

2) Wastewater treatment facilities.

3) Sludge management facilities.

4) Inventory of facilities.

5) Assessment of environmental conditions.

6) Operation and maintenance.

E. Plant Flows and Loads including:

1) Discussion of the general service area and plant rating. This is expected to focus on maintaining existing capacity and definitions of the capacity made in prior work and not expected to include any population projections.

2) Review Existing Flows and Loads including septage. Although an Inflow and Infiltration (I/I) study will not be included, this would include a discussion about peak flows and possible impacts of I/I.

3) Discussion of compliance history.

4) Project Future Flows and Loads including septage. This work is expected to include recommendations for an influent sampling study to verify influent loads and possibly additional sampling to better characterize influent to the secondary treatment process. Sampling and testing would be outside of the scope of the study, but results and subsequent analysis would be included.

F. Wastewater Collection System Alternatives (screening and cost evaluations as appropriate) for upgrade due to age and based on assumptions stated in part D above including:

1) Collection System

2) Pump Stations.

3) Assessment of environmental impacts.

G. Wastewater Alternatives for upgrade due to age and new permit limits (screening and cost evaluations as appropriate) including:

1) Preliminary Treatment.

2) Primary Treatment.

3) Secondary Treatment.

4) Disinfection.

5) Post Aeration.

6) All support facilities including chemical feed, plant water, etc.

7) Assessment of environmental impacts.

H. Sludge management alternatives for upgrade due to age and new permit limits (screening and cost evaluations as appropriate) including:

1) Activated sludge storage and thickening.

2) Primary sludge storage and thickening.

3) Sludge disposal including dewatering.

4) Assessment of environmental impacts.

I. Recommended Plan

1) Recommended upgrades including:

i. Collection System and Pump Stations.

ii. Wastewater facilities.

iii. Sludge management.

iv. Hydraulic evaluation and mass balance.

v. Administrative facilities.

vi. Site/Civil.

vii. Site-wide support-related improvements (HVAC, structural, architectural, plumbing, fire protection, etc).

viii. Major electrical facilities and backup power.

ix. System-wide SCADA, instrumentation and controls.

2) Discussion about specific sustainable design recommendations.

3) Environmental and MEPA requirements including assessment of no action alternative, impacts of the recommended plan, mitigation measures during construction, and permitting.

4) Probable Project Costs.

i. Capital.

ii. Operation and maintenance.

5) Schedule.

i. Phasing.

ii. Financing and cash Flow.

iii. Sequence of construction.

J. Public Participation during the Planning Process.

In addition, this Task 1 is anticipated to include three (3) local trips to view wastewater treatment equipment that is comparable to proposed upgrades to allow the town the opportunity to ensure compatibility with expectations.

2. Meetings.

A. Project meetings:

1) Project Chartering and kickoff meeting.

2) Progress Meetings/Workshops (approximately monthly).

B. Public Meetings – to support a public participation program to solicit ideas and comments from the public and to disseminate project information.

1) Selectmen Meetings (as needed).

2) Other public meetings (as needed).

3. **QA/QC.** Engineer will have in place a quality control and management system throughout the duration of the project to maintain budget and time constraints, to solicit and incorporate Town, State, and citizen input, and to monitor regulatory requirements for the project.

4. **SRF Application.** For this task, we will assist the Town in utilizing the Facilities Planning document to obtain SRF funding by assisting in submitting the initial application and developing backup documentation for the SRF rating criteria.

5. **Submissions.** Although the project is expected to contain a number of interim technical memoranda, the completed report will be provided to the Town in the form of a draft. Five (5) copies of this draft will be provided. The full draft will be provided within the timeframe provided in the schedule below.

   Any Town comments will be addressed within 45 days of receipt and a final report will be provided to the Town in hardcopy (five copies) and PDF form.

PROJECT BUDGET

To accomplish the tasks listed above, we propose a lump sum fee of One Hundred Forty Seven Thousand Two Hundred Dollars ($147,200).

PROJECT SCHEDULE

The work described above shall be completed within 12 months. This time frame is a standard timeframe that we have found to be convenient for Towns to be able to consider options. If a more accelerated schedule is desired, it can be accommodated.

Although this proposal was developed based on our experience working within the State on comparable evaluations, MassDEP recommends that the scope of this work be reviewed by them to ensure SRF eligibility. We would be happy to initiate this process with your permission.

We would be happy to review this proposal in more detail at your earliest convenience.

Sincerely,

GHD INC.

William R. Hall, Jr., BCEE

Marc R. Drainville, P.E., BCEE

WRH/MRD/lm

Attachment B CWMP Scope

Town of Uxbridge
Articles Of Agreement

Commodity: **Wastewater Facilities Plan**
MCC Code: **8999 Professional Services**
File Number: **12-WW00020**
Type: **Original**

Vendor: **GHD, Inc.**

This agreement is made and entered into this **November 30, 2011** by and between the **Town of Uxbridge** ("the TOWN"), a municipal corporation organized and existing under the laws of the Commonwealth of Massachusetts, and **GHD, Inc.** existing under the laws of the State of **Massachusetts** ("the Contractor").

Address: **1545 Iyannough Road, Hyannis, MA, 02601**
Telephone: **508-362-5680**

Article I. Definition. "This Contract" as used herein shall mean these Articles of Agreement and "the quote documents," which include, but are not limited to, the instructions to bidders, the Contractor's bid or proposal, the specifications, the general conditions, the requirements, the applicable addenda, and all documents and forms submitted with the Contractor's quote or proposal that were accepted by the TOWN.

Article II. Duration. The Contractor shall commence the performance of this contract for the period beginning on **November 30, 2011** and ending on **January 4, 2016** or at completion, whichever is sooner.

Article III. Terms. The Contractor agrees to provide services as outlined in the proposal entitled "Proposal for Professional Services, Wastewater Facilities Plan" dated September 20, 2011 (attached). The Contractor will perform the services listed, and request any change orders or clarifications in writing from the Department of Public Works prior to executing additional services. The Town will not be responsible for additional services that are performed without prior written approval.

Contract Value: **$147,200**
Change Order #1: **$190,000**
Total Contract Value: **$337,200**

Article IV. Payment. The TOWN agrees to pay to Contractor the sum set forth in the Contractor's cost proposal dated September 20, 2011 and August 8, 2012 proposal for CWMP services (additional services). Contractor shall invoice the Town for the total cost of services provided on a monthly basis. Payments will be subject to review by the Town of Uxbridge Department of Public Works. Funding for this project was approved at the Fall Town Meeting November 15, 2011 (Article 6, A5) and Fall Town Meeting November 19, 2013 (Articles 5, A10 and Article 13).

Article V. Termination. The following shall constitute events of default under this Contract requiring immediate termination: a) any material misrepresentation made by the Contractor, b) any failure by the Contractor to perform any of its obligations under this Contract including, but not limited to, the following: (i) failure to commence performance of this Contract at the time specified in this Contract due to a reason or circumstance within the Contractor's reasonable control, (ii) failure to perform this Contract with sufficient personnel and equipment or with sufficient material to ensure the completion of this Contract within the specified time due to a reason or circumstance within the Contractor's reasonable control, (iii) failure to perform this Contract in a manner reasonably satisfactory to the TOWN, (iv) failure to promptly re-perform within reasonable time the services that were rejected by the TOWN as erroneous or unsatisfactory, (v) discontinuance of the services for reasons not beyond the Contractor's reasonable control, (vi) failure to comply with a material term of this Contract, including, but not limited to, the provision of insurance and

nondiscrimination, and (vii) any other acts specifically and expressly stated in this Contract as constituting a basis for termination of this Contract.

Except as otherwise provided in the Articles of Agreement, the TOWN may terminate the contract upon seven days notice.

Article VI . Damages and Insurance. From any sums due to the Contractor for services, the TOWN may keep for its own the whole or any part of the amount for expenses, losses and damages as directed by the Purchasing Agent, incurred by the TOWN as a consequence of procuring services as a result of any failure, omission or mistake of the Contractor in providing services as provided in this Contract. **The Contractor must provide the Town with proof of insurance, for both General Liability and Workers Compensation, naming the Town of Uxbridge as a certificate holder prior to conducting work on site.**

Article VII. Conflict. In the event there is a conflict between these Articles and the quote documents, the quote documents shall supersede these articles.

Article VIII. Governing laws and ordinances. This Contract is made subject to all the laws of the Commonwealth and the Ordinances of the TOWN and if any such clause thereof does not conform to such laws or ordinances, such clause shall be void (the remainder of the Contract shall not be affected) and the laws or ordinances shall be operative in lieu thereof.

Article IX. Performance Security. Upon execution of this Contract by the Contractor, the Contractor shall furnish to the TOWN security for the faithful performance of this Contract in the amount of N/A of the value of the bid in the form of a performance bond issued by a surety satisfactory to the TOWN or in the form of a certified check.

Article X. Equal Opportunity. the Contractor in the performance of all work under this contract will not discriminate on the grounds of race, color, sex, age, religious creed, disability, national origin or ancestry, sexual orientation, marital status, family status, military status, or source of income in the employment practices or in the selection or retention of subcontractors, and in the procurement of materials and rental of equipment. The TOWN may cancel, terminate or suspend the contract in whole or in part for any violation of this article.

Article XI. Assignability. The Contractor shall not assign, sell, subcontract or transfer any interest in this contract without prior written consent of the TOWN.

In witness whereof the parties have hereto and to three other identical instruments set their hands the day and year first above written.

Approved as to Form:

Sean Hendricks
Town Manager

Justin Cole
Town Accountant

The Contractor:

William R Hall Jr Principal
Print Name and Title

Contractor Signature

CLIENTS | PEOPLE | PERFORMANCE

August 8, 2012

Mr. Benn Sherman, DPW Director
Town of Uxbridge
147 Hecla Street
Uxbridge, MA 01569

RE: Proposal for Professional Services
Comprehensive Wastewater Management Plan

Dear Mr. Sherman:

Per your request, we submit for your review a proposal to complete a Comprehensive Wastewater Management Plan (CWMP) for the Town. During the meeting with the Massachusetts Department of Environmental Protection (MassDEP) on May 11, 2012, MassDEP explained the benefits of the CWMP which include more funding options as well as the development of a comprehensive planning document for the Town. The CWMP will expand the current wastewater facilities plan (WWFP) project to be a Town-wide plan and will increase the project focus to evaluate wastewater impacts to drinking water supplies, ponds, and rivers; and to develop a more detailed build-out analysis for the Town. This type of plan (the CWMP) can be valuable for other Town planning functions and will help to make subsequent upgrades of the WWTF available for zero-percent loans from the State Revolving Fund (SRF) instead of the two-percent loans that are typically available for Towns that do not complete a CWMP.

It is noted that the Town will also need to develop a "Flow Neutral" bylaw or regulation for properties that connect to the sewer in the future as a second major requirement of the zero-percent low interest loan. This bylaw development will require input from Town Legal Counsel.

The following Project Scope will modify/expand the currently contracted WWFP to a CWMP. This scope makes reference to specific tasks in the WWFP scope that would be expanded to allow the project to become a CWMP.

The Project Scope also provides a task to assist the town with the development of a Flow Neutral Bylaw or Regulation.

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SCOPE OF SERVICES

Task No.	Task Description
1.	Expand Introduction, Purpose, and Scope (Task 1A) to include: A. Town-wide focus and scope B. Discussion on Town issues, goals, and vision C. Planned review process
2.	Expand Project Background (Task 1B) to include: A. Location, history, and description of the Town and planning area B. Review of available planning/assessment documents C. Description of how these documents will be used
3.	Expand Planning and Evaluation Criteria (Task 1C) to include the following criteria applicable to a broader range of alternative solutions (not just WWTF solutions): A. Relative capital costs B. Relative O&M costs C. Flexibility D. Energy use E. Effluent quality F. Regulatory requirements G. Potential for air emissions/odors H. Land requirements I. Anticipated public acceptance J. Ease of implementation K. Maintenance requirements and complexity of operations Alternatives will be identified and considered based on this set of criteria to be consistent in the consideration of "at WWTF" vs. "away from WWTF" wastewater management alternatives.

4. Expand Description of Existing Conditions (Task 1D) to include identification and discussion of the following:

   A. Areas of the Town utilizing individual septic systems and their approximate age and condition. (This evaluation will be based on discussions with the Health Agent and/or Building Inspector. No detailed review of Board of Health files is scoped at this time.)

   B. Areas of the Town utilizing innovative/alternative septic systems (I/A systems) and their approximate age and condition.

   C. Properties with private WWTF and effluent discharge permits. This will include summaries of wastewater flows and effluent quality as available from MassDEP.

   D. Water quality problems in surface waters and drinking waters related to wastewater and treated effluent discharges to the groundwater and to surface waters. (This evaluation will be based on existing information and existing sampling data and site visits. No new sampling is scoped at this time.)

   E. Existing Town-wide land use and zoning considerations. (This information will be based on Assessor's data, existing zoning maps, and discussions with the Zoning Enforcement Officer and Planning & Development office.)

5. Estimate land use growth in the Town during the 20-year planning period. This will be based on current zoning and available plans and discussions with the Zoning Enforcement Officer and Planning & Development office.

6. Estimate existing and projected water consumption and wastewater discharge in the Town (Expansion of Task IE) for the 20-year planning period. This estimate will be for properties served by public water supplies.

7. Summarize the findings of Tasks 1 thru 6 of this Scope and Tasks 1A thru 1E of the original scope into a Needs Assessment Summary for Town review.

8. Identify and consider appropriate wastewater management alternatives for "away from WWTF" wastewater management solutions for the areas of the Town that are currently not connected to the WWTF and have wastewater needs. These alternatives will include:

   A. Improved septic systems

   B. Cluster septic systems (flows less than 10,000 gpd)

C. Small municipal satellite WWTF with groundwater discharges

This evaluation will consider the general issues of each alternative with respect to the criteria listed in Task 3, above.

This "alternatives screening" evaluation of "away from WWTF" wastewater management solutions is expected to lead to recommendations that some parts of the Town are obvious for connection to the WWTF and will need a sewer extension. It is also expected to indicate that some parts of Town are obviously best served with "away from WWTF" solutions with groundwater discharges and no need for a sewer extension. This evaluation is also expected to indicate the need to do a more detailed cost comparison and non-monetary evaluation of some areas of the Town that could be connected to the WWTF or could be served by "away from WWTF" solutions as detailed in the next item.

9. Complete a detailed evaluation for up to three areas of the Town that could be connected to the WWTF or could be served by "away from WWTF" solutions. This evaluation would include:

A. Cost comparison

B. Non-monetary evaluation

10. Expand Recommended Plan (Task 1I) to include the recommendation of any "away from WWTF" solutions for portions of the Town that are not expected to connect to the WWTF during the 20-year planning period. The plan for these areas will include:

A. Geographic area delineated

B. Description of wastewater solution and estimated capital costs

C. Town regulatory body with management responsibility

D. Expected residuals (sludge/septage) that will be generated from these systems and would be transported to the WWTF

E. Recommended next steps to proceed with these areas

11. Expand Recommended Plan (Task 1I) to include the recommendation of any sewer extensions for any portions of the Town that are expected to connect to the WWTF with a sewer extension during the 20-year planning period. The plan for these areas will include:

A. Geographic area delineated

B. Description of sewer extension and estimated capital costs

C. Expected wastewater flows that will be generated from these sewer extension areas

D. Recommended next steps to proceed with these areas

12. Expand the number of meetings to include two (2) additional workshops to discuss zoning and build-out considerations.

13. Assist the Town with development of a Growth Neutral Bylaw or Regulation that would help the Town become eligible for the zero-percent low interest rate

OUT OF SCOPE

This amendment does not include effort or budget for the preparation of an Environmental Impact Report (EIR) because at this time we do not expect there to be the recommendation for large scale sewer expansion or other recommendations that would trigger the need for this CWMP project to file an EIR with the MEPA office.

PERIOD OF SERVICE

The anticipated period of service for the completion of this work is as defined in the attached schedule (Table 1).

PAYMENTS TO CONSULTANT

GHD proposes to complete the work outlined above for lump sum fees as defined below:

Tasks 1 through 7 and tasks 10 through 13	$170,000
Tasks 8 and 9	$20,000
TOTAL (tasks 1 through 13)	**$190,000**

Tasks 8 and 9 would only be required if the Needs Assessment Summary (Task 7) dictates the need for up to three (3) "away from WWTF" wastewater management solutions.

We would be happy to review this proposal in more detail at your earliest convenience.

Sincerely,

GHD INC.

Marc R. Drainville, P.E., BCEE
Senior Manager – Wastewater Processes

MRD/lm

Attachment

Table 1

Town of Uxbridge
CWMP Schedule (1)

Task	2012			2013											
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1.Expand Introduction (Task 1A)	X														
2. Expand Project Background (Task 1B)	X														
3. Expand Criteria (Task 1C)	X														
4. Expand Evaluation of Existing Conditions (1D)	X	X	X	X											
5. Estimate land use growth		X	X		X										
6. Estimate existing and projected water consumption		X	X												
7. Prepare Needs Assessment Summary			X	X											
Town review and comment					X										
8. Identify and screen "away from WWTF" alternatives			X	X											
Town review and comment					X										
9. Complete detailed evaluation of up to 3 "away from WWTF"alternatives						X	X								
10. Expand Recommended Plan to include any "away from WWTF" recomendations						X	X								
11. Expand Recommended Plan to include any sewer extensions						X	X								
Complete Facilities Plan portion of CWMP	X	X	X	X	X	X	X	X							
12. Coordinate and attend 2 additional workshops						X	X								
13. Assist Town with development of Growth Neutral Bylaw							X								
Town review of Preliminary Draft CWMP									X						
Prepare Final Draft CWMP										X					
Prepare and Submit SRF PEF											X				
Submit CWMP for MassDEP review											X				
MassDEP approval of CWMP														X	

Notes

1. This schedule represents a reasonable, but aggressive time frame that is intended to benefit the Town in permit negotiations with EPA.

GHD Inc.

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Appendix B – MEPA Advisory Opinion

DRAFT

This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
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Karyn E. Polito
LIEUTENANT GOVERNOR

Matthew A. Beaton
SECRETARY

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January 12, 2015

Anastasia Rudenko
GHD, Inc.
1545 Iyannough Road
Hyannis, MA 02601

Re: Request for Advisory Opinion
Comprehensive Wastewater Management Plan - Uxbridge

Dear Ms. Rudenko:

I am writing in response to your letter of December 1, 2014, in which you requested a determination as to whether review under the Massachusetts Environmental Policy Act (MEPA) would be required for the project referenced above.

According to your letter, the Town of Uxbridge is currently completing a Comprehensive Wastewater Management Plan (CWMP). The Town of Uxbridge owns and operates a Wastewater Treatment Facility (WWTF) that was constructed in the 1970s and is located at 80 River Road, Uxbridge, Massachusetts. The Uxbridge WWTF serves commercial districts and residential areas north and east of Route 146. The remainder of the Town utilizes on-site wastewater disposal. The U.S. Environmental Protection Agency (EPA) issued a new National Pollutant Discharge Elimination System (NPDES) permit for the WWTF in 2013. Because certain conditions within the permit cannot be met with the WWTF's existing infrastructure, EPA issued a Consent Order in June 2014 that provides a schedule by which the Town is to come into compliance with the new permit and provides interim limits that must be met while the planning, design, and construction of the upgraded facilities at the WWTF are underway. The NPDES permit also requires that the Town complete a CWMP.

The CWMP considers the Town's wastewater management needs over the 20-year planning period, 2015 through 2035. The Draft Needs Assessment Report identified the following primary needs:

- Replacement of mechanical equipment that is well past its useful life; and
- Upgrade of the facility to meet current design standards and the requirements of the NPDES permit.

The planned upgrade will not increase the capacity of the facility. Additionally, the Draft Needs Assessment Report found no concentrated, problematic areas of individual on-site disposal and, therefore, no major sewer extensions are recommended.

You state that no permits from the Massachusetts Department of Environmental Protection (MassDEP) will be required to construct or operate the upgraded facility. However, the CWMP and the design for the upgraded facility will be submitted to DEP for its review and approval. The Town is currently exploring financing options for the Project, including possible funding opportunities through the State Revolving Fund program. You also state that the proposed facility upgrade does not meet or exceed any MEPA review thresholds.

Based on the information contained in and attached to your letter, I concur that this project does not appear to meet or exceed any MEPA review thresholds. Therefore, notwithstanding the possibility that the project may receive Financial Assistance from the Commonwealth, I hereby determine that this project is not subject to review under MEPA and that the submission of an Environmental Notification Form (ENF) is not required.

Please contact Rick Bourré, Assistant Director of the MEPA Office, at (617) 626-1130 if you have any questions concerning this matter.

Sincerely,

Deirdre Buckley
MEPA Director

Wixon, Josephine (EEA)

From: Bourre, Richard (EEA)
Sent: Tuesday, December 02, 2014 10:10 AM
To: Wixon, Josephine (EEA)
Subject: FW: Request for MEPA Opinion
Attachments: Uxbridge CWMP - Analysis of MEPA Thresholds Memo.pdf

Please log this one in as well. Thanks.

Rick Bourré
Assistant Director, MEPA
Executive Office of Energy and Environmental affairs
100 Cambridge Street, 9th floor
Boston, MA 02114
(617) 626-1130 (direct line)
(617) 626-1181 (fax)
richard.bourre@state.ma.us

From: Anastasia Rudenko [mailto:Anastasia.Rudenko@ghd.com]
Sent: Monday, December 01, 2014 2:13 PM
To: Bourre, Richard (EEA)
Cc: Marc Drainville; bsherman@uxbridge-ma.gov
Subject: FW: Request for MEPA Opinion

Mr. Bourre,

The Town of Uxbridge is currently completing a Comprehensive Wastewater Management Plan (CWMP) Project. Attached is a memorandum describing the project and an analysis of the MEPA thresholds for this project. I am also forwarding the Draft Needs Assessment for your reference through our file-share program (the email will be addressed from files@ghd.sendthisfile.com).

The facility was issued an updated NPDES discharge permit in 2013. We do not anticipate that any additional DEP permits will be needed to construct or operate the upgraded facility. However, the CWMP and design of the upgraded facility will be submitted to DEP for review and approval.

The Town is currently exploring financing options for the Project, including possible funding opportunities through the State Revolving Fund program.

As we discussed over the phone, the primary recommendations of the Draft Needs Assessment are that (1) mechanical equipment past its useful life be replaced and that (2) the facility be upgraded to meet the requirements of its NPDES permit. The upgrade will not increase the design capacity of the facility. Additionally, the Draft Needs Assessment Report found no concentrated, problematic areas of individual on-site disposal and no major sewer extensions are recommended as part of the Project.

We have reviewed the MEPA regulations and concluded that the Project does not exceed any of the minimum thresholds outlined in 301 CMR 11. We would like to request an advisory opinion from MEPA to confirm that the Project does not need to enter the MEPA review process.

Cheers,

Anastasia Rudenko PE, ENV SP
Engineer

GHD
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MEMORANDUM

November 26, 2014

To	Town of Uxbridge, MA		
Copy to			
From	Marc Drainville, P.E., BCEE, LEED AP	Tel	774-470-1634
Subject	Analysis of Massachusetts Environmental Policy Act Thresholds for the Uxbridge Comprehensive Wastewater Management Plan	Job No.	8614914

Purpose

The purpose of this memorandum is to document the fact that no Massachusetts Environmental Policy Act (MEPA) thresholds are exceeded for the Uxbridge Comprehensive Wastewater Management Planning (CWMP) Project and to advise that an opinion from MEPA be sought to confirm that the project does not need to enter into the MEPA review process.

Background

The Town of Uxbridge owns and operates a Wastewater Treatment Facility (WWTF) that was constructed in the 1970's and is located at 80 River Road, Uxbridge, Massachusetts. The Uxbridge WWTF serves commercial districts and residential areas north and east of Route 146. The remainder of the Town utilizes on-site wastewater disposal.

The facility was issued a new National Pollutant Discharge Elimination System (NPDES) permit in 2013 (Permit No. MA0102440); and because certain conditions within the permit cannot be met with the WWTFs existing infrastructure, EPA issued a Consent Order (Docket No. 14-003) on June 2014. The Consent Order provides a schedule by which the Town is to come into compliance with the new permit and provides interim limits that must be met while the planning, design, and construction of the upgraded facilities at the WWTF are underway. The recently issued permit also requires that the Town complete a CWMP Project and submit the final draft to the Environmental Protection Agency (EPA) in December 2015. This may be a tight schedule, depending on the possible need for MEPA review.

CWMP Scope

A project scope for the CWMP Project was developed in a Plan of Study. The Plan of Study was submitted to MassDEP on March 14, 2014 and approved on September 26, 2104. The project scope has been divided into six phases. A brief listing of the tasks associated with each phase of this project follows.

Phase 1 – Develop the following Needs Assessment items:

- Description, purpose, and scope of the CWMP project
- Background
- Existing conditions
- Summary of needs

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Phase 2 – Develop a Final Needs Assessment Report based on Town comments.

Phase 3 – Develop the following alternatives screening and recommended plan items:

- Documentation of planning and evaluation criteria to be used in the CWMP
- Flows and loads
- Sewer service area evaluation
- "Away from WWTF" detailed evaluation
- Wastewater infrastructure screening and detailed evaluation
- Recommended plan

Phase 4 – Develop a Final Recommended Plan in accordance with Town comments.

Phase 5 – Initiate public participation through the public review process.

Phase 6 – Initiate a MEPA review (if required).

CWMP Needs Assessment

The CWMP considers the Towns wastewater management needs over the 20 year planning period—2015 through 2035. The Draft Needs Assessment Report has been completed; it is provided on the compact disc attached to this memorandum.

The Draft Needs Assessment Report identified the following primary needs:

- Replacement of mechanical equipment that is well past its useful life.
- Upgrade of the facility to meet current design standards and the requirements of the NPDES permit.

It has been determined that the upgrade will not increase the capacity of the facility. Also, the Draft Needs Assessment Report found no concentrated, problematic areas of individual on-site disposal, and no major sewer extensions are recommended as part of the Project.

MEPA Thresholds

We have reviewed the MEPA regulations and criteria that identify when a project needs to enter the MEPA review process. A summary of the criteria and our conclusions is enclosed with this memorandum. Because no minimum thresholds have been exceeded, we do not believe that we need to enter the MEPA process. It is recommended that an opinion be sought from MEPA to confirm that the Project does not need to enter into the MEPA review process.

Category	Review Threshold ENF and Mandatory EIR	ENF and Other MEPA Review if the Secretary So Requires	Uxbridge CWMP Anticipated to Trigger?
Land	1. Direct alteration of 50 or more acres of land, unless the Project is consistent with an approved Conservation Farm plan or forest current plan or other similar generall accepted agricultural or forestry practices. 2. Creation of 10 or more impercious acres. 2. Creation of 10 or more impervious acres	1. Direct alteration of 25 or more acres of land, unless the Project is consistent with an approved conservation farm plan or forest cutting plan or other similar generally accepted agricultural or forestry practices. 2. Creation of 5 or more acres of impervious area. 3. Conversion of land held for natural resource purposes in accordance with Article 97 of the Amendment to the Constitution of the Commonwealth to any purpose not in accordance with Article 97. 4. Conversion of land in active agricultural use to non-agricultural use, provided the land includes soils classified as prime, state-important or unique to the United States Department of Agriculture, unless the Project is accessory to active agricultural use or consists solely of one single family dwelling. 5. Release of an interest in land held for conservation, preservation or agricultural or watershed preservation purposes. 6. Approval in accordance with M.G.L. c. 121A ofa New urban redevelopment project or a fundamental change in an approved urban redevelopment project, provided that the Project consists of 100 or more dwelling units or 50,000 or more sf of non-residential space. 7. Approval in accordance with M.G.L. c. 121B ofaNew urban renewal planor a major modification of an existing urban renewal plan.	No
State-listed Species under MGL c 131A (Massachusetts Endangered Species Act)	None	1. Alteration of designated significant habitat. 2. Greater than two acres of disturbance of designated priority habitat, as defined in 321 CMR 10.02, that results in a take of a state-listed endangered or or species of special concern.threatened species	No
Wetlands, Waterways and Tidelands	1. Provided that a Permit is required: a. alteration of one or more acres of salt marsh or bordering vegetating wetlands; or b. alteration of ten or more acres of any other wetlands. 2. Alteration requiring a variance in accordance with the Wetlands Protection Act. 3. Construction of a New dam. 4. Structural alteration of an existing dam that causes an Expansion of 20% or any decrease in impoundment Capacity. 5. Provided that a Chapter 91 License is required, New non-water dependent use or Expansion of an existing non-water dependent structure, provided the use or structure occupies one or more acres of waterways or tidelands.	1. Provided that a Permit is required: a. alteration of coastal dune, barrier beach or coastal bank; b. alteration of 500 or more linear feet of bank along a fish run or inland bank; c. alteration of 1,000 or more sf of salt marsh or outstanding resource waters; d. alteration of 5,000 or more sf of bordering or isolated vegetated wetlands; e. New fill or structure or Expansion of existing fill or structure, except a pilesupported structure, in a velocity zone or regulatory floodway; or f. alteration of Yi or more acres of any other wetlands. 2. Construction of a New roadway or bridge providing access to a barrier beach or a New utility line providing service to a structure on a barrier beach. 3. Dredging of 10,000 or more cy of material. 4. Disposal of 10,000 or more cy of dredged material, unless at a designated in-water disposal site. 5. Provided that a Chapter 91 License is required, New or existing unlicensed non-water dependent use of waterways or tidelands, unless the Project is an overhead utility line, a structure of 1,000 or less sf base area accessory to a single family dwelling, a temporary use in a designated port area, or an existing unlicensed structure in use prior to January 1, 1984.	No
Water	1. New withdrawal or Expansion in withdrawal of: a. 2,500,000 or more gpd from a surface water source; or b. 1,500,000 or more gpd from a groundwater source. 2. New interbasin transfer of water of 1,000,000 or more gpd or any amount determined significant by the Water Resources Commission. 3. Construction of one or more New water mains ten or more miles in length. 4. Provided that the Project is undertaken by an Agency, New water service to a municipality or water district across a municipal boundary through New or existing pipelines, unless a disruption of service emergency is declared in accordance with applicable statutes and regulations.	1. New withdrawal or Expansion in withdrawal of 100,000 or more gpd from a water source that requires New construction for the withdrawal. 2. New withdrawal or Expansion in withdrawal of 500,000 or more gpd from a water supply system above the lesser of current system-wide authorized withdrawal volume or three-years' average system-wide actual withdrawal volume. 3. Construction of one or more New water mains five or more miles in length. 4. Construction of a New drinking water treatment plant with a Capacity of 1,000,000 or more gpd. 5. Expansion of an existing drinking water treatment plant by the greater of 1,000,000 gpd or 10% of existing Capacity. 6. Alteration requiring a variance in accordance with the Watershed Protection Act, unless the Project consists solely of one single family dwelling. 7. Non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities.	No

Category	Review Threshold ENF and Mandatory EIR	ENF and Other MEPA Review if the Secretary So Requires	Uxbridge CWMP Anticipated to Trigger?
Wastewater	1. Construction of a New wastewater treatment and/or disposal facility with a Capacity of 2,500,000 or more gpd. 2. New interbasin transfer of wastewater of 1,000,000 or more gpd or any amount determined significant by the Water Resource Commission. 3. Construction of one or more New sewer mains ten or more miles in length. 4. Provided that the Project is undertaken by an Agency, New sewer service to a municipality or sewer district across a municipal boundary through New or existing pipelines, unless an emergency is declared in accordance with applicable statutes and regulations. 5. New discharge or Expansion in discharge of any amount of sewage, industrial waste water or untreated stormwater directly to an outstanding resource water. 6. New Capacity or Expansion in Capacity for storage, treatment, processing, combustion or disposal of 150 or more wet tpd of sewage sludge, sludge ash, grit, screenings, or other sewage sludge residual materials, unless the Project is an Expansion of an existing facility within an area that has already been sited for the proposed use in accordance with M.G.L. c. 21 or M.G.L. c. 83, § 6.	1. Construction of a New wastewater treatment and/or disposal facility with a Capacity of 100,000 or more gpd. 2. Expansion of an existing wastewater treatment and/or disposal facility by the greater of 100,000 gpd or 10% of existing Capacity. 3. Construction of one or more New sewer mains: a. that will result in an Expansion in the flow to a wastewater treatment and/or disposal facility by 10% of existing Capacity; b. five or more miles in length; or c. ~ or more miles in length, provided the sewer mains are not located in the right b. five or more miles in length; or c. – or more miles in length, provided the sewer mains are not located in the right of way of existing roadways. 4. New discharge or Expansion in discharge: a. to a sewer system of 100,000 or more gpd of sewage, industrial waste water or untreated stormwater; b. to a surface water of: i. 100,000 or more gpd of sewage; ii. 20,000 or more gpd of industrial waste water; or 111. any amount of sewage, industrial waste water or untreated stormwater requiring a variance from applicable water quality regulations; or c. to groundwater of: i. 10,000 or more gpd of sewage within an area, zone or district established, delineated or identified as necessary or appropriate to protect a public drinking water supply, an area established to protect a nitrogen sensitive embayment, an area within 200 feet of a tributary to a public surface drinking water supply, or an area within 400 feet of a public surface drinking water supply; ii. 50,000 or more gpd of sewage within any other area; iii. 20,000 or more gpd of industrial waste water; or iv. any amount of sewage, industrial waste water or untreated stormwater requiring approval by the Department of Environmental Protection of a variance from Title 5 of the State Environmental Code for New construction. 5. New Capacity or Expansion in Capacity for: a. combustion or disposal of any amount of sewage sludge, sludge ash, grit, screenings, or other sewage sludge residual materials; or b. storage, treatment, or processing of 50 or more wet tpd of sewage sludge or sewage sludge residual materials.	No
Transportation	1. Unless the Project consists solely of an internal or on-site roadway or is located entirely on the site of a non-roadway Project: a. construction of a New roadway two or more miles in length; or b. widening of an existing roadway by one or more travel lanes for two or more miles. 2. New interchange on a completed limited access highway. 3. Construction of a New airport. 4. Construction of a New runway or terminal at an existing airport. 5. Construction of a New rail or rapid transit line along a New, unused or abandoned right-of-way for transportation of passengers or freight (not including sidings, spurs or other lines not leading to an ultimate destination). 6. Generation of 3,000 or more New adt on roadways providing access to a single location. 7. Construction of 1,000 or more New parking spaces at a single location.	1. Unless the Project consists solely of an internal or on-site roadway or is located entirely on the site of a non-roadway Project: a. construction of a New roadway one-quarter or more miles in length; or b. widening of an existing roadway by four or more feet for one-half or more miles. 2. Construction, widening or maintenance of a roadway or its right-of-way that will: a. alter the bank or terrain located ten more feet from the existing roadway for onehalf or more miles, unless necessary to install a structure or equipment; b. cut five or more living public shade trees of 14 or more inches in diameter at breast height; or c. eliminate 300 or more feet of stone wall. 3. Expansion of an existing runway at an airport. 4. Construction of a New taxiway at an airport. 5. Expansion of an existing taxiway at Logan Airport. 6. Expansion of an existing terminal at Logan Airport by 100,000 or more sf. 7. Expansion of an existing terminal at any other airport by 25 ,000 or more sf. 8. Construction of New or Expansion of existing air cargo buildings at an airport by 100,000 or more sf. 9. Conversion of a military airport to a non-military airport. 10. Construction of a New rail or rapid transit line for transportation of passengers or freight. 11. Discontinuation of passenger or freight service along a rail or rapid transit line. 11. Discontinuation of passenger or freight service along a rail or rapid transit line. 12. Abandonment of a substantially intact rail or rapid transit right-of way. 13. Generation of 2,000 or more New adt on roadways providing access to a single location. 14. Generation of 1,000 or more New adt on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location. 15. Construction of 300 or more New parking spaces at a single location.	NO
Energy	1. Construction of a New electric generating facility with a Capacity of 100 or more MW. 2. Expansion of an existing electric generating facility by 100 or more MW. 3. Construction of a New fuel pipeline ten or more miles in length. 4. Construction of electric transmission lines with a Capacity of 230 or more kv, provided the transmission lines are five or more miles in length along New, unused or abandoned right of way.	1. Construction of a New electric generating facility with a Capacity of 25 or more MW. 2. Expansion of an existing electric generating facility by 25 or more MW. 3. Construction of a New fuel pipeline five or more miles in length. 4. Construction of electric transmission lines with a Capacity of 69 or more kv, provided the transmission lines are one or more miles in length along New, unused or abandoned right of way.	No
Air	Construction of a New major stationary source with federal potential emissions, after construction and the imposition of required controls, of: 250 tpy of any criteria air pollutant; 40 tpy of any HAP; or 100 tpy of any combination of HAPs.	1. Construction of a New major stationary source with federal potential emissions, after construction and the imposition of required controls, of: 100 tpy of PM as PMIO, CO, lead or S02; 50 tpy ofVOC or NOx; 10 tpy of any HAP; or 25 tpy of any combination of HAPs. 2. Modification of an existing major stationary source resulting in a "significant net increase" in actual emissions, provided that the stationary source or facility is major for the pollutant, emission of which is increased by: 15 tpy of PM as PMIO; 100 tpy of CO; 40 tpy of S02; 25 tpy ofVOC or NOx; 0.6 tpy of lead.	No
Solid and Hazardous Waste	New Capacity or Expansion in Capacity of 150 or more tpd for storage, treatment, processing, combustion or disposal of solid waste, unless the Project is a transfer station, is an Expansion of an existing facility within a validly site assigned area for the proposed use, or is exempt from site assignment requirements.	1. New Capacity or Expansion in Capacity for combustion or disposal of any quantity of solid waste, or storage, treatment or processing of 50 or more tpd of solid waste, unless the Project is exempt from site assignment requirements. 2. Provided that a Permit is required in accordance with M.G.L. c. 21D, New Capacity or Expansion in Capacity for the storage, recycling, treatment or disposal of hazardous waste.	No

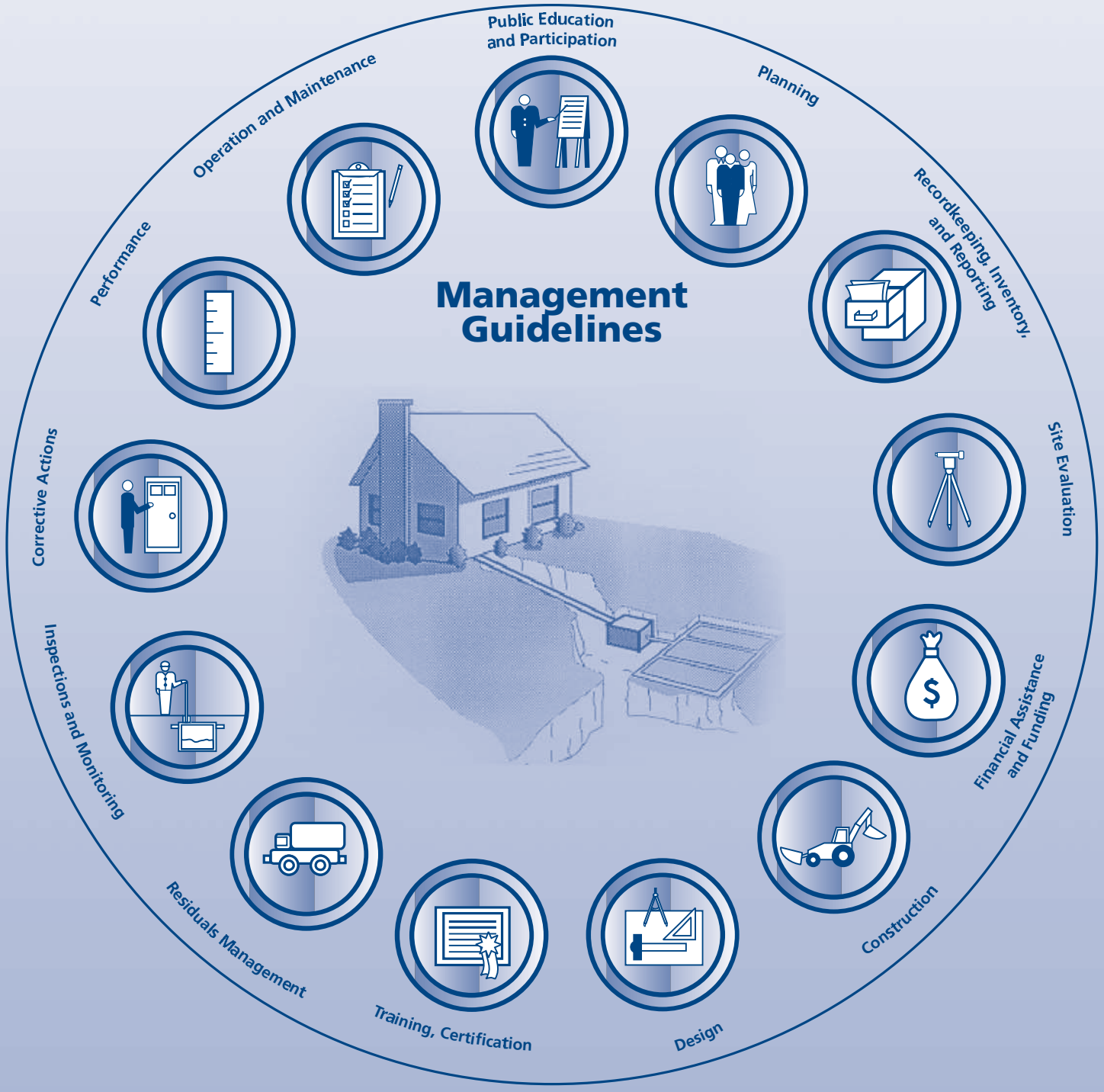
Category	Review Threshold ENF and Mandatory EIR	ENF and Other MEPA Review if the Secretary So Requires	Uxbridge CWMP Anticipated to Trigger?
Historical and Archaeological Resources	None	Unless the Project is subject to a Determination of No Adverse Effect by the Massachusetts Historical Commission or is consistent with a Memorandum of Agreement with the Massachusetts Historical Commission that has been the subject of public notice and comment: 1. demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth; or 2. destruction of all or any part of any Archaeological Site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth.	No
Areas of Critical Environmental Concern	None	Promulgation of New or revised regulations, of which a primary purpose is protecting against Damage to the Environment, that significantly reduce: 1. standards for environmental protection; 2. opportunities for public participation in permitting or other review processes; or 3. public access to information generated or provided in accordance with the regulations.	No

Appendix C – Decentralized Management Models

DRAFT

This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems



APPENDIX A: MANAGEMENT MODELS

This appendix presents a description of activities associated with each program element and identifies the party responsible for each activity. A detailed discussion is presented in the Management Handbook. Activities in bold are activities added to program elements from the preceding Management Model.

Note: If applicable, National Pollutant Discharge Elimination System (NPDES) requirements under the Clean Water Act (CWA) or Underground Injection Control (UIC) requirements under the Safe Drinking Water Act (SDWA) supercede any less stringent or inconsistent provisions. Program elements in each model help inform the state, tribe, or EPA in establishing NPDES permit requirements.

MANAGEMENT MODEL 1: HOMEOWNER AWARENESS

Objective: To ensure that conventional onsite systems are sited and constructed properly in accordance with appropriate state, tribal, and local regulations and codes; that they are periodically inspected; and, if necessary, that they are repaired by the Owner. The Regulatory Authority maintains a record of the location of all systems and periodically provides the Owner/User with notices regarding operation and preventive maintenance recommendations.

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY
PUBLIC EDUCATION AND PARTICIPATION	Regulatory Authority	• Educate Owner/User on purpose, use, and care of treatment system. • Provide public review and comment periods of any proposed program or rule changes.
	Service Provider	• Be informed of existing rules and review and comment on any proposed program and/or rule changes. • Participate in advisory committees established by the Regulatory Authority.
	Owner/User	• Be informed of purpose, use, and care of treatment system. • Be informed of existing rules and review and comment on any proposed program and/or rule changes. • Participate in advisory committees established by the Regulatory Authority.
PLANNING	Regulatory Authority	• Coordinate program rules and regulations with state, tribal, and local planning and zoning and other water-related programs. • Evaluate potential risks of wastewater discharges to limit environmental impacts on receiving environments during the rule making process. • Limit potential risks of environmental impacts from residuals management program and evaluate available handling/treatment capacities. • Inform local planning authority of rule changes and recommend its evaluation of potential impacts on land use.
	Developer	• Hire planners, certified site evaluators, and designers to ensure that all lots of proposed subdivision plats meet requirements for onsite treatment prior to final plat.
PERFORMANCE	Regulatory Authority	• Establish system failure criteria to protect public health, e.g., wastewater backups in building, wastewater ponding on ground surface, insufficient separation from ground water or wells.
	Owner/User	• Regularly maintain system in proper working order.
TRAINING AND CERTIFICATION/ LICENSING	Licensing Board/ Regulatory Authority	• Develop and administer training, testing, and certification/licensing program for site evaluators, designers, contractors, and pumpers/haulers. • Maintain a current certified/licensed Service Provider listing.
	Service Provider	• Obtain appropriate certification(s)/license(s) and continuing education as required. • Obtain training from the manufacturer or vendor regarding appropriate use, installation requirements, and O&M procedures of any proprietary equipment to be installed. • Comply with applicable federal, state, tribal, and local requirements.
	Owner/User	• When using third-party services, contract with only the appropriate certified/licensed Service Providers.
SITE EVALUATION	Regulatory Authority	• Codify prescriptive requirements for site evaluation procedures. • Codify criteria for treatment site characteristics suitable for permitted designs that will prevent unacceptable impacts on ground and surface water resources.
	Site Evaluator	• Obtain certification/license to practice. • Describe site and soil characteristics, determine suitability of site with respect to code requirements, and estimate site's hydraulic and treatment capacity. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
	Owner	• Hire a certified/licensed site evaluator to perform site evaluation.

MANAGEMENT MODEL 1: HOMEOWNER AWARENESS

MANAGEMENT MODEL 1: HOMEOWNER AWARENESS

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY
DESIGN	Regulatory Authority	• Codify prescriptive, preengineered designs that are suitable for treatment sites that meet the appropriate prescriptive site criteria.
	Designer	• Obtain a certification/license to practice. • Design a treatment system that is compatible with the site and soil characteristics described by the site evaluator. • Comply with applicable federal, state, tribal, and local requirements in the design of wastewater treatment and dispersal systems.
	Owner	• Hire a certified/licensed designer to prepare system design.
CONSTRUCTION	Regulatory Authority	• Administer a permitting program for system construction, including Regulatory Authority review of proposed system siting and design plans. • Perform final construction inspection for compliance assurance and inventory data collection. • Require that record drawings of constructed system be submitted to the Regulatory Authority by Owner.
	Contractor/ Installer	• Obtain certification/license to practice. • Construct the system in accordance with the approved plans and specifications. • Prepare record drawings of completed system and submit to Owner. • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Designer of Record	• Approve proposed field changes and submit to Owner. • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Owner	• Hire a certified/licensed contractor/installer to construct system. • Submit final record drawings of constructed system to Regulatory Authority.
OPERATION & MAINTENANCE	Regulatory Authority	• Provide Owner/User with educational materials regarding system use and care. • Send timely reminder to Owner of when scheduled preventive maintenance is due.
	Pumper/Hauler	• Obtain certification/license to practice. • Inspect and service system as necessary. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.
	Owner	• Perform recommended routine maintenance or hire a certified/licensed pumper/hauler to perform maintenance. • Hire a certified/licensed pumper/hauler to periodically inspect, service, and remove septage for proper treatment and disposal.
	User	• Follow recommendations provided by Regulatory Authority, Service Providers, and/or Owner to ensure that undesirable or prohibited materials are not discharged to system.
RESIDUALS MANAGEMENT	Regulatory Authority	• Administer a tracking system for residuals hauling, treatment, and disposal and review to evaluate compliance with 40 CFR Part 503 (Use and Disposal of Sewage Sludge), 40 CFR Part 257, and applicable state, tribal, and local requirements. • Inventory available residuals handling/treatment capacities and develop contingency plans to ensure that sufficient capacities are always available.
	Pumper/Hauler	• Obtain certification/license to practice. • Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of treatment system residuals.
COMPLIANCE INSPECTIONS/ MONITORING	Regulatory Authority	• Conduct final construction inspections to ensure compliance with approved plans and permit requirements. • Perform compliance inspections at point-of-sale, change-in-use of properties, "targeted areas," and systems reported to be in violation. • Conduct compliance inspections of residuals hauling, treatment, and disposal.
	Pumper/Hauler	• Inform Owner of any noncompliant items observed during routine servicing of system.
	Owner	• Periodically perform a "walk-over" inspection of the system and correct any deficiencies.

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY
CORRECTIVE ACTIONS	Regulatory Authority	• Negotiate compliance schedule with Owner for correcting documented noncompliance items. • Administer enforcement program, including fines and/or penalties for failure to comply with compliance requirements. • Obtain necessary authority to enter property to correct imminent threats to public health if the Owner/User fails to comply.
	Designer	• Provide Owner with documents (drawings, specifications, modifications, etc.) that may be required by Regulatory Authority prior to corrective action.
	Contractor/ Installer	• Perform required repairs, modifications, and upgrades as necessary.
	Owner	• Comply with terms and conditions of the negotiated compliance schedule. • Submit required documents for corrective actions to Regulatory Authority. • Hire appropriate certified/licensed Service Providers to perform required corrective actions.
RECORD KEEPING, INVENTORY, & REPORTING	Regulatory Authority	• Administer a database inventory (locations, site evaluations, record drawings, permits, performed maintenance, inspection reports) of all systems. • Maintain a residuals treatment and disposal tracking system. • Maintain a current certified/licensed Service Provider listing that is available to the public.
	Pumper/Hauler	• Prepare and submit records of residuals handling as required.
	Owner	• Maintain approved record drawings of system. • Maintain maintenance records of system. • Provide drawings, specifications, and maintenance records to new property owner at time of property transfer.
FINANCIAL ASSISTANCE & FUNDING	Regulatory Authority	• Provide the legal and financial support to sustain the management program. • Provide a listing of financial assistance programs available to Owner and the qualifying criteria for each program. • Consider implementing a state or local financing program to assist Owners in upgrading their systems.

MANAGEMENT MODEL 1: HOMEOWNER AWARENESS

MANAGEMENT MODEL 2: MAINTENANCE CONTRACTS

Objective: To allow use of more complex mechanical treatment options or small clusters through the requirement that maintenance contracts be maintained between the Owner and maintenance provider to ensure appropriate and timely system component maintenance by qualified technicians over the service life of the system.

MANAGEMENT MODEL 2: MAINTENANCE CONTRACTS

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
PUBLIC EDUCATION AND PARTICIPATION	Regulatory Authority	• Educate Owner/User on purpose, use, and care of treatment system. • Provide public review and comment periods of any proposed program and/or rule changes.
	Service Provider	• Be informed of existing rules, and review and comment on any proposed program or rule changes. • Participate in advisory committees established by the Regulatory Authority.
	Owner/User	• Be informed of purpose, use, and care of treatment system. • Be informed of existing rules, and review and comment on any proposed program or rule changes. • Participate in advisory committees established by the Regulatory Authority.
PLANNING	Regulatory Authority	• Coordinate program rules and regulations with state, tribal, local planning and zoning and other water-related programs. • Evaluate potential risks of wastewater discharges to limit environmental impacts on receiving environments during the rule making process. • Limit potential risks of environmental impacts from residuals management program and evaluate available handling/treatment capacities. • Inform local planning authority of rule changes and recommend its evaluation of potential impacts on land use.
	Developer	• Hire planners, certified site evaluators, and designers to ensure that all lots of proposed subdivision plats meet requirements for onsite treatment prior to final plat.
PERFORMANCE	Regulatory Authority	• Establish system failure criteria to protect public health, e.g., wastewater backups in building, wastewater ponding on ground surface, insufficient separation from ground water or wells. • **Establish minimum performance criteria for manufactured component approvals.** • **Establish minimum maintenance requirements for approved systems.**
	Owner/User	• Regularly maintain system in proper working order.
TRAINING AND CERTIFICATION/ LICENSING	Licensing Board/ Regulatory Authority	• Develop and administer training, testing, and certification/licensing program for site evaluators, designers, contractors, operators, and pumpers/haulers. • Maintain a current certified/licensed Service Provider listing.
	Service Provider	• Obtain appropriate certification(s)/license(s) and continuing education as required. • Obtain training from the manufacturer or vendor regarding appropriate use, installation requirements, and O&M procedures of any proprietary equipment to be installed. • Comply with applicable federal, state, tribal, and local requirements.
	Owner/User	• When using third-party services, contract only with the appropriate certified/licensed Service Providers.
SITE EVALUATION	Regulatory Authority	• Codify prescriptive requirements for site evaluation procedures. • Codify criteria for treatment site characteristics suitable for permitted designs that will prevent unacceptable impacts on ground and surface water resources. • **Establish alternative site acceptance criteria for approved systems providing enhanced pretreatment.**
	Site Evaluator	• Obtain certification/license to practice. • Describe site and soil characteristics, determine suitability of site with respect to code requirements, and estimate site's hydraulic and treatment capacity. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
	Owner	• Hire a certified/licensed site evaluator to perform site evaluation.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
DESIGN	Regulatory Authority	• Codify prescriptive, preengineered designs that are suitable for treatment sites that meet the appropriate prescriptive site criteria. • **Administer an evaluation program for approving manufactured components for use with pre-engineered designs.**
	Designer	• Obtain certification/license to practice. • Design a treatment system that is compatible with the site and soil characteristics described by the site evaluator. • Comply with applicable federal, state, tribal, and local requirements in the design of wastewater treatment and dispersal systems.
	Owner	• Hire a certified/licensed designer to prepare system design.
CONSTRUCTION	Regulatory Authority	• Administer a permitting program for system construction, including Regulatory Authority review of proposed system siting and design plans. • Perform final construction inspection for compliance assurance and inventory data collection. • Require that record drawings of constructed system be submitted to the Regulatory Authority by Owner. • **Require Owner to submit a copy of system O&M manual to the Regulatory Authority.**
	Contractor/ Installer	• Obtain certification/license to practice. • Construct the system in accordance with the approved plans and specifications. • Prepare record drawings of completed system and submit to Owner. • **Provide Owner with an O&M manual describing component manufacturer's maintenance and troubleshooting requirements/recommendations.** • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Designer of Record	• Approve proposed field changes and submit to Owner. • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Owner	• Hire a certified/licensed contractor/installer to construct system. • Submit final record drawings of constructed system to Regulatory Authority. • **Submit a copy of system O&M manual to Regulatory Authority to record required maintenance.**
OPERATION & MAINTENANCE	Regulatory Authority	• Provide Owner/User with educational materials regarding system use and care. • Send timely reminder to Owner when scheduled preventive maintenance is due. • **Administer a program that requires the Owner to attest periodically that he or she holds a valid contract with a certified/licensed operator to perform scheduled and any necessary maintenance according to the maintenance requirements described in submitted O&M manual.** • **Require Owner to submit a maintenance report signed/sealed by certified/licensed operator immediately following scheduled maintenance.**
	Operator	• **Obtain certification/license to practice.** • **Inspect and service system as necessary in accordance with the submitted O&M manual.** • **Certify to Owner that the required maintenance was performed in a timely manner, describing any system deficiencies observed.** • **Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.**
	Pumper/Hauler	• Obtain certification/license to practice. • Inspect and service system as necessary. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of treatment and dispersal system.
	Owner	• Hire a certified/licensed pumper/hauler to periodically inspect, service, and remove septage or other residuals for proper treatment and disposal. • **Maintain contractual agreement with a certified/licensed operator to perform scheduled maintenance as required.** • **Inform Regulatory Authority of any change in maintenance contract status.**
	User	• Follow recommendations provided by Regulatory Authority, Service Providers, and/or Owner to ensure that undesirable or prohibited materials are not discharged to system.

MANAGEMENT MODEL 2: MAINTENANCE CONTRACTS

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 2: MAINTENANCE CONTRACTS

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
RESIDUALS MANAGEMENT	Regulatory Authority	• Administer a tracking system for residuals hauling, treatment, and disposal and review to evaluate compliance with 40 CFR Part 503 (Use and Disposal of Sewage Sludge), 40 CFR Part 257, and applicable state, tribal, and local requirements. • Inventory available residuals handling/treatment capacities and develop contingency plans to ensure that sufficient capacities are always available.
	Pumper/Hauler	• Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of treatment system residuals.
COMPLIANCE INSPECTIONS/ MONITORING	Regulatory Authority	• Conduct final construction inspections to ensure compliance with approved plans and permit requirements. • Perform compliance inspections at point-of-sale, change-in-use of properties, "targeted areas," and/or systems reported to be in violation. • Conduct compliance inspections of residuals hauling, treatment, and disposal. • **Administer program for confirming that Owners hold valid maintenance contracts with certified/licensed operators and for monitoring timely submittals of certified maintenance reports.**
	Operator or Pumper/Hauler	• Inform Owner of any noncompliant items observed during routine servicing of system.
	Owner	• Periodically perform a "walk-over" inspection of the system and correct any deficiencies. • **Attest to the Regulatory Authority that a valid contract exists with a certified/licensed operator to perform necessary system maintenance.** • **Submit a maintenance report signed/sealed by a certified/licensed Service Provider immediately following scheduled maintenance.**
CORRECTIVE ACTIONS	Regulatory Authority	• Negotiate compliance schedule with Owner for correcting documented noncompliant items. • Administer enforcement program, including fines and/or penalties for failure to comply with compliance requirements. • Obtain necessary authority to enter property to correct imminent threats to public health if the Owner/User fails to comply.
	Designer	• Provide Owner with documents (drawings, specifications, modifications, etc.) that may be required by Regulatory Authority prior to corrective action.
	Contractor/ Installer	• Perform required repairs, modifications, and upgrades as necessary.
	Owner	• Comply with terms and conditions of the negotiated compliance schedule. • Submit required documents for corrective actions to Regulatory Authority. • Hire appropriate certified/licensed Service Providers to perform required corrective actions.
RECORD KEEPING, INVENTORY, & REPORTING	Regulatory Authority	• Administer a database inventory (locations, site evaluations, record drawings, permits, performed maintenance, inspection reports) of all systems. • Maintain a residuals treatment and disposal tracking system. • Maintain a current certified/licensed Service Provider listing that is available to the public. • **Administer an Owner/Service Provider maintenance contract compliance and certified maintenance report tracking system.** • **Record maintenance contract requirement on property deed.** • **Administer a certified maintenance report tracking system.**
	Operator	• Provide certified report of all maintenance and observed system deficiencies to Owner.
	Pumper/Hauler	• Prepare and submit records of residuals handling as required.
	Owner	• Maintain approved record drawings and **O&M manual** of system. • Maintain maintenance records of system. • Provide drawings, specifications, **O&M manual**, and maintenance records to new property owner at time of property transfer.
FINANCIAL ASSISTANCE & FUNDING	Regulatory Authority	• Provide the legal and financial support to sustain the management program. • Provide a listing of financial assistance programs available to Owner/User and the qualifying criteria for each program. • Consider implementing a state or local financing program to assist Owners in upgrading their systems.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 3: OPERATING PERMITS

Objective: To issue renewable/revocable operating permits to system Owner that stipulate specific and measurable performance criteria for the treatment system and periodic submittals of compliance monitoring reports. The performance criteria are based on risks to public health and water resources posed by wastewater dispersal in the receiving environment. Operating permits allow the use of clustered or onsite systems on sites with a greater range of site characteristics.

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
PUBLIC EDUCATION AND PARTICIPATION	Regulatory Authority	• Educate Owner/User on purpose, use, and care of treatment system. • Provide public review and comment periods of any proposed program and/or rule changes.
	Service Provider	• Be informed of existing rules, and review and comment on any proposed program or rule changes. • Participate in advisory committees established by the Regulatory Authority.
	Owner/User	• Be informed of purpose, use, and care of treatment system. • Be informed of existing rules, and review and comment on any proposed program or rule changes. • Participate in advisory committees established by the Regulatory Authority.
PLANNING	Regulatory Authority	• Coordinate program rules and regulations with state, tribal, and local planning and zoning and other water-related programs. • Evaluate potential risks of wastewater discharges to limit environmental impacts on receiving environments during the rule making process. • Limit potential risks of environmental impacts from residuals management program and evaluate available handling/treatment capacities. • Inform local planning authority of rule changes and recommend its evaluation of potential impacts on land use.
	Developer	• Hire planners, certified site evaluators, and designers to ensure that all lots of proposed subdivision plats meet requirements for onsite treatment prior to final plat.
PERFORMANCE	Regulatory Authority	• Establish system failure criteria to protect public health, e.g., wastewater backups in building, wastewater ponding on ground surface, insufficient separation from ground water or wells. • Establish minimum maintenance requirements for approved systems. • **Establish performance criteria necessary to protect public health and water resources for each defined receiving environment in Regulatory Authority's jurisdiction.**
	Owner/User	• Operate and regularly maintain system in proper working order. • **Operate system to comply with performance criteria stipulated in operating permit.**
TRAINING AND CERTIFICATION/ LICENSING	Licensing Board/ Regulatory Authority	• Develop and administer a training, testing, and certification/licensing program for site evaluators, designers, contractors, operators, pumpers/haulers, and **inspectors**. • Maintain a current certified/licensed Service Provider listing.
	Service Provider	• Obtain appropriate certification(s)/license(s) and continuing education as required. • Obtain training from the manufacturer or vendor regarding appropriate use, installation requirements, and O&M procedures of any proprietary equipment to be installed. • Comply with applicable federal, state, tribal, and local requirements.
	Owner/User	• When using third-party services, contract with only the appropriate certified/licensed Service Providers.
SITE EVALUATION	Regulatory Authority	• Codify prescriptive requirements for site evaluation procedures. • Codify criteria for treatment site characteristics suitable for permitted designs that will prevent unacceptable impacts on ground and surface water resources. • **Establish defining characteristics for each receiving environment in the Regulatory Authority's jurisdiction.**
	Site Evaluator	• Obtain certification/license to practice. • Describe site and soil characteristics, determine suitability of site with respect to code requirements, and estimate site's hydraulic and treatment capacity. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
	Owner	• Hire a certified/licensed site evaluator to perform site evaluation.

MANAGEMENT MODEL 3: OPERATING PERMITS

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 3: OPERATING PERMITS

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
DESIGN	Regulatory Authority	• Codify prescriptive, preengineered designs that are suitable for treatment sites that meet the appropriate prescriptive site criteria. • **Administer a plan review program for engineered designs to meet stipulated performance criteria.** • **Require submission of routine operation and emergency contingency plans that will sustain system performance and avoid unpermitted discharges.**
	Designer	• Obtain certification/license to practice. • Certified/licensed designer to design treatment system that is compatible with the site and soil characteristics described by the site evaluator. • Comply with applicable federal, state, tribal, and local requirements in the design of wastewater treatment and dispersal systems.
	Owner	• Hire a certified/licensed designer to prepare system design.
CONSTRUCTION	Regulatory Authority	• Administer a permitting program for system construction, including Regulatory Authority review of proposed system siting and design plans. • **Require designer of record to certify that completed system construction is in substantial compliance with approved plans and specifications.** • Require that record drawings of constructed system be submitted to the Regulatory Authority by Owner. • Require Owner to submit a copy of system O&M manual to the Regulatory Authority.
	Contractor/ Installer	• Obtain certification/license to practice. • Construct the system in accordance with the approved plans and specifications. • Prepare record drawings of completed system and submit to Owner. • Provide Owner with an O&M manual describing component manufacturer's maintenance and troubleshooting requirements/recommendations. • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Designer of Record	• Approve proposed field changes and submit to Owner. • **Certify that construction of the system is substantially in conformance with the approved plans and specifications.**
	Owner	• Hire a certified/licensed contractor/installer to construct system. • Submit final record drawings of constructed system to Regulatory Authority. • Submit a copy of system O&M manual to Regulatory Authority to record required maintenance.
OPERATION & MAINTENANCE	Regulatory Authority	• Provide Owner/User with educational materials regarding system use and care. • **Administer a program of renewable/revocable operating permits that are issued to Owner stipulating system performance criteria, compliance monitoring reporting schedule, term of permit, and renewal option upon documented compliance with permit.** • **Track and review compliance monitoring reports to ensure that systems are operating in accordance with operating permits.**
	Operator	• Obtain certification/license to practice. • **Inspect and service system as necessary in accordance with the submitted O&M manual and/or operating permit stipulations.** • Certify to Owner that the required maintenance was performed in a timely manner, describing any system deficiencies observed. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.
	Pumper/Hauler	• Obtain certification/license to practice. • Inspect and service system as necessary. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.
	Owner	• Hire a certified/licensed pumper/hauler or operator to maintain system. • Maintain system in proper working order. • **Operate and maintain the system in accordance with O&M manual and/or operating permit stipulations.** • **Submit compliance monitoring reports to the Regulatory Authority according to the schedule stipulated in the operating permit.**
	User	• Follow recommendations provided by Regulatory Authority and/or Service Providers to ensure that undesirable or prohibited materials are not discharged to system.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
RESIDUALS MANAGEMENT	Regulatory Authority	• Administer a tracking system for residuals hauling, treatment, and disposal and review to evaluate compliance with 40 CFR Part 503 Use and Disposal of Sewage Sludge, 40 CFR Part 257, and applicable state, tribal, and local requirements. • Inventory available residuals handling/treatment capacities and develop contingency plans to ensure that sufficient capacities are always available.
	Pumper/Hauler	• Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of treatment system residuals.
COMPLIANCE INSPECTIONS/ MONITORING	Regulatory Authority	• Perform inspection programs at point-of-sale, change-in-use of properties, "targeted areas," and/or systems reported to be in violation. • Conduct compliance inspections of residuals hauling, treatment, and disposal. • **Administer a program to monitor timely submittals of acceptable compliance maintenance reports.** • **Notify Owner of impending scheduled submittals of compliance monitoring reports.** • **Perform system inspections randomly and/or at time of operating permit renewal.**
	Operator or Pumper/Hauler	• Inform Owner of any noncompliant items observed during routine servicing of system.
	Owner	• Submit compliance monitoring reports to Regulatory Authority as stipulated in operating permit. • **Submit compliance inspection report signed/sealed by a certified/licensed inspector prior to applying for renewal of operating permit.**
CORRECTIVE ACTIONS	Regulatory Authority	• Negotiate compliance schedule with Owner for correcting documented noncompliant items. • Administer enforcement program including fines and/or penalties for failure to comply with compliance requirements. • Obtain necessary authority to enter property to correct imminent threats to public health if the Owner/User fails to comply. • **Require system inspection by certified inspector at time of operating permit renewal.**
	Designer	• Provide Owner with documents (drawings, specifications, modifications, etc.) that may be required by Regulatory Authority prior to corrective action.
	Contractor/ Installer	• Perform required repairs, modifications, and upgrades as necessary.
	Inspector	• **Obtain certification/license to practice.** • **Inspect treatment system for compliance with operating permit prior to permit renewal.**
	Owner	• Comply with terms and conditions of the negotiated compliance schedule. • Submit required documents for corrective actions to Regulatory Authority. • Hire appropriate certified/licensed Service Providers to perform required corrective actions.
RECORD KEEPING, INVENTORY, & REPORTING	Regulatory Authority	• Administer a database inventory (locations, site evaluations, record drawings, permits, performed maintenance, and inspection reports) of all systems. • Maintain a residuals treatment and disposal tracking system. • Maintain a current certified/licensed Service Provider listing that is available to the public. • **Administer a tracking system for operating permits.** • **Administer a tracking database for compliance reports.**
	Operator or Inspector	• Provide certified report of all maintenance and observed system deficiencies to Owner. • **Perform system monitoring as stipulated in Owner's operating permit.**
	Pumper/Hauler	• Prepare and submit records of residuals handling as required.
	Owner	• Maintain approved record drawings and O&M manual of system. • Maintain maintenance records of system. • Submit compliance monitoring reports to Regulatory Authority. • Provide drawings, specifications, O&M manual, and maintenance records to new property owner at time of property transfer.
FINANCIAL ASSISTANCE & FUNDING	Regulatory Authority	• Provide the legal and financial support to sustain the management program. • Provide a listing of financial assistance programs available to Owner/User and the qualifying criteria for each program. • Consider implementing a state or local financing program to assist Owners in upgrading their systems.

MANAGEMENT MODEL 3: OPERATING PERMITS

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 4: RME OPERATION AND MAINTENANCE

Objective: To ensure that onsite/decentralized systems consistently meet their stipulated performance criteria through Responsible Management Entities that are responsible for operation and performance of systems within their service areas.

MANAGEMENT MODEL 4: RME OPERATION AND MAINTENANCE

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
PUBLIC EDUCATION AND PARTICIPATION	Regulatory Authority	• Educate Owner/User on purpose, use, and care of treatment system. • Hold public meetings to inform the public of any proposed program and/or rule changes.
	Service Provider	• Be informed of existing rules, and review and comment on any proposed program or rule changes. • Participate in advisory committees established by the Regulatory Authority.
	Owner/User	• Be informed of purpose, use, and care of treatment system. • Be informed of existing rules and review and comment on any proposed program and/or rule changes. • Participate in advisory committees established by the Regulatory Authority.
	RME	**• Inform Owner/User of care and use of system.** **• Inform Owner/User of RME requirements and prohibited uses of system.**
PLANNING	Regulatory Authority	• Coordinate program rules and regulations with state, tribal, and local planning and zoning and other water-related programs. • Evaluate potential risks of wastewater discharges to limit environmental impacts on receiving environments during the rule making process. • Limit potential risks of environmental impacts from residuals management program and evaluate available handling/treatment capacities. • Inform local planning authority of rule changes and recommend their evaluation of potential impacts on land use.
	Developer	• Hire planners, certified site evaluators, and designers to ensure that all lots of proposed subdivision plats meet requirements for onsite treatment prior to final plat.
	RME	**• Develop criteria (e.g., site evaluation, design, construction) to be required of systems for acceptance into O&M program and inform Owners.** **• Continuously evaluate existing wastewater treatment needs and forecast future needs.**
PERFORMANCE	Regulatory Authority	• Establish system failure criteria to protect public health, e.g., wastewater backups in building, wastewater ponding on ground surface, insufficient separation from ground water or wells. • Establish minimum maintenance requirements for approved systems. • Establish performance criteria necessary to protect public health and water resources for each defined receiving environment in the Regulatory Authority's jurisdiction.
	Owner	• Regularly maintain system components in proper working order. **• Comply with any RME requirements regarding care and use of the system.**
	RME	**• Operate systems to comply with performance criteria stipulated in the operating permits.**
TRAINING AND CERTIFICATION/ LICENSING	Licensing Board/ Regulatory Authority	• Develop and administer training, testing, and certification/licensing program for site evaluators, designers, contractors, operators, pumpers/haulers, and inspectors. • Maintain a current certified/licensed Service Provider listing.
	Service Provider	• Obtain appropriate certification(s)/license(s) and continuing education as required. • Obtain training from the manufacturer or vendor regarding appropriate use, installation requirements, and operation and maintenance procedures of any proprietary equipment to be installed. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
	Owner	• When using third-party services, contract only with the appropriate certified/licensed Service Providers.
	RME	**• When using third-party services, contract with only the appropriate certified/licensed Service Providers.** **• Ensure that RME staff who operate and/or maintain systems obtain appropriate certification(s)/license(s) to practice.** **• Arrange for supplemental training as needed for Service Providers and/or staff to manage, operate, and/or maintain systems.**

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 4: RME OPERATION AND MAINTENANCE

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
SITE EVALUATION	Regulatory Authority	• Codify prescriptive requirements for site evaluation procedures. • Codify criteria for treatment site characteristics suitable for permitted designs that will prevent unacceptable impacts on ground and surface water resources. • Establish the defining characteristics of each receiving environment in the Regulatory Authority's jurisdiction. • **Approve and oversee site evaluation procedures required by RME for system acceptance in the O&M program to ensure that system designs are appropriate for the sites and their stipulated performance criteria.**
	Site Evaluator	• Obtain certification/license to practice. • Describe site and soil characteristics, determine suitability of site with respect to code requirements, and estimate site's hydraulic and treatment capacity. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
	Owner	• Hire a certified/licensed site evaluator to perform site evaluation. • **Comply with any additional siting requirements established by RME for system acceptance in the O&M program.**
DESIGN	Regulatory Authority	• Codify prescriptive, pre-engineered designs that are suitable for treatment sites that meet the appropriate prescriptive site criteria. • Administer a plan review program for engineered designs to meet stipulated performance criteria. • Require submission of routine operation and emergency contingency plans that will sustain system performance and avoid unpermitted discharges.
	Designer	• Obtain certification/license to practice. • Design treatment system that is compatible with the site and soil characteristics described by the site evaluator. • Comply with applicable federal, state, tribal, and local requirements in the design of wastewater treatment and dispersal systems.
	Owner	• Hire a certified/licensed designer to prepare system design. • Comply with any additional design requirements established by the RME for system acceptance in the O&M program.
CONSTRUCTION	Regulatory Authority	• Administer a permitting program for system construction, including Regulatory Authority review of proposed system siting and design plans. • Require designer of record to certify that completed system construction is in substantial compliance with approved plans and specifications. • Require that record drawings of constructed system be submitted to the Regulatory Authority by Owner. • Require Owner to submit a copy of system O&M manual to the Regulatory Authority and RME.
	Contractor/ Installer	• Obtain certification/license to practice. • Construct system in accordance with the approved plans and specifications. • Prepare record drawings of completed system and submit to Owner. • Provide Owner with an O&M manual describing component manufacturer's maintenance and troubleshooting requirements/recommendations. • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Designer of Record	• Approve proposed field changes and submit to Owner. • Certify that construction of the system is substantially in conformance with the approved plans and specifications.
	Owner	• **Comply with any additional construction requirements established by the RME for system acceptance in the O&M program.** • Hire a certified/licensed designer to prepare system design. • Submit final record drawings of constructed system to Regulatory Authority. • Submit a copy of the system O&M manual to the Regulatory Authority and RME to record required maintenance.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 4: RME OPERATION AND MAINTENANCE

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
OPERATION & MAINTENANCE	Regulatory Authority	• Provide Owner/User with educational materials regarding system use and care. • Administer a program of renewable/revocable operating permits that are issued to RME, stipulating system performance criteria, compliance monitoring reporting schedule, term of permit, and renewal option upon documented compliance with operating permit stipulations. • Track and review compliance monitoring reports to ensure that systems are operating in accordance with operating permits. • **Consider replacing individual system operating permits with general permits issued to the RME for classes of systems.**
	Operator	• Inspect and service the system as necessary in accordance with the submitted O&M manual and/or operating permit stipulations. • Perform system monitoring as stipulated in RME's operating permit. • Certify to RME that the required maintenance and monitoring was performed in a timely manner and noting any system deficiencies. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.
	Pumper/Hauler	• Obtain certification/license to practice. • Inspect and service system as necessary. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of treatment and dispersal system.
	Owner/User	• Follow recommendations provided by Regulatory Authority, Service Providers, and/or Owner to ensure that undesirable or prohibited materials are not discharged to system. • Maintain system components in proper working order. • **Comply with any RME requirements regarding care and use of system.**
	RME	• **Operate and maintain systems in accordance with the stipulated operating permit requirements.** • **Submit compliance monitoring reports to the Regulatory Authority according to the schedule stipulated in the operating permit.** • Hire a certified/licensed pumper/hauler or operator to maintain system.
RESIDUALS MANAGEMENT	Regulatory Authority	• Administer a tracking system for residuals hauling, treatment, and disposal and review to evaluate compliance with 40 CFR Part 503 Use and Disposal of Sewage Sludge, 40 CFR Part 257, and applicable state, tribal, and local requirements. • Inventory available residuals handling/treatment capacities and develop contingency plans to ensure that sufficient capacities are always available.
	Pumper/Hauler	• Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of wastewater treatment system residuals.
	RME	• Hire a certified/licensed pumper/hauler to remove, treat, and dispose of residuals. • **Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of treatment system residuals.** • **Inventory available residuals handling/treatment capacities and develop contingency plans when insufficient capacities are available.**
COMPLIANCE INSPECTIONS/ MONITORING	Regulatory Authority	• Perform inspection programs at point-of-sale, change-in-use of properties, "targeted areas," and/or systems reported to be in violation. • Conduct compliance inspections of residuals hauling, treatment, and disposal. • Administer a program to monitor timely submittals of acceptable compliance maintenance reports. • Perform system inspections randomly and/or at time of operating permit renewal.
	Inspector	• **Obtain certification/license to practice.** • **Perform system compliance inspections for RME in accordance with prevailing Regulatory Authority requirements.**
	RME	• **Submit compliance monitoring reports to the Regulatory Authority as stipulated in operating permit.** • **Submit compliance inspection report signed/sealed by a certified/licensed inspector prior to applying for renewal of operating permit.** • **Conduct regular reviews of management program with Owner/User and Regulatory Authority to optimize system operation program.** • **Hire a certified/licensed inspector to inspect system compliance status.**

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 4: RME OPERATION AND MAINTENANCE

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
CORRECTIVE ACTIONS	Regulatory Authority	• Negotiate compliance schedules with RME for correcting documented noncompliance items. • Administer enforcement program including fines and/or penalties for failure to comply with compliance requirements. • Obtain necessary authority to enter property to correct imminent threats to public health if the Owner/User fails to comply. • Require system inspection by certified inspector at time of operating permit renewal. • **Negotiate compliance schedules with RME, Owner/User, or both, for correcting documented noncompliance items.**
	Designer	• Provide Owner/RME with documents (drawings, specifications, modifications, etc.) that may be required by the Regulatory Authority prior to corrective actions.
	Contractor/ Installer	• Perform required repairs, modifications, and upgrades as necessary.
	Inspector	• Inspect treatment system for compliance with operating permit prior to permit renewal.
	Owner	• Comply with terms and conditions of the negotiated compliance schedule for component replacement/repairs. • Submit required documents for corrective actions to Regulatory Authority. • Hire appropriate certified/licensed Service Providers to perform required corrective actions.
	RME	• **Comply with terms and conditions of the negotiated compliance schedule for system performance.**
RECORD KEEPING, INVENTORY, & REPORTING	Regulatory Authority	• Administer a database inventory (locations, site evaluations, record drawings, permits, performed maintenance, and inspection reports) of all systems. • Maintain a residuals treatment and disposal tracking system. • Maintain a current certified/licensed Service Provider listing that is available to the public. • Administer a tracking system for operating permits. • Administer a tracking database for compliance reports. • **Administer periodic financial, management, and technical audits of RME.**
	Operator or Inspector	• Provide certified report of all maintenance and observed system deficiencies to RME. • Provide certified report of all observed system deficiencies to Owner. • Perform system monitoring as stipulated in RME's operating permit.
	Pumper/Hauler	• Prepare and submit records of residuals handling as required.
	Owner	• Maintain approved record drawings and O&M manual of system. • Maintain maintenance records of system. • Provide drawings, specifications, O&M manual, and maintenance records to new property owner at time of property transfer.
	RME	• **Maintain system monitoring and service records.** • **Inventory, collect, and provide permit information to Regulatory Authority.**
FINANCIAL ASSISTANCE & FUNDING	Regulatory Authority	• Provide the legal and financial support to sustain the management program. • Provide a listing of financial assistance programs available to Owner/User and the qualifying criteria for each program. • Consider implementing a state or local financing program to assist Owners in upgrading their systems.
	RME	• **Conduct regular reviews of management program with Owner/User and Regulatory Authority to optimize operations.**

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 5: RME OWNERSHIP

Objective: To provide professional management of the planning, siting, design, construction, operation, and maintenance of onsite/decentralized systems through Responsible Management Entities that own and manage individual and clustered systems within their service areas.

MANAGEMENT MODEL 5: RME OWNERSHIP	PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
	PUBLIC EDUCATION AND PARTICIPATION	Regulatory Authority	• Educate Owner/User on purpose, use, and care of treatment system. • Provide public review and comment periods of any proposed program and/or rule changes.
		Service Provider	• Be informed of existing rules, and review and comment on any proposed program or rule changes. • Participate in advisory committees established by the Regulatory Authority.
		RME	• Inform User of care and use of system. • Inform User of RME requirements and prohibited uses of system.
		User	• Be informed of purpose, use, and care of treatment system.
	PLANNING	Regulatory Authority	• Coordinate program rules and regulations with state, tribal, and local planning and zoning and other water-related programs. • Evaluate potential risks of wastewater discharges to limit environmental impacts on receiving environments during the rule making process. • Limit potential risks of environmental impacts from residuals management program and evaluate available handling/treatment capacities. • Inform local planning authority of rule changes and recommend their evaluation of potential impacts on land use.
		Developer	• Hire planners, certified site evaluators, and designers to ensure that all lots of proposed subdivision plats meet requirements for onsite treatment prior to final plat.
		RME	• Continuously evaluate existing wastewater treatment needs and forecast future needs. • **Require developers to submit proposed subdivision plats to RME for review and comment to ensure compatibility with RME requirements.** • **Plan most cost-effective approach to meeting treatment needs through appropriate mix of central sewerage, clusters, and individual onsite systems.**
	PERFORMANCE	Regulatory Authority	• Establish system failure criteria to protect public health, e.g., wastewater backups in building, wastewater ponding on ground surface, insufficient separation from ground water or wells. • Establish minimum maintenance requirements for approved systems. • Establish performance criteria necessary to protect public health and water resources for each defined receiving environment in the Regulatory Authority's jurisdiction.
		RME	• Operate, maintain, and repair systems to comply with performance criteria stipulated in the operating permits.
		User	• Comply with any RME requirements regarding care and use of the system.
	TRAINING AND CERTIFICATION/ LICENSING	Licensing Board/ Regulatory Authority	• Develop and administer training, testing, and certification/licensing program for site evaluators, designers, contractors, pumpers/haulers, inspectors, and operators. • Maintain a current certified/licensed Service Provider listing.
		Service Provider	• Obtain appropriate certification(s)/license(s) and continuing education as required. • Obtain training from the manufacturer or vendor regarding appropriate use, installation requirements, and operation and maintenance procedures of any proprietary equipment to be installed. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
		RME	• When using-third party services, contract with only certified/licensed Service Providers. • RME staff who site, **design**, **construct**, operate, and/or maintain systems must obtain appropriate certification(s)/license(s) to practice. • Arrange for supplemental training as needed for Service Providers and/or staff to manage, operate, and/or maintain systems.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 5: RME OWNERSHIP

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
SITE EVALUATION	Regulatory Authority	• Codify prescriptive requirements for site evaluation procedures. • Codify criteria for treatment site characteristics suitable for permitted designs that will prevent unacceptable impacts on ground and surface water resources. • Establish the defining characteristics of each receiving environment in the Regulatory Authority's jurisdiction. • Approve and oversee site evaluation procedures used by RME to ensure that system designs are appropriate for the sites and their stipulated performance criteria.
	Site Evaluator	• Obtain certification/license to practice. • Describe site and soil characteristics, determine suitability of site with respect to code requirements, and estimate site's hydraulic and treatment capacity. • Comply with applicable federal, state, tribal, and local requirements in the evaluation of sites for wastewater treatment and dispersal.
	RME	• Hire a certified/licensed site evaluator to perform site evaluation.
DESIGN	Regulatory Authority	• Codify prescriptive, pre-engineered designs that are suitable for treatment sites that meet the appropriate prescriptive site criteria. • Administer the plan review program for engineered designs to meet stipulated performance criteria. • Require routine operation and emergency contingency plans that will sustain system performance and avoid the submission of unpermitted discharges.
	Designer	• Obtain certification/license to practice. • Design treatment system that is compatible with the site and soil characteristics described by the site evaluator. • Comply with applicable federal, state, tribal, and local requirements in the design of wastewater treatment and dispersal systems.
	RME	• Hire a certified/licensed designer to prepare system design.
CONSTRUCTION	Regulatory Design	• Administer a permitting program for system construction, including Regulatory Authority review of proposed system siting and design plans. • Require designer of record to certify that completed system construction is in substantial compliance with approved plans and specifications. • Require that record drawings of constructed system be submitted to the Regulatory Authority by RME.
	Contractor/ Installer	• Obtain certification/license to practice. • Construct system in accordance with the approved plans and specifications. • Prepare record drawings of completed system and submit to RME. • Provide RME with an O&M manual describing component manufacturer's maintenance and troubleshooting requirements/recommendations. • Comply with applicable federal, state, tribal, and local requirements in the design and construction of wastewater treatment and dispersal systems.
	Designer of Record	• Approve proposed field changes and submit to RME. • Certify that construction of the system is substantially in conformance with the approved plans and specifications.
	RME	• Hire a certified/licensed designer to prepare system design. • Submit final record drawings of constructed system to Regulatory Authority. • Submit a copy of system O&M manual to the Regulatory Authority to record required maintenance.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

MANAGEMENT MODEL 5: RME OWNERSHIP

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
OPERATION & MAINTENANCE	Regulatory Authority	• Provide User with educational materials regarding system use and care. • Administer a program of renewable/revocable operating permits that are issued to RME that stipulate system performance, compliance monitoring reporting schedule, term of permit, and renewal option upon documented compliance with operating permit stipulations. • Track and review compliance monitoring reports to ensure that systems are operating in accordance with operating permits. • Consider replacing individual system operating permits with general permits issued to RME for classes of systems.
	Operator	• Inspect and service system as necessary in accordance with the submitted O&M manual and/or operating permit stipulations. • Perform system monitoring as stipulated in RME's operating permit. • Certify to RME that the required maintenance and monitoring were performed in a timely manner and noting any system deficiencies. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.
	Pumper/Hauler	• Obtain certification/license to practice. • Inspect and service system as necessary. • Comply with applicable federal, state, tribal, and local requirements in the operation and maintenance of the treatment and dispersal system.
	User	• Follow recommendations provided by Regulatory Authority, Service Providers, and/or Owner to ensure that undesirable or prohibited materials are not discharged to system. • Comply with any RME requirements regarding care and use of system.
	RME	• Operate and maintain systems in accordance with the stipulated operating permit requirements. • Submit compliance monitoring reports to the Regulatory Authority according to the schedule stipulated in the operating permit. • Hire a certified/licensed pumper/hauler or operator to maintain system.
RESIDUALS MANAGEMENT	Regulatory Authority	• Administer a tracking system for residuals hauling, treatment, and disposal and review to evaluate compliance with 40 CFR Part 503 Use and Disposal of Sewage Sludge, 40 CFR Part 257, and applicable state, tribal, and local requirements. • Inventory available residuals handling/treatment capacities and develop contingency plans when capacities available are insufficient.
	Pumper/ Hauler	• Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of wastewater treatment system residuals.
	RME	• Hire a certified/licensed pumper/hauler to remove, treat, and dispose of residuals. • Comply with applicable federal, state, tribal, and local requirements in the pumping, hauling, treatment, and disposal of treatment system residuals. • Inventory available residuals handling/treatment capacities and develop contingency plans when capacities available are insufficient.
COMPLIANCE INSPECTIONS/ MONITORING	Regulatory Authority	• Perform inspection programs at point-of-sale, change-in-use of properties, "targeted areas," and/or systems reported to be in violation. • Conduct compliance inspections of residuals hauling, treatment, and disposal. • Administer a program to monitor timely submittals of acceptable compliance maintenance reports. • Perform system inspections randomly and/or at the time of operating permit renewal.
	Inspector	• Obtain certification/license to practice. • Perform system compliance inspections for RME in accordance with prevailing Regulatory Authority requirements.
	RME	• Submit compliance monitoring reports to Regulatory Authority as stipulated in operating permit. • Submit a compliance inspection report signed/sealed by a certified/licensed inspector prior to applying for renewal of operating permit. • Conduct regular reviews of management program with Regulatory Authority to optimize system operation program. • Hire a certified/licensed inspector to inspect system compliance status.

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

PROGRAM ELEMENT	RESPONSIBLE PARTY	ACTIVITY[1]
CORRECTIVE ACTIONS	Regulatory Authority	• Negotiate compliance schedules with RME for correcting documented noncompliance items. • Administer the enforcement program including fines and/or penalties for failure to comply with compliance requirements. • Require system inspection by a certified inspector at time of operating permit renewal. • Negotiate compliance schedules with RME for correcting documented noncompliance items.
	Designer	• Provide RME with documents (drawings, specifications, modifications, etc.) that may be required by the Regulatory Authority prior to corrective action.
	Contractor/ Installer	• Perform required repairs, modifications, and upgrades as necessary.
	Inspector	• Inspect treatment system for compliance with operating permit prior to permit renewal.
	RME	• Comply with terms and conditions of the negotiated compliance schedule. • Submit required documents for corrective actions to the Regulatory Authority. • Hire appropriate certified/licensed Service Providers to perform required corrective actions.
RECORD KEEPING, INVENTORY, & REPORTING	Regulatory Authority	• Administer a database inventory (locations, site evaluations, record drawings, permits, and inspection reports) of all systems within the Regulatory Authority's jurisdiction. • Maintain a residuals treatment and disposal tracking system. • Maintain a current certified/licensed Service Provider listing, which is available to the RMEs. • Administer a tracking system for operating permits. • Administer a tracking database for compliance reports. • Administer financial, management, and technical audits of RME.
	Operator or Inspector	• Provide a certified report of all maintenance and observed system deficiencies to RME. • Provide a certified report of all observed system deficiencies to Owner. • Perform system monitoring as stipulated in RME's operating permit.
	Pumper/Hauler	• Prepare and submit records of residuals handling as required.
	RME	• Maintain system monitoring and service records. • Inventory, collect, and provide permit information to Regulatory Authority.
FINANCIAL ASSISTANCE & FUNDING	Regulatory Authority	• Provide the legal and financial support to sustain the regulatory program. • Provide a listing of financial assistance programs available to RME and the qualifying criteria for each program. • Consider implementing a state or local financing program to assist RME in upgrading systems.
	RME	• Conduct regular reviews of management program with Regulatory Authority to optimize operations.

MANAGEMENT MODEL 5: RME OWNERSHIP

[1] *Activities in bold are activities added to program elements from the preceding Management Model.*

Appendix D – 2013 NPDES Permit

DRAFT

This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

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 Uxbridge
Sewer Commission

is authorized to discharge from the facility located at

Uxbridge Wastewater Treatment Facility
80 River Road
Uxbridge, MA 01569

to receiving water named

Blackstone River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall 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 last day of the month preceding the effective date.

This permit supersedes the permit issued on September 30, 1999 and effective on October 30, 1999.

This permit consists of 18 pages in Part I including effluent limitations, monitoring requirements, and state permit conditions, **Attachment A** (Freshwater Acute Toxicity Test Procedure and Protocol, February 2011), and 25 pages in Part II, Standard Conditions.

Signed this 17th day of June, 2013

/S/ SIGNATURE ON FILE
Ken Moraff, Acting Director
Office of Ecosystem Protection
Environmental Protection Agency
Region 1
Boston, MA

David Ferris, Director
Massachusetts Wastewater Management Program
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I

A.1.During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge treated wastewater from outfall **001** to the Blackstone River. Such discharge shall be limited and monitored by the permittee as specified below.

a. *Reduced Flow Limits* – the permittee's discharge shall be limited as specified below for the period in which the facility's annual average discharge is at or below an annual average flow limit of 1.25 MGD. If and when the permittee becomes aware that increased flows or planned connections/extensions of the sewer system may result in an exceedance of the 1.25 MGD average annual flow limit, the permittee shall evaluate its flow trends and estimate a projected date at which such exceedance is expected to occur. The permittee shall notify EPA in writing a minimum of 60 days prior to the date it expects to exceed the limit, identifying the date such exceedance is expected to occur. The limits in Part I.A.1.b shall go into effect on the earlier of (i) the date identified by the permittee for exceeding 1.25 MGD annual average flow limit, or (ii) 60 days after the first month in which the 1.25 MGD annual average flow limit is exceeded.

EFFLUENT CHARACTERISTIC	***REDUCED FLOW* EFFLUENT LIMITS** **Applicable at Annual Average Flows ≤ 1.25 MGD**						**MONITORING REQUIREMENTS**	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
FLOW[2]	***	***	***	1.25 MGD	***	***	Continuous	Recorder
FLOW[2]	***	***	***	Report MGD	***	Report MGD	Continuous	Recorder
BOD_5 [3] (June 1 to October 31)	*209* lbs/day	*313* lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
BOD_5 [3] (November 1 to May 31)	*313* lbs/day	*469* lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (June 1 to October 31)	*209* lbs/day	*313* lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (November 1 to May 31)	*313* lbs/day	*469* lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
Total Residual Chlorine[5,6,7]	***	***	***	0.24 mg/l	***	0.42 mg/l	2/Day[15]	Grab
Escherichia Coli[5,8] (April 1 to October 31)	***	***	***	126 cfu/100 ml	***	409 cfu/100 ml	2/Week	Grab
Enterococci[8,9]	***	***	***	73 cfu/100 ml	***	236 cfu/100 ml	1/Week	Grab
pH RANGE[5]	6.0 - 8.3 SU See Permit Page 6, Part I.A.1.b.						1/Day	Grab
DISSOLVED OXYGEN[5] (April 1 to October 31)	***	***	***	Not less than 5.0 mg/l			1/Week	Grab

EFFLUENT CHARACTERISTIC	*REDUCED FLOW* EFFLUENT LIMITS Applicable at Annual Average Flows ≤ 1.25 MGD						MONITORING REQUIREMENTS	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
TOTAL AMMONIA, as N (June 1- October 31)	*52* lbs/day	*104* lbs/day	Report lbs/day	5 mg/l	10 mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (December 1 to April 30)	*157* lbs/day	Report lbs/day	Report lbs/day	15 mg/l	Report mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (May 1-31and November 1-30)	*104* lbs/day	*209* lbs/day	Report lbs/day	10 mg/l	20 mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL PHOSPHORUS[13] (April 1- October 31)	*4.2* lbs/day	***	***	*Report* mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL PHOSPHORUS[13] (November 1- March 31)	*10* lbs/day	***	***	1.0 mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
ORTHO PHOSPHORUS, DISSOLVED, as P[13] (November 1- March 31)	Report lbs/day	***	***	Report mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
TOTAL NITROGEN[17] (May 1- October 31) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	*Report* lbs/day Report lbs/day Report lbs/day	***	***	*Report* mg/l Report mg/l Report mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL NITROGEN[17] (November 1 – April 30) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	Report lbs/day Report lbs/day Report lbs/day	***	***	Report mg/l Report mg/l Report mg/l	***	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL ALUMINUM	1.81 lbs/day	***	***	87 ug/l	***	Report ug/l	1/Month	24-Hour Composite[4]
Whole Effluent Toxicity[10,11,12]	Acute LC50 ≥ 100%						2/Year	24-Hour Composite[4]
Hardness[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Ammonia Nitrogen as N[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]

EFFLUENT CHARACTERISTIC	*REDUCED FLOW* EFFLUENT LIMITS Applicable at Annual Average Flows ≤ 1.25 MGD						MONITORING REQUIREMENTS	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
Total Recoverable Aluminum[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Cadmium[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Copper[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Nickel[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Lead[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Zinc[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]

b. *Design Flow Limits* – the permittee's discharge shall be limited as specified below for annual average discharges that exceed 1.25 MGD. The limits in this Part shall go into effect on the earlier of (i) the date identified by the permittee that it expects to exceed the 1.25 mgd annual average flow, or (ii) 60 days after the first month in which the 1.25 MGD annual average flow is exceeded.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**						**MONITORING REQUIREMENTS**	
	Mass Limits			Concentration Limits				
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[1]**
FLOW[2]	***	***	***	2.5 MGD	***	***	Continuous	Recorder
FLOW[2]	***	***	***	Report MGD	***	Report MGD	Continuous	Recorder
BOD_5 [3] (June 1 to October 31)	417 lbs/day	626 lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
BOD_5 [3] (November 1 to May 31)	626 lbs/day	938 lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (June 1 to October 31)	417 lbs/day	626 lbs/day	Report lbs/day	20 mg/l	30 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
TSS[3] (November 1 to May 31)	626 lbs/day	938 lbs/day	Report lbs/day	30 mg/l	45 mg/l	Report mg/l	2/Week	24-Hour Composite[4]
Total Residual Chlorine[5,6,7]	***	***	***	0.24 mg/l	***	0.42 mg/l	2/Day[15]	Grab
Escherichia Coli[5,8] (April 1 to October 31)	***	***	***	126 cfu/100 ml	***	409 cfu/100 ml	2/Week	Grab
Enterococci[8,9]	***	***	***	73 cfu/100 ml	***	236 cfu/100 ml	1/Week	Grab
pH RANGE[5]	6.0 - 8.3 SU See Permit Page 6, Part I.A.1.b.						1/Day	Grab
DISSOLVED OXYGEN[5] (April 1 to October 31)	***	***	***	Not less than 5.0 mg/l			1/Week	Grab
TOTAL AMMONIA, as N (June 1- October 31)	104 lbs/day	208.5 lbs/day	Report lbs/day	5 mg/l	10 mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (December 1 to April 30)	313 lbs/day	Report lbs/day	Report lbs/day	15 mg/l	Report mg/l	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL AMMONIA, as N (May 1-31and November 1-30)	208.5 lbs/day	417 lbs/day	Report lbs/day	10 mg/l	20 mg/l	Report mg/l	1/Week	24-Hour Composite[4]

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITS						MONITORING REQUIREMENTS	
	Mass Limits			Concentration Limits				
PARAMETER	AVERAGE MONTHLY	AVERAGE WEEKLY	MAXIMUM DAILY	AVERAGE MONTHLY	AVERAGE WEEKLY	MAXIMUM DAILY	MEASUREMENT FREQUENCY	SAMPLE TYPE[1]
TOTAL PHOSPHORUS[13] (April 1- October 31)	4.2 lbs/day	***	***	0.2 mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL PHOSPHORUS[13] (November 1- March 31)	21 lbs/day	***	***	1.0 mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
ORTHO PHOSPHORUS, DISSOLVED, as P[13] (November 1- March 31)	Report lbs/day	***	***	Report mg/l	***	Report mg/l	2/Month	24-Hour Composite[4]
TOTAL NITROGEN[14] (May 1- October 31) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	167 lbs/day Report lbs/day Report lbs/day	***	***	8 mg/l Report mg/l Report mg/l	***	Report mg/l	2/Week	24-Hour Composite[4]
TOTAL NITROGEN[14] (November 1 – April 30) Total Nitrate+Nitrite as N Total Kjeldahl Nitrogen	Report lbs/day Report lbs/day Report lbs/day	***	***	Report mg/l Report mg/l Report mg/l	***	Report mg/l	1/Week	24-Hour Composite[4]
TOTAL ALUMINUM	1.81 lbs/day	***	***	87 ug/l	***	Report ug/l	1/Month	24-Hour Composite[4]
Whole Effluent Toxicity[10,11,12]	Acute LC50 ≥ 100%						2/Year	24-Hour Composite[4]
Hardness[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Ammonia Nitrogen as N[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Aluminum[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Cadmium[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Copper[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Nickel[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Lead[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]
Total Recoverable Zinc[16]	***	***	***	***	***	Report mg/l	2/Year	24-Hour Composite[4]

Footnotes:

1. All required effluent samples shall be collected at the outlet of the chlorine contact chamber and prior to discharge to the Blackstone River. A routine sampling program shall be developed in which samples are taken at the same location, the same time and the same days each month. Any deviations from the routine sampling program shall be documented in correspondence attached to the applicable discharge monitoring report that is submitted to EPA. 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.

2. The limit is an annual average limit, which shall be reported as a rolling average. The first value will be calculated using the monthly average flow for the first full month ending after the effective date of the permit and the eleven previous monthly average flows. Each subsequent month's DMR will report the annual average flow that is calculated from that month and the previous 11 months. The monthly average and maximum daily flows for each month shall also be reported.

   The permittee shall notify EPA by letter to the OEP Director, U.S. Environmental Protection Agency, 5 Post Office Square – Suite 100 (OEP06-5), Boston, MA 02109-3912 (with an additional copy to be submitted with its monthly DMR), (i) no later than sixty days before a projected exceedance of the 1.25 MGD annual average flow limit, if and when the permittee's evaluation of flow trends indicates that flows are expected to exceed 1.25 MGD; or (ii) at the time of filing of the first DMR in which the reported annual average flow exceeds 1.25 MGD.

3. Sampling is required for the influent and effluent.

4. A 24-hour composite sample will consist of at least twenty-four (24) grab samples taken during a consecutive 24 hour period (e.g. 7:00 A.M. Monday to 7:00 A.M. Tuesday), either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

5. Required for Massachusetts State Certification.

6. The minimum level (ML) for total residual chlorine (TRC) is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G, or USEPA Manual of Methods of Analysis of Water and Wastes, Method 330.5. One of these methods must be used to determine total residual chlorine. For effluent limitations less than 20 ug/l, compliance/non-compliance will be determined based on the ML. Sample results of 20 ug/l or less shall be reported in accordance with the discharge monitoring report instructions. This monitoring shall be conducted concurrently with the fecal coliform and/or E.coli sampling described below.

7. The chlorination system shall include an alarm system within one (1) year of the effective date of the permit. Any interruption or malfunction of the chlorine dosing system that may have resulted in levels of chlorine which were inadequate for achieving effective disinfection or 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(s), and the estimated amount of time that the low or high dosage levels of chlorine chemicals occurred.

8. Bacteria samples shall be collected concurrently with a TRC sample.

9. The E. coli limits are Massachusetts State certification requirements. The enterococci limits are a requirement of the U. S. EPA permit and are not a requirement of the Massachusetts Department of Environmental Protection (MassDEP) permit.

   The enterococci sample shall be collected currently with one of the E.coli samples during the April to October period. After a minimum of one year, the permitee may request a reduction of enterococci monitoring to winter only, if the monitoring data establishes that E.coli control is adequate to ensure control of enterococcus. The request shall be made in writing to EPA and shall include all concurrent monitoring data collected by the permittee. The permittee shall continue sampling for both E.coli and enterococci between April and October until receiving written approval of its request from EPA.

10. The permittee shall conduct acute toxicity tests two times per year. The permittee shall test the daphnid, Ceriodaphnia dubia, only. Toxicity test samples shall be collected during the months of April and October. The test results shall be submitted by the last day of the month following the completion of the test. The results are due May 31st and November 30th, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit.

Test Periods	**Submit Results By:**	**Test Species**	**Acute Limit LC50**
April and October	May 31st November 30th	Ceriodaphnia dubia (Daphnid)	$\geq$ 100%

11. 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**.

    Any tests using alternate dilution water must be run with a minimum of two controls: a receiving water (Blackstone River) control and a toxicity-free alternate dilution water control. Chemical data of the receiving water, including data for all metals listed in the protocol, must be included in the whole effluent toxicity (WET) report.

12. The LC50 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.

13. The maximum daily concentration and loading values for dissolved ortho phosphorus shall be derived from sampling done concurrently with the sampling for total phosphorus.

14. The total nitrogen effluent limitations and monitoring requirements are conditions of the U.S. Environmental Protection Agency (EPA) permit and are not requirements of the MassDEP permit. Sampling must be conducted and reported as specified, beginning on the effective date of the permit. The permittee shall operate the treatment facility to reduce the discharge of total nitrogen during the months of November to April to the maximum extent possible, using all available treatment equipment in place at the facility. The total nitrogen values will be calculated by adding the results of the nitrite and nitrate nitrogen and the total Kjeldahl nitrogen sampling. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit during the months of May through October is not required during the months of November through April.

15. Two samples per day Monday to Friday; one sample per day Saturday, Sunday and holidays.

16. For each whole effluent toxicity test the permittee shall report on the appropriate discharge monitoring report, (DMR), the concentrations of the hardness, ammonia nitrogen as nitrogen, total recoverable aluminum, cadmium, copper, lead, nickel, and zinc found in the 100 percent effluent sample. All these aforementioned chemical parameters shall be determined to at least the minimum quantification level shown in **Attachment A**. Also the permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

17. The permittee shall operate the treatment facility to reduce the discharge of total nitrogen to the maximum extent possible using all available treatment equipment in place at the facility. The permittee shall submit an annual report to EPA and the MassDEP by **February 1st** of 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. The total nitrogen values will be calculated by adding the results of the nitrite and nitrate nitrogen and the total Kjeldahl nitrogen sampling.

    The total nitrogen effluent limitations and monitoring requirements are conditions of the U.S. Environmental Protection Agency (EPA) permit and are not requirements of the MassDEP permit.

Part I.A.2

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 6.0 nor greater than 8.3 at any time.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall contain neither a visible oil sheen, foam, nor floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of total suspended solids, biochemical oxygen demand and carbonaceous 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 permittee shall conduct a planning process leading to the completion of a Comprehensive Wastewater Management Plan (CWMP) that shall include consideration of whether a design flow smaller than 2.5 mgd may be appropriate within the planning horizon of the plan. The resulting CWMP shall be completed no later than four (4) years from the effective date of the permit and shall be submitted with the reapplication for the next permit reissuance.

h. The results of sampling for any parameter above its required frequency must also be reported.

3. 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.

4. Prohibitions Concerning Interference and Pass Through:

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.

5. 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.

6. 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 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 (Part II) of this permit (Twenty-four hour reporting).

Notification of Sanitary Sewer Overflows (SSOs) to MassDEP shall be made on its SSO Reporting Form (which includes MassDEP Regional Office Telephone numbers). The reporting form and instructions for its completion may be found on-line at http://www.mass.gov/eea/agencies/massdep/service/approvals/sanitary-sewer-overflow-bypass-backup-notification.html.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance (O & M) 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 submitted and implemented 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 the design flow [1.9 MGD] 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.

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:

1 As defined at 40 CFR §122.2, which references the definition at 40 CFR §403.3

- General requirements
- Pollutant limitations
- Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
- Management practices
- Record keeping
- Monitoring
- Reporting

Which of the 40 C.F.R. 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 than1,500	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

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

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:

- Name and address of contractor(s) responsible for sludge preparation, use or disposal
- 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.

E. MONITORING AND REPORTING

The permittee shall submit monitoring data and all other NPDES permit required reports to EPA 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. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

1. Submittal of Reports Using NetDMR

   NetDMR is accessed from: http://www.epa.gov/netdmr. 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. A permittee submitting reports using NetDMR is no longer required to submit hard copies of DMRs or other reports to EPA and no longer 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, Toxicity Test Results and Nutrient Optimization Reports) to MassDEP until further notice from MassDEP.

2. Submittal of Reports in Hard Copy Form

   While we do not anticipate the need for the permittee to submit hard copies of reports to EPA, any hard copies that are submitted to EPA 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 address:

Massachusetts Department of Environmental Protection
Central Regional Office
Bureau of Resource Protection
627 Main Street
Worcester, Massachusetts 01608

Toxicity test reports only shall also be submitted to the State at the following address:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd 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.

F. 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. With the exception of the nitrogen and winter fecal coliform limits, 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.

USEPA REGION 1 FRESHWATER ACUTE TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **Daphnid (Ceriodaphnia dubia) definitive 48 hour test.**
- **Fathead Minnow (Pimephales promelas) definitive 48 hour test.**

Acute toxicity test data shall be reported as outlined in Section VIII.

II. METHODS

The permittee shall use 40 CFR Part 136 methods. Methods and guidance may be found at:

http://water.epa.gov/scitech/swguidance/methods/wet/index.cfm#methods

The permittee shall also meet the sampling, analysis and reporting requirements included in this protocol. This protocol defines more specific requirements while still being consistent with the Part 136 methods. If, due to modifications of Part 136, there are conflicting requirements between the Part 136 method and this protocol, the permittee shall comply with the requirements of the Part 136 method.

III. SAMPLE COLLECTION

A discharge sample shall be collected. Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for chemical and physical analyses required. The remaining sample shall be measured for total residual chlorine and dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1.0 mg/L chlorine. If dechlorination is necessary, a thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) must also be run in the WET test.

All samples held overnight shall be refrigerated at 1- 6°C.

IV. DILUTION WATER

A grab sample of dilution water used for acute toxicity testing shall be collected from the receiving water at a point immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. In the case where an alternate dilution water has been agreed upon an additional receiving water control (0% effluent) must also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids similar to that of the receiving water may be substituted **AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S)**. Written requests for use of an alternate dilution water should be mailed with supporting documentation to the following address:

Director
Office of Ecosystem Protection (CAA)
U.S. Environmental Protection Agency-New England
5 Post Office Sq., Suite 100 (OEP06-5)
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
5 Post Office Sq., Suite 100 (OES04-4)
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcementandassistance/dmr.html for further important details on alternate dilution water substitution requests.

It may prove beneficial to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable performance as outlined in the 'test acceptability' section of the protocol.

V. TEST CONDITIONS

The following tables summarize the accepted daphnid and fathead minnow toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNID, CERIODAPHNIA DUBIA 48 HOUR ACUTE TESTS[1]

1.	Test type	Static, non-renewal
2.	Temperature (^oC)	20 ± 1° C or 25 ± 1^oC
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hour light, 8 hour dark
5.	Test chamber size	Minimum 30 ml
6.	Test solution volume	Minimum 15 ml
7.	Age of test organisms	1-24 hours (neonates)
8.	No. of daphnids per test chamber	5
9.	No. of replicate test chambers per treatment	4
10.	Total no. daphnids per test concentration	20
11.	Feeding regime	As per manual, lightly feed YCT and Selenastrum to newly released organisms while holding prior to initiating test
12.	Aeration	None
13.	Dilution water[2]	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q^R or equivalent deionized water and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	$\geq$ 0.5, must bracket the permitted RWC

15.	Number of dilutions[3]	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Effect measured	Mortality-no movement of body or appendages on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in dilution water control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must first be used within 36 hours of collection.
19.	Sample volume required	Minimum 1 liter

Footnotes:

1. Adapted from EPA-821-R-02-012.
2. Standard prepared dilution water must have hardness requirements to generally reflect the characteristics of the receiving water.

EPA NEW ENGLAND TEST CONDITIONS FOR THE FATHEAD MINNOW (PIMEPHALES PROMELAS) 48 HOUR ACUTE TEST[1]

1.	Test Type	Static, non-renewal
2.	Temperature (^{o}C):	20 $\pm$ 1 ^{o} C or 25 $\pm$ 1°C
3.	Light quality:	Ambient laboratory illumination
4.	Photoperiod:	16 hr light, 8 hr dark
5.	Size of test vessels:	250 mL minimum
6.	Volume of test solution:	Minimum 200 mL/replicate
7.	Age of fish:	1-14 days old and age within 24 hrs of each ~~the~~ other~~s~~
8.	No. of fish per chamber	10
9.	No. of replicate test vessels per treatment	4
10.	Total no. organisms per concentration:	40
11.	Feeding regime:	As per manual, lightly feed test age larvae using concentrated brine shrimp nauplii while holding prior to initiating test
12.	Aeration:	None, unless dissolved oxygen (D.O.) concentration falls below 4.0 mg/L, at which time gentle single bubble aeration should be started at a rate of less than 100 bubbles/min. (Routine D.O. check is recommended.)
13.	dilution water:[2]	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q^{R} or equivalent deionized and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	$\geq$ 0.5, must bracket the permitted RWC

15.	Number of dilutions[3]	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Effect measured	Mortality-no movement on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in dilution water control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples are used within 36 hours of collection.
19.	Sample volume required	Minimum 2 liters

Footnotes:

1. Adapted from EPA-821-R-02-012
2. Standard dilution water must have hardness requirements to generally reflect characteristics of the receiving water.

VI. CHEMICAL ANALYSIS

At the beginning of a static acute toxicity test, pH, conductivity, total residual chlorine, oxygen, hardness, alkalinity and temperature must be measured in the highest effluent concentration and the dilution water. Dissolved oxygen, pH and temperature are also measured at 24 and 48 hour

intervals in all dilutions. The following chemical analyses shall be performed on the 100 percent effluent sample and the upstream water sample for each sampling event.

Parameter	Effluent	Receiving Water	ML (mg/l)
Hardness[1,]	x	x	0.5
Total Residual Chlorine (TRC)[2, 3,]	x		0.02
Alkalinity	x	x	2.0
pH[4]	x	x	--
Specific Conductance	x	x	--
Total Solids	x		--
Total Dissolved Solids	x		--
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005
Al	x	x	0.02
Other as permit requires			

Notes:

1. Hardness may be determined by:
   - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
     -Method 2340B (hardness by calculation)
     -Method 2340C (titration)

2. Total Residual Chlorine may be performed using any of the following methods provided the required minimum limit (ML) is met.
   - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
     -Method 4500-CL E Low Level Amperometric Titration
     -Method 4500-CL G DPD Colorimetric Method

3. Required to be performed on the sample used for WET testing prior to its use for toxicity testing

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration (Determined at 48 Hours)

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See the flow chart in Figure 6 on p. 73 of EPA-821-R-02-012 for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See the flow chart in Figure 13 on p. 87 of EPA-821-R-02-012 .

VIII. TOXICITY TEST REPORTING

A report of the results will include the following:

- Description of sample collection procedures, site description
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicant test data should be included.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)
- Raw data and bench sheets.
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.

NPDES PART II STANDARD CONDITIONS
(January, 2007)

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PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

   The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

   a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

   b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

   c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

   Note: See 40 CFR §122.41(a)(2) for complete “Duty to Comply” regulations.

2. Permit Actions

   This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or notifications of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

   The permittee shall furnish to the Regional Administrator, within a reasonable time, any information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

4. Reopener Clause

The Regional Administrator reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA in order to bring all discharges into compliance with the CWA.

For any permit issued to a treatment works treating domestic sewage (including "sludge-only facilities"), the Regional Administrator or Director shall include a reopener clause to incorporate any applicable standard for sewage sludge use or disposal promulgated under Section 405 (d) of the CWA. The Regional Administrator or Director may promptly modify or revoke and reissue any permit containing the reopener clause required by this paragraph if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or contains a pollutant or practice not limited in the permit.

Federal regulations pertaining to permit modification, revocation and reissuance, and termination are found at 40 CFR §122.62, 122.63, 122.64, and 124.5.

5. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the CWA, or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

6. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges.

7. Confidentiality of Information

a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

b. Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;
(2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).

c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

8. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Regional Administrator. (The Regional Administrator shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

9. State Authorities

Nothing in Part 122, 123, or 124 precludes more stringent State regulation of any activity covered by these regulations, whether or not under an approved State program.

10. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, or local laws and regulations.

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. Bypass

a. Definitions

(1) *Bypass* means the intentional diversion of waste streams from any portion of a 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 be reasonably expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(2) 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 preventative maintenance; and
(3) i) The permittee submitted notices as required under Paragraph 4.c. of this section.
ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

5. <u>Upset</u>

a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during

administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee 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 that the permittee can identify the cause(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
(4) The permittee complied with any remedial measures required under B.3. above.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.

c. Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and
(6) The results of such analyses.

d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by

imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. Planned Changes. The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

(1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
(2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
(3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and

incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

(2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

(3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Twenty-four hour reporting.

(1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance 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 noncompliance.

(2) The following shall be included as information which must be reported within 24 hours under this paragraph.

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
(b) Any upset which exceeds any effluent limitation in the permit.
(c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

(3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.

h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)

b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Applicable standards and limitations means all, State, interstate, and Federal standards and limitations to which a “discharge”, a “sewage sludge use or disposal practice”, or a related activity is subject to, including “effluent limitations”, water quality standards, standards of performance, toxic effluent standards or prohibitions, “best management practices”, pretreatment standards, and “standards for sewage sludge use and disposal” under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the CWA.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in "approved States", including any approved modifications or revisions.

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

Average monthly discharge limitation means 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.

Average weekly discharge limitation means the highest allowable average of "daily discharges" measured during the calendar week divided by the number of "daily discharges" measured during the week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Best Professional Judgment (BPJ) means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

Coal Pile Runoff means the rainfall runoff from or through any coal storage pile.

Composite Sample means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

Construction Activities - The following definitions apply to construction activities:

(a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

(b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.

(c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

(d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

(e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

Contiguous zone means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

Continuous discharge means a "discharge" which occurs without interruption throughout the operating hours of the facility except for infrequent shutdowns for maintenance, process changes, or similar activities.

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Director normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

Discharge Monitoring Report Form (DMR) means the EPA standard national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by "approved States" as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

Discharge of a pollutant means:

(a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source", or

(b) Any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation (See "Point Source" definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead

to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any "indirect discharger."

Effluent limitation means any restriction imposed by the Regional Administrator on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States", the waters of the "contiguous zone", or the ocean.

Effluent limitation guidelines means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise "effluent limitations".

EPA means the United States "Environmental Protection Agency".

Flow-weighted composite sample means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab Sample – An individual sample collected in a period of less than 15 minutes.

Hazardous Substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

Indirect Discharger means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

(b) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

Large and Medium municipal separate storm sewer system means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized

populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

Maximum daily discharge limitation means the highest allowable "daily discharge" concentration that occurs only during a normal day (24-hour duration).

Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO) is defined as "maximum concentration" or "Instantaneous Maximum Concentration" during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean "a value that shall not be exceeded" during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of "Maximum Daily Discharge" and "Average Daily Discharge" concentrations are specifically limited to the daily (24-hour duration) values.

Municipality means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribe organization, or a designated and approved management agency under Section 208 of the CWA.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the CWA. The term includes an "approved program".

New Discharger means any building, structure, facility, or installation:

(a) From which there is or may be a "discharge of pollutants";

(b) That did not commence the "discharge of pollutants" at a particular "site" prior to August 13, 1979;

(c) Which is not a "new source"; and

(d) Which has never received a finally effective NPDES permit for discharges at that "site".

This definition includes an "indirect discharger" which commences discharging into "waters of the United States" after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore rig or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors specified in 40 CFR §§125.122 (a) (1) through (10).

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New source means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants", the construction of which commenced:

(a) After promulgation of standards of performance under Section 306 of CWA which are applicable to such source, or

(b) After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal.

NPDES means "National Pollutant Discharge Elimination System".

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES programs.

Pass through means 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 POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved" State.

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point Source means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by the authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

Privately owned treatment works means any device or system which is (a) used to treat wastes from any facility whose operation is not the operator of the treatment works or (b) not a "POTW".

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly Owned Treatment Works (POTW) means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Regional Administrator means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

Secondary Industry Category means any industry which is not a "primary industry category".

Section 313 water priority chemical means a chemical or chemical category which:

(1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);

(2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and

(3) satisfies at least one of the following criteria:

(i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
(ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
(iii) are pollutants for which EPA has published acute or chronic water quality criteria.

Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Significant materials includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

Sludge-only facility means any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

Time-weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

Toxic pollutants means any pollutant listed as toxic under Section 307 (a)(1) or, in the case of "sludge use or disposal practices" any pollutant identified in regulations implementing Section 405(d) of the CWA.

Treatment works treating domestic sewage means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a "treatment works treating domestic sewage", where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

Waste Pile means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Waters of the United States means:

(a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;

(b) All interstate waters, including interstate "wetlands";

(c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands", sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purpose;

(2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(3) Which are used or could be used for industrial purposes by industries in interstate commerce;

(d) All impoundments of waters otherwise defined as waters of the United States under this definition;

(e) Tributaries of waters identified in Paragraphs (a) through (d) of this definition;

(f) The territorial sea; and

(g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in Paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

Active sewage sludge unit is a sewage sludge unit that has not closed.

Aerobic Digestion is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

Agricultural Land is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate is the whole sludge application rate (dry weight basis) designed:

(1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

Anaerobic digestion is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

Annual pollutant loading rate is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Annual whole sludge application rate is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

Aquifer is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

Base flood is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

Contaminate an aquifer means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2,

classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

Cover is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

Cumulative pollutant loading rate is the maximum amount of inorganic pollutant that can be applied to an area of land.

Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

Displacement is the relative movement of any two sides of a fault measured in any direction.

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

Fault is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

Feed crops are crops produced primarily for consumption by animals.

Fiber crops are crops such as flax and cotton.

Final cover is the last layer of soil or other material placed on a sewage sludge unit at closure.

Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

Forest is a tract of land thick with trees and underbrush.

Ground water is water below the land surface in the saturated zone.

Holocene time is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

Hourly average is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

Incineration is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

Industrial wastewater is wastewater generated in a commercial or industrial process.

Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

Land with a high potential for public exposure is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

Land with low potential for public exposure is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

Leachate collection system is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

Liner is soil or synthetic material that has a hydraulic conductivity of 1×10^{-7} centimeters per second or less.

Lower explosive limit for methane gas is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

Monthly average (Incineration) is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

Monthly average (Land Application) is the arithmetic mean of all measurements taken during the month.

Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

Permitting authority is either EPA or a State with an EPA-approved sludge management program.

Person is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

Person who prepares sewage sludge is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

pH means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

Pollutant (as defined in sludge disposal requirements) is an organic substance, an inorganic substance, a combination or organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

Pollutant limit (for sludge disposal requirements) is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

Public contact site is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

Qualified ground water scientist is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

Range land is open land with indigenous vegetation.

Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

Runoff is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

Seismic impact zone is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

Sewage sludge is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to:, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

Sewage sludge unit is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

Sewage sludge unit boundary is the outermost perimeter of an active sewage sludge unit.

Specific oxygen uptake rate (SOUR) is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

Surface disposal site is an area of land that contains one or more active sewage sludge units.

Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

Treat or treatment of sewage sludge is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Unstable area is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl_2	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M^3/day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH_3-N	Ammonia nitrogen as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NO_3-NO_2	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	"Whole effluent toxicity" is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	"Chronic (Long-term Exposure Test) – No Observed Effect Concentration". The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	"Acute (Short-term Exposure Test) – No Observed Effect Concentration" (see C-NOEC definition).
LC_{50}	LC_{50} is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC_{50} = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

NPDES PERMIT NUMBER: **MA0102440**

PUBLIC NOTICE START AND END DATES: September 21, 2012 thru November 19, 2012

NAME AND MAILING ADDRESS OF APPLICANT:

Town of Uxbridge
Sewer Commission
River Road
Uxbridge, MA 01569

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Uxbridge Wastewater Treatment Facility
80 River Road
Uxbridge, MA 01569

RECEIVING WATER: **Blackstone River (MA51-05)**
USGS Hydrologic Code #01090003 – Blackstone River Watershed (51)

RECEIVING WATER CLASSIFICATION(S): **Class B – warm water fishery**

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I. Proposed Action, Type of Facility, and Discharge Location.

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 water. The facility is engaged in the collection and treatment of domestic wastewater and septage. The discharge from this secondary wastewater treatment facility is via Outfall 001 to the Blackstone River.

II. Description of Treatment System and Discharges

A quantitative description of the wastewater treatment plant discharge in terms of significant effluent parameters based on recent monitoring data is shown on **Table 1**. **Figure 1** shows the geographical location, and **Figure 2** shows the flow process diagram of the Uxbridge Wastewater Treatment Facility (WWTF).

The Uxbridge WWTF is a 2.5 million gallon per day (MGD) secondary wastewater treatment facility which serves a population of about 6618, according to the Town's permit application dated April 26, 2004. There is currently one industrial user contributing a small amount of non-contact cooling water to the WWTF. The collection system consists of separate sanitary sewers and there are no known combined sewers or combined sewer overflows. The facility accepts several thousand gallons per day of septage from within Uxbridge and may accept septage from other communities.

The WWTF's treatment process is shown in Figure 2. Influent wastewater flow is pumped to a headworks building where a mechanical bar rack and a shredder remove coarse sewage solids and other materials from the wastewater; heavier suspended solids are then removed in primary sedimentation tanks. Following primary sedimentation, sodium aluminate is added to the wastewater in a rapid mix tank to enhance phosphorus removal. The wastewater then enters aeration tanks, where it is mixed with sludge returned from the secondary sedimentation tanks, and undergoes biological treatment. Following aeration, the flow is discharged to secondary settling tanks where biological flocculant and fine solids are removed. The flow is then discharged to an effluent channel, where flow is measured with an ultrasonic Parshall flume, and then to a chlorine contact chamber, where the effluent is seasonally disinfected with liquid sodium hypochlorite, added in proportion to flow. The effluent is then discharged to the Blackstone River through a diffuser on the river bottom. The sludge handling facilities are described in Section VIII.

III. Receiving Water Description

The Uxbridge WWTF discharges to the Blackstone River in southeastern Uxbridge, MA. The Blackstone River is an interstate water which has its headwaters in Worcester. It flows south through Millbury, Sutton, Grafton, Northbridge, Uxbridge, Millville and Blackstone to the state line with Rhode Island, approximately five miles downstream of the Uxbridge discharge. The river then flows through Rhode Island to Pawtucket, where the Slater Mill Dam marks the boundary with the marine waters of the Seekonk River, the uppermost segment of Narragansett Bay. The Seekonk River joins the Providence River, which then flows into the main body of

Narragansett Bay. The Seekonk and Providence Rivers are estuaries and are classified as marine waters. The Blackstone River has a number of dams and related impoundments along its length. The closest downstream is the Tupperware Dam and associated "Millville Pond" impoundment at Blackstone, MA, approximately 3 miles downstream of the Uxbridge discharge.

Massachusetts Surface Water Quality Standards ("MA SWQS") list the Blackstone River, from its source to the Rhode Island border, as a Class B Warm Water Fishery. Its uses include habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary (e.g., swimming) and secondary (e.g., fishing and boating) contact recreation. *See* 314 CMR 4. 05(3)(b) and 4.06 (Table 11). Such waters must have consistently good aesthetic value.

Rhode Island has classified the Blackstone River as a Class B1 water from the Massachusetts border to the Central Falls CSO outfall, and as a Class B1{a} water from the CSO outfall to the Seekonk River. The Seekonk River is designated as a Class SB1 water from the Blackstone to the confluence with the Providence River. The Providence River has been designated as a Class SB1{a} water from its confluences with the Seekonk and two other tributaries until a boundary extending between Warwick and East Providence, and a Class SB{a}water from that point until it reaches the Upper Narragansett Bay segment. Rhode Island Water Quality Regulations, July 2006, amended December 2009 ("RI WQR"), Appendix A.

Rhode Island Class B1 waters' designated uses include primary and secondary recreational uses and fish and wildlife habitat, except that primary contact recreational uses may be impacted by pathogens from approved wastewater discharges. RI WQR at Rule 8.B(1)(d). Rhode Island Class SB waters' designated uses include primary and secondary contact recreation; fish and wildlife habitat; shellfish harvesting; and must have good aesthetic value. Id. at Rule 8(B)(2)(b). Class SB1 waters share the same designated uses as Class SB, with the exception of shellfish harvesting. Id. at Rule 8(B)(2)(c). The {a} designation indicates partial use due to impacts from CSOs. RI WQR, Appendix A.

The Blackstone River is listed on the *Massachusetts Year 2010 Integrated List of Waters* (the "MA 303(d) list") as a water that is impaired (not meeting water quality standards) and requiring one or more Total Maximum Daily Loads (TMDLs). The segment of the Blackstone River that the Uxbridge WWTF discharges to, Segment MA51-05, is listed for impairments caused by unknown toxicity, priority organics, metals, nutrients, pH, flow alteration, pathogens, taste/odor/color, suspended solids and turbidity. The Blackstone River in Rhode Island is listed on Rhode Island's *2010 303(d) List of Impaired Waters* for impairments caused by cadmium, lead, total phosphorus, dissolved oxygen, fecal coliform, enterococcus, mercury and PCB in fish tissue, and benthic macroinvertebrate bioassessments (as well as non-native plant impairments not caused by pollutants). The Seekonk and Providence Rivers are listed for impairments caused by total nitrogen, low dissolved oxygen, and fecal coliform.

No TMDLs have been completed for these pollutants in either Massachusetts or Rhode Island. However extensive work has been completed to document and analyze these impairments, as set forth in the discussion of effluent limits derivation below.

IV. Limitations and Conditions

The effluent limitations and all other requirements described in Part VI of this Fact Sheet may be found in the draft permit.

V. Permit Basis: Statutory and Regulatory Authority

Congress enacted the Clean Water Act (CWA) "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." CWA § 101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into the waters of the United States from any point source, except as authorized by specified permitting sections of the CWA, one of which is Section 402. *See* CWA §§ 301(a), 402(a).

Section 402(a) established one of the CWA's principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the CWA, EPA may "issue a permit for the discharge of any pollutant, or combination of pollutants" in accordance with certain conditions. *See* CWA § 402(a). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. *See* CWA § 402(a)(1)-(2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: "technology-based" limitations and "water quality-based" limitations. *See* §§ 301, 304(b); 40 CFR §§ 122, 125, 131. Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 402 and 301(b) of the Clean Water Act. For publicly owned treatment works (POTWs), technology based requirements are effluent limits based on secondary treatment as defined in 40 CFR 133.102.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where necessary to maintain or achieve federal or state water quality standards. Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts Surface Water Quality Standards (MA SWQS), 314 CMR 4.00, establish 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 a site specific criteria is established. Massachusetts regulations similarly require that its permits contain limitations which are adequate to assure the attainment and maintenance of the water quality standards of the receiving waters as assigned in the MA SWQS, 314 CMR 4.00. *See* 314 CMR 3.11(3). EPA is required to obtain certification from the state in which the discharge is located that all water quality standards or other applicable requirements of state law, in accordance with Section 301(b)(1)(C) of the CWA, are satisfied, unless the state waives certification.

Section 401(a)(2) of the CWA and 40 CFR § 122.44(d)(4) require EPA to condition NPDES permits in a manner that will ensure compliance with the applicable water quality standards of a "downstream affected state," in this case Rhode Island. The RI WQR also establish designated uses of the State's waters, criteria to protect those uses, and an antidegradation provision to ensure that existing uses and high quality waters are protected and maintained.

In addition, a permit may not be renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirements of CWA § 303(d)(4) and 40 CFR §122.44(l). States are also required to develop antidegradation policies pursuant to 40 CFR § 131.12. No lowering of water quality is allowed, except in accordance with the antidegradation policy.

VI. Explanation of Permit's Effluent Limitations

A. Basis of current permit limits

The current permit was issued on September 30, 1999, and incorporated limits based on a waste load allocation (WLA) set forth in *Blackstone River Watershed Dissolved Oxygen Waste Load Allocation for Massachusetts and Rhode Island* (November 1997). This WLA was based on a dissolved oxygen (DO) mathematical model developed by the University of Rhode Island and funded by the EPA, the MassDEP and the Rhode Island Department of Environmental Management (RIDEM) which was calibrated and verified using water quality survey data collected in 1991. The water quality data and modeling report can be found in the *Blackstone River Initiative Report* (February 1998). Modeling results formed the basis for water quality based seasonal limits on biochemical oxygen demand (BOD_5), carbonaceous oxygen demand (CBOD), total suspended solids (TSS), phosphorus and ammonia nitrogen that were found necessary to achieve the minimum dissolved oxygen criterion of 5.0 mg/l for the Blackstone River.

The draft permit maintains the existing concentration-based limits on BOD_5, TSS and ammonia nitrogen while also expressing those limits as mass load limits. The CBOD limits in the current permit have been expressed as BOD limits in the draft permit at the permittee's request, in order to conserve laboratory resources due to the greater complexity of the CBOD laboratory methods. BOD is a more conservative measure than CBOD (CBOD should always be less than BOD), and BOD is equally consistent with the approved WLA. The draft permit also sets more stringent limits on total phosphorus and additional limits for total nitrogen, metals and bacteria. These are discussed in greater detail in the pollutant-specific sections that follow.

B. Effluent Limits Derivation

The effluent limits in the draft permit are established to ensure compliance with technology-based requirements, the MA SWQS, the approved WLA for dissolved oxygen, and RI WQR. In most cases the applicable water quality criteria for Massachusetts are similar to, and in some cases more stringent than, the applicable water quality criteria for Rhode Island, so that the effluent limits designed to meet the MA SWQS also ensure compliance with the RI WQR. This is not the case for the limits on total nitrogen and on bacteria in the winter months, and those limits are established solely to ensure compliance with the RI WQR.

1. Flow

The draft permit contains an annual average flow limit of 2.5 MGD, which is the long term average design flow of the facility. The flow limit in the current permit is expressed as a monthly average flow of 2.5 MGD. This change from a monthly average to an annual average is the result of MassDEP adopting a policy establishing flow limits in POTW permits as an annual average in order to account for seasonal flow variations, particularly those associated with high flow and high groundwater which commonly occur in the spring time. *See* MassDEP-DWM, *NPDES Permit Program Policies Related to Flow and Nutrients in NPDES Permits* (2000). Uxbridge's actual flow is routinely well below its design flow, averaging 0.91 MGD in 2009-2010. See Table 1.

2. Conventional Pollutants

a. BOD and TSS

The concentration-based effluent limits for these pollutants remain the same as in the current permit with the exception of the change from CBOD to BOD. For the period of November through May, effluent limitations for monthly and weekly average BOD_5 and TSS are based on secondary treatment requirements. CWA § 301(b)(1)(B); 40 CFR § 133.102. The BOD and TSS draft permit limits for the period from June to October (20 mg/l average monthly and 30 mg/l average weekly) are water-quality based limits based on the WLA. These water quality based effluent limits are more stringent than the technology-based limits for BOD and TSS of 30 mg/l average monthly and 45 mg/l average weekly. There were no CBOD, BOD or TSS violations between 2005 and December 2010.

Mass loading effluent limits for average monthly and average weekly BOD_5, BOD and TSS are found by multiplying the allowable effluent concentration in mg/l by the design flow in MGD and converting to units of pounds per day. The calculations are shown in Attachment A. The monitoring frequency is reduced from three to two times per week based on the facility's history of compliance; long term average concentrations of these pollutants are on the order of 2 mg/l, well below the permit average monthly limits of 20 and 30 mg/l.

b. Ammonia and DO

The draft permit limits for ammonia nitrogen and dissolved oxygen are the same as in the current permit. The permit limits for ammonia nitrogen (expressed in mg/l of nitrogen) were established in order to control both in-stream oxygen demand and the degree of toxicity associated with the discharge. The May limits (10 mg/l and 20 mg/l) and the June through October limits (5 mg/l and 10 mg/l) were based on the 1997 WLA for achieving minimum DO criteria. The November limits (10 mg/l and 20 mg/l) and the December thru April limits (15 mg/l) were based on a December 1999 ammonia criteria document for preventing toxic impacts associated with in-stream ammonia concentrations. *See* EPA, *1999 Update of Ambient Water Quality Criteria for Ammonia,* 822-R-99-014 (1999). There were no violations of the ammonia nitrogen limits from 2005 to 2010.

The minimum DO requirement of 5.0 mg/l has been continued in the draft permit with weekly monitoring, consistent with the State WQS for Class B waters. There were 12 violations of the minimum DO requirement from 2005 to 2010.

c. Bacteria

Limitations for bacteria are based upon state water quality standards and differ from those in the current permit in two respects. First, during the seasonal period of April to October, this permit transitions from fecal coliform to Escherichia coli (*E. coli*) as the bacterial indicator. Second, while the expired permit has seasonal bacteria limits, this permit includes year round limits to satisfy the RI WQR, which are in terms of enterococci.

There were no violations of the existing fecal coliform limits from 2005 to 2010.

E. coli limits

The draft permit includes seasonal (April 1st – October 31st) *E. coli* limitations which are based upon the *E. coli* criteria in the revisions to the MA SWQS, 314 CMR § 4.05(3)(b), approved by EPA in 2007. The monthly average limitation in the draft permit is 126 colony forming units (cfu) per 100 ml, and shall be expressed as a monthly geometric mean. The daily maximum limitation in the draft permit is 409 cfu/100 ml. These limitations are a State certification requirement and are consistent with EPA guidance recommending that no dilution be considered in establishing permit limits for discharges to rivers designated for primary contact recreation. EPA, *Memorandum re: Initial Zones of Dilution for Bacteria in Rivers and Streams Designated for Primary Contact Recreation*,(2008).

The monitoring frequency is maintained at two times per week. In addition, all bacterial samples shall be collected concurrently with one of the daily total residual chlorine (TRC) samples.

Enterococci bacteria limits

Rhode Island's water quality standard for bacteria in Class B waters is a year round criterion for enterococci bacteria. Enterococci concentrations are not to exceed a geometric mean value of 54 colonies/100 ml, with a single sample maximum of 61 colonies/100 ml. For permitting purposes RIDEM uses the geometric mean criterion to establish monthly average permit limit, and the 90% upper confidence level value for "lightly used full body contact recreation" of 175 colonies/100ml to set daily maximum permit limits. RIDEM, *Burrillville Wastewater Treatment Facility Permit Development Document* (January 2012).

To confirm whether water quality standards are in fact violated at the state line, EPA reviewed water quality data collected by USGS at a monitoring station in Millville, MA, upstream of the Tupperware Dam (close to the Rhode Island border) between 2007 and 2009. Monitoring data from the winter months show a median enterococci count of 104 cfu/100 ml, with seven of eleven counts above the single sample maximum (high of 1,160) cfu/100 ml, violating Rhode Islands WQR. Monitoring data from between April and October show a median of 42 cfu/100 ml, with six of fifteen data points above the single sample maximum (high of 1,167 cfu/100 ml), violating the single sample maximum standard. RIDEM, data transmittal (July 9, 2012). While

Uxbridge has not been monitoring bacteria levels in the winter months, the only significant source of bacteria in the river during dry weather is the upstream POTWs. Therefore, EPA has determined that the discharge from the Massachusetts POTWs, including Uxbridge, have a reasonable potential to cause or contribute to violations of Rhode Island's WQR, and that bacteria limitations designed to meet the RI WQR are necessary for these NPDES permits.

To establish the appropriate bacteria limit to meet the RI standard at the state line, EPA has estimated the amount of bacteria die-off that is expected to occur between Uxbridge and the state line. Die-off was estimated using a first order die-off equation as shown below and derived from Crane, S.R., and Moore, J.A., "Modeling enteric bacterial die-off: a review", *Water, Air and Soil Pollution*, 27, 411-39 (1986); and Illinois state water quality standards, Title 35, Subtitle C: Water Pollution; Part 378 (Effluent Disinfection Exemptions.).

$$N(t) = \{N(o)\}e^{-kt}$$

Where:

N(t) = Predicted concentration of bacteria at travel time t, downstream, in #/100 ml
N(o) = Bacteria concentration in the effluent of the source, in #/100 ml
k = The first order die-off rate constant, in 1/day
t = travel time to the point of interest below the source, in days

Although the value of N(o) would typically be the source, or effluent concentration of bacteria, by setting this value to 1 the value that is solved for, N(t), will be a fraction of the bacteria discharged at the source. This allows estimation of the percentage of the effluent concentration that is present at the downstream point (the State line). EPA assumed a river velocity of 1.0 feet per second, which was also used in the Northbridge permit. This value was within the range that was estimated for river flows consistent with this time of year by a USGS modeling effort. A travel distance of 5 miles, or 26400 feet was used, as estimated from the *Blackstone River Initiative Report* at 5-3 and 5-4. This distance is the difference between the river mile readings at Reach 14 of the Blackstone River in Uxbridge (23.2 miles) and that of Reach 16 which crosses over into Rhode Island (18.2). Using these values results in an estimated travel time of 0.31 days. EPA selected a decay rate (k) of 1.0/day from the literature. Mancini, J.L., "Numerical estimates of coliform mortality rates under various conditions", *Journal of Water Pollution Control Federation*, 50, (1978), pp 2477 – 2484. This results in a percentage of the bacteria count at the state line, or N(t), of 74% (0.74). In other words, 74% of the bacteria that is discharged at the Uxbridge WWTF would be present at the state line.

Using the die-off estimate of 26%, EPA has set the enterococci limits for the period of November 1 to March 31 at a monthly geometric mean of 73 colonies/100 ml and a daily maximum of 175 colonies/100 ml, as calculated below. The proposed limits are consistent with Rhode Island's WQR.

$$\frac{\text{Bacteria target at State line}}{\text{percent of discharge bacteria present at state line}} = \text{maximum discharged at WWTF}$$

Monthly average: (Geometric mean)	Daily maximum:
$\frac{54}{0.74}$ = **73 colonies/100 ml**	$\frac{175}{0.74}$ = **236 colonies/100 ml**

The draft permit limit does not take into account dilution consistent with EPA policy (*see EPA Memorandum, supra*), and because of the multitude of other sources of bacteria in the river that effectively eliminate the dilution benefit of the instream flow. Blackstone River data indicate that bacteria concentrations in the river exceed the Rhode Island criteria at various times of the year and under a variety of different flow conditions. *See, e.g.*, Louis Berger Group, Inc., *Water Quality – Blackstone River, Final Report 2: Field Investigations* (2008). Consequently, allowing for dilution would not ensure that the discharge does not cause or contribute to a violation of the RI WQR at the state line.

The monitoring frequency is established at one time per week. Enterococci samples shall be collected concurrently with the E. coli sample. This is a year-round limit, consistent with Rhode Island's year-round water quality standard. However, should monitoring data from the April to October period indicate that control of *E.coli* is sufficient to ensure adequate control of enterococci, the permittee may request that enterococci monitoring be reduced to winter only. Any such request must be based on a minimum of one year of concurrent monitoring and include a side by side comparison of all concurrent bacteria monitoring data.

d. pH

Limitations for pH are based upon State Certification requirements for POTWs under Section 401(d) of the CWA, 40 CFR 124.53 and 124.55, and water quality standards. Although the lower end of the pH range in the MA SQWS is 6.5 s.u., the permit limit was established at 6.0 s.u. in the 1999 permit. The permittee's historic pH data show levels in the 6.0 to 6.5 range, although there has been only one reported pH value below 6.5 since 2005. The low pH values were likely caused by the plant's nitrification efforts. Although it was not stated in the fact sheet accompanying the 1999 permit, it is assumed that the 6.0 s.u. at the effluent was determined not to have a reasonable potential to violate the instream standard of a minimum of 6.5 s.u., since there is considerable mixing available to the effluent. In addition, adding chemical to raise the pH to 6.5 in the absence of a reasonable potential to cause an exceedance of instream water quality standards would not be environmentally justified. The permit limit is also consistent with the technology based requirements of 40 CFR § 133.102. Therefore, the pH range will remain at 6.0 to 8.3 s.u.

3. Nutrients

Nutrients, such as phosphorus and nitrogen, are necessary for the growth of aquatic plants and animals to support a healthy ecosystem. In excess, however, nutrients can contribute to fish disease, brown tide, algae blooms and low DO. Excessive nutrients, generally phosphorus in freshwater and nitrogen in salt water, stimulate the growth of algae, which can start a chain of

events detrimental to the health of an aquatic ecosystem. Algae inhibit sunlight from penetrating through the water column. Once deprived of sunlight, underwater plants cannot survive and are lost. Animals that depend on these plants for food and shelter leave the area or die. Large biomass of algae causes extreme diurnal swings in DO levels. In addition, as the algae decay, they further depress the DO levels in the water. Fish and shellfish are in turn deprived of oxygen, and fish kills can occur. Excessive algae may also cause foul smells and decreased aesthetic value, which could affect swimming and recreational uses.

a. Phosphorus

The draft permit contains a monthly average phosphorus limit of 0.2 mg/l from April to October to control this discharge's contribution to eutrophication in the Blackstone River. The current permit limit of 1.0 mg/l established through the WLA to meet minimum dissolved oxygen criteria in the Blackstone River is not sufficient to control cultural eutrophication.

i. Evidence of eutrophication and reasonable potential

The MA SWQS at 314 CMR 4.00 do not contain numerical criteria for total phosphorus. They include a narrative criterion for nutrients at 314 CMR 4.05(5)(c), which provides that "all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses." They also include a requirement that "[a]ny 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" Id. MassDEP has interpreted the "highest and best practicable treatment" requirement in its standards as requiring an effluent limit of 0.2 mg/l (200 ug/l) for phosphorus.

Numerous reports and studies have documented the existence of cultural eutrophication in the Blackstone River reaches downstream of the Uxbridge discharge and have identified wastewater treatment plant discharges of phosphorus as the major cause. The *Blackstone River 1998 Water Quality Assessment Report* found the river segment where the Uxbridge WWTF discharge is located (MA51-05) to be non-supportive of aquatic life uses based on elevated nutrient levels and an impaired benthic macroinvertebrate community. Similar impairment to the benthic community was documented in MassDEP's 2003 assessment surveys. *Blackstone River Watershed 2003 Biological Assessment* (MassDEP 2006). The *Blackstone River Initiative Report* (2001), the product of a "multi-phased, interagency, interstate project to conduct the sampling, assessment, and modeling work necessary for the restoration of the river system," stated that "[p]hosphorus and its contribution to algal blooms in the river is a serious water quality concern" and linked the problem to "the cumulative effect from the combined input of all municipal discharges." *BRI Report* at 1-3 to 4. The Army Corps of Engineers' *Phase I: Water Quality Evaluation and Modeling of the Massachusetts Blackstone River, Draft* (March 2004), a followup study intended to expand and build upon the results from the Blackstone River Initiative, concluded that the reaches of the river below Sutton to the RI state line were characterized by "high productivity" and "a consistent rise in algae" as indicated by nutrient loss ratios and profiles of chlorophyll_a (an indicator parameter for algae).

Water quality monitoring data confirms the extensive phosphorus enrichment in the area of Blackstone River affected by this discharge. In 1998 MassDEP found total phosphorus concentrations of 0.34 mg/l upstream and 0.23 mg/l downstream of the discharge. MassDEP's monthly monitoring from May to October 2003 documented total phosphorus levels ranging from 0.16 to 0.69 mg/l in Northbridge, upstream of the discharge, and ranging from 0.11 to 0.37 mg/l downstream of the discharge in Millville. *Blackstone River Watershed 2003 DWM Water Quality Monitoring Data* (MassDEP 2005). While MassDEP has not yet released the results of its 2008 water quality monitoring, data from the Blackstone River Coalition Volunteer Water Quality Monitoring Program confirms continued high concentrations of phosphorus in the vicinity of the Uxbridge discharge, with dissolved phosphorus concentrations averaging 0.41 mg/l (and as high as 0.9 mg/l) between 2005 and 2008 at their monitoring site on the Blackstone River in Uxbridge, upstream of the Uxbridge WWTF. These values far exceed the recommended values contained in EPA's national technical guidance and the peer-reviewed scientific literature pertaining to nutrients. These sources recommend protective in-stream phosphorus values ranging from 0.024 mg/l (24 ug/l) to 0.1 mg/l (100 ug/l). *1986 Quality Criteria for Water* (EPA 1986); *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion XIV,* December 2000 (EPA- 822-B-00-022).

Given the condition of the receiving water described above, EPA has determined that the discharge of phosphorus from the Uxbridge WWTF under the current permit limit "will cause, have reasonable potential to cause, or contribute to" an excursion above the narrative criterion for nutrients. The Uxbridge plant currently discharges under a seasonal monthly average effluent limit of 1.0 mg/l, with concentrations averaging 0.55 mg/l during the 2009-10 phosphorus control seasons. Concentrations outside of the treatment season (indicative of the full potential of the facility to contribute to water quality exceedances) have been as high as 2.8 mg/l. These concentrations are well above the receiving water concentrations that have already been shown to be related to eutrophication in the Blackstone River. The receiving water does not provide substantial dilution under low flow (7Q10) conditions, as receiving water concentrations are already high due to the inputs from the numerous upstream POTWs and nonpoint sources. Therefore the setting of a more stringent effluent limit is required. 40 CFR § 122.44(d)(1)(ii) and (iii).

ii. Determination of effluent limitation

As noted above, the MA SWQS require the implementation of "highest and best practical treatment," interpreted by MassDEP as an effluent limit of 0.2 mg/l for POTWs, where necessary to control cultural eutrophication. EPA is also, however, required under the Clean Water Act to determine whether such an effluent limit is sufficient to ensure that the receiving water quality complies with all applicable water quality standards. 40 CFR § 122.44(d)(vii)(A). EPA must therefore determine whether an effluent limit of 0.2 mg/l is sufficiently stringent to ensure compliance with the standard that "all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses." 314 CMR 4.05(5)(c).

To determine whether the water quality standard is met, EPA interprets the Massachusetss narrative criterion in numeric terms by looking to nationally recommended criteria and other technical guidance documents. *See* 40 CFR 122.44(d)(1)(vi)(B). EPA has previously established a numeric target of 0.1 mg/l to meet the narrative criterion in the Blackstone River, based on the *1986 Quality Criteria for Water* ("Gold Book") recommendation of in-stream phosphorus concentrations of no greater than 50 ug/l in any stream entering a lake or reservoir, 100 ug/l for any stream not discharging directly to lakes or impoundments, and 25 ug/l within a lake or reservoir. This target is consistent with criteria and guidelines adopted by other states for total phosphorus, as well as other EPA Guidance, *see, e.g., Nutrient Criteria Technical Guidance Manual: Rivers and Streams* (EPA 2000), and EPA's choice of this standard has been upheld by the Environmental Appeals Board in *In re Upper Blackstone Water Pollution Abatement District*, 14 E.A.D. __ (2010).

To determine whether a 0.2 mg/l is sufficient to ensure that the instream level of 0.1 mg/l is met under 7Q10 low flow conditions, EPA calculated the projected instream concentration assuming all the contributing point sources are discharging at their effluent limits under design flow conditions. Design flows and effluent limits for these facilities are set forth in Table 2 below. It should be noted that this does not represent the current discharge concentrations to the Blackstone River, which are significantly higher, but rather the expected discharge concentrations after the facilities are brought into compliance with their newest permit limits.[1] Phosphorus levels in the base flow in the Blackstone River is also included, with a background concentration of 0.04 mg/l based on monitoring data upstream of UBWPAD collected by MassDEP in 2002 (near 7Q10 conditions). MassDEP, *Blackstone River 2003-2007 Water Quality Assessment Report*, at F-8 (2008).[2]

Table 2. Blackstone River POTW Phosphorus Limits

Source	Flow (MGD)	P limit
UBWPAD	56.0	0.1 mg/l
Grafton	2.4	0.2 mg/l*
Northbridge	2.0	0.2 mg/l
Douglas WWTF	0.6	1.2 lbs/day
Upton WWTF	0.4	0.2 mg/l
Uxbridge	2.5	0.2 mg/l*

* proposed

Instream concentration is determined using a mass balance equation as follows:

$$Q_r C_r = \Sigma\ Q_d C_d + Pload_{\text{Douglas}} + Q_s C_s$$

[1] In the case of Grafton, a new permit limit of 0.2 mg/l has been proposed in a draft permit issued concurrently with this draft permit.

[2] While these data are several years old they are consistent with more recent monitoring data from the Blackstone Watershed Coalition's volunteer monitoring program taken upstream of POTW influence. The BWC data indicates a median orthophosphate (as P) concentration of 0.033 mg/l in the Mumford River upstream of the Douglas WWTF in the period 2005 to 2008. Blackstone Watershed Coalition, *WQM Database* (April 2008).

Where

Q_r = receiving water flow downstream of the discharge (Σ Qd + $Q_{Douglas}$ + Qs)
C_r = total phosphorus concentration in the receiving water downstream of the discharge
Q_d = design flow from each facility (excluding Douglas)
C_d = total phosphorus concentration in each discharge (assumed to be permit limit)
$Q_{Douglas}$ = design flow from Douglas
$Pload_{Douglas}$ = mass load from Douglas (assumed to be permit load limit)
Q_s = Blackstone River base flow at 7Q10 = 22.75 cfs = 14.7 MGD[3]
C_s = phosphorus concentration in baseflow, from sampling upstream of all POTWs = 0.04 mg/l

Solving for C_r yields:

$$C_r = \frac{\Sigma\ Q_d C_d + Pload_{Douglas} + Q_s C_s}{Qr}$$

$$C_r = \frac{56*0.1 + 2.4*0.2 + 2.0*0.2 + 0.4*0.2 + 2.5*0.2 + 1.2/8.34 + 14.7*0.04}{78.4}$$

$$C_r = 0.10 \text{ mg/l}$$

This calculation indicates that an effluent limit of 0.2 mg/l, consistent with the "highest and best practical treatment" mandated under the MA SWQS, is sufficient to ensure that the narrative water quality standard for nutrients is met.

In addition to the seasonal phosphorus limit of 0.2 mg/l, the permit contains a winter period total phosphorus limit of 1.0 mg/l which will be in effect from November 1 through March 31. A higher phosphorus effluent discharge limitation in the winter period is appropriate because the expected predominant form of phosphorus, the dissolved fraction, lacking plant growth to absorb it, will likely remain dissolved and flow out of the system. Imposing a limit on phosphorus during the cold weather months is, however, necessary to ensure that phosphorus discharged during the cold weather months does not result in the accumulation of phosphorus in the sediments, and subsequent release during the warm weather growing season. To confirm that EPA's assumption of the anticipated behavior of dissolved and particulate phosphorus is correct, a monitoring requirement for orthophosphorus has been included for this winter period (November 1 - March 31) in order to determine the dissolved particulate fraction of phosphorus in this discharge. If future evaluations indicate that phosphorus may be accumulating in downstream sediments, the winter period phosphorus limit may be reduced in future permitting actions.

iii. UBWPAD modeling effort

EPA also notes that the UBWPAD has funded the development of an HSPF model of the Blackstone River, conducted by CDM Smith and the University of Massachusetts. EPA has

[3] Baseflow is calculated by subtracting upstream POTW flows from the total 7Q10 at Uxbridge (82.7 cfs) that was derived from the Wasteload Allocation Model. See Attachment B.

reviewed the model (including underlying model input files provided by CDM to EPA) and results to determine whether they form a basis for a different permit limit for phosphorus for this facility. For the reasons below, EPA has concluded that they do not.

First, EPA notes that this modeling effort is funded by the UBWPAD and is specifically designed to address the impacts of UBWPAD permit limits and potential alternatives in dam management and nonpoint source reduction. It clearly does not attempt to assess impacts of changes in permit limits and discharges from any of the other Massachusetts facilities downstream on the Blackstone River, which are assumed to be at their 1997-2005[4] discharges for all the future scenarios analyzed. *Review of Scenario Results Utilizing the Blackstone River HSPF Model 2010 Calibration* at 9 (April 2011). This is unfortunate, as substantial reductions in phosphorus concentrations were achieved by these facilities between 2000 and 2007, and since that time, in connection with permit limits implemented during this period.

As CDM Smith noted in a letter to EPA dated August 9, 2012, the modeled annual average discharge from the smaller MA plants was 25,986 lbs/yr[5], 33% more than the reported discharges in 2007 (19,538 lbs/yr) and 75% more than the 2010-11 discharges (14,944 lbs/yr). The difference would be even larger for the critical summer months when more stringent permit limits are in effect, and new limits on Uxbridge and Grafton are expected to reduce current loads by more than half. In scale the load reduction being implemented from the smaller MA facilities, which discharge directly upstream of the most impacted reaches in the modeling results, is comparable to the 20% NPS reduction scenario in the model (87,400 to 69,900 lbs/yr). *Blackstone River HSPF Model 2009 Scenario Report*, Tables 15 and 16 (2010).[6] The HSPF modeling effort appears to contain an implicit assumption that reductions in discharges from the other WWTPs on the Blackstone River are irrelevant, a position with which EPA disagrees. This makes the modeling results unsuitable for setting permit limits on these facilities.

The decision to focus on 2002 for presentation of results of all scenarios, based on the hydrological conditions during that year that approached 7Q10, exacerbates this issue. Not only are the 2002 phosphorus concentrations for Northbridge, Grafton and Uxbridge far above the current levels, but the Millbury WWTP was still operating in 2002. The scenario plots show a clear spike in phosphorus concentrations at the location of the (now discontinued) Millbury outfall, as well as noticeable spikes at the locations of Grafton and Northbridge (less so Uxbridge) that represent far greater phosphorus discharges than current loads, let alone the reductions that would be seen under new permit limits for Grafton and Uxbridge. These plots therefore do not plausibly reflect what actual conditions would be under the future scenarios.

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[4] While the model extends through 2007, the modeling team used year 2003 and 2000 data in lieu of actual discharges in 2006 and 2007. *Blackstone River HSPF Water Quality Model Calibration Report* at 4-4 (August 2008). This does not appear to have been updated in later refinements of the model, based on EPA's review of the model input files provided in connection with the UBWPAD permit modification request.

[5] This is a correction of the mass balance figures contained in the *Blackstone River HSPF Model 2009 Scenario Report*, Table 15 (2010) which stated that loads from the "other PS" in Massachusetts totaled 98,000 lbs/yr.

[6] As CDM Smith did not correct these figures in its letter of August 9, 2012, EPA assumes that the reported values are correct. We note that while CDM suggests that any review of the model be based on information provided with their modification request, and not the "older, more dated 2009 Scenario report", the updated modeling reports do not contain updated mass balance tables or any other data tables showing input loads.

Moreover, there are additional questions concerning the model itself, particularly the fact that the model does not incorporate periphyton; the consistent overprediction of chlorophyll-a concentrations by the model; and the large errors and paucity of validation data in the Rhode Island reaches. As the Technical Advisory Committee assembled to review the modeling effort stated, "the current HSPF model may be used with caution (because it gives a conservative prediction [too-high] of chlorophyll-a and ammonia concentrations) for evaluating relative in-stream benefits likely to be realized from alternative nutrient reduction scenarios for the UBWPAD discharge and other point and non-point source inputs to the river. However, we believe that improvements will need to be made in the model's ability to predict algal growth dynamics and nitrogen nutrient levels during the growing season, before it is appropriate for use in more detailed applications, such as for development of a nutrient Total Maximum Daily Load (TMDL)." *Technical Advisory Committee (TAC) Review Report on The Blackstone River HSPF Water Quality Model* at 2 (April 29, 2011).

In light of the above, EPA does not believe it is appropriate to use this model in the setting of permits limits for this facility. However, EPA notes that the modeling results on a general level support EPA's position that a high level control on all sources, not just the UBWPAD, is necessary to control eutrophication in the Blackstone River. That is the basis for EPA's implementation of phosphorus limits in this permit and those of the other downstream WWTPs. In addition, EPA is addressing nonpoint source and stormwater reduction efforts through grant funding, stormwater permitting for construction, industrial and municipal separate storm sewer system (MS4) sources, and other programs. EPA believes this multi-pronged approach is consistent with all available data regarding the necessary steps to achieve water quality standards in the Blackstone River.

In summary, the draft permit total phosphorus limit for the period of April 1 to October 31 is 0.2 mg/l and for the period of November 1 to March 31 is 1.0 mg/l. The monitoring frequency for the summer is 2/week, and the winter monitoring frequency is 2/month.

b. Nitrogen

The draft permit contains an effluent limitation of 8 mg/l total nitrogen in the summer months, in order to ensure that this discharge does not contribute to eutrophication in the Seekonk and Providence River estuaries. This requirement is imposed in order to meet the water quality standards of Rhode Island, an affected downstream state under 40 CFR § 122.44(d)(vii)(b)(4).

Rhode Island like Massachusetts, does not provide numeric criteria for nutrients. The relevant narrative criterion for nutrients provides:

> Nutrients: None in such concentration that would impair any usages specifically assigned to said Class, or cause undesirable or nuisance aquatic species associated with cultural eutrophication. Shall not exceed site-specific limits if deemed necessary by the Director to prevent or minimize accelerated or cultural eutrophication. Total phosphorus, nitrates and ammonia may be assigned site-specific permit limits based on reasonable Best Available Technologies.

RI WQR, Rule 8.D(3)(10)(Table 2); *see also* Rule 8.D(1)(d). The regulations also include requirements for minimum instantaneous DO levels and cumulative DO exposure, Rule 8.D(3) Table 3, and other applicable criteria including:

> At a minimum, all waters shall be free of pollutants in concentrations or combinations or from anthropogenic activities subject to these regulations that:
>
> i. Adversely affect the composition of fish and wildlife;
> ii. Adversely affect the physical, chemical, or biological integrity of the habitat;
> iii. Interfere with the propagation of fish and wildlife;
> iv. Adversely alter the life cycle functions, uses, processes and activities of fish and wildlife . . .

Rule 8.D(1).

i. Evidence of eutrophication and link to nitrogen discharges

Narragansett Bay, and particularly the Seekonk and Providence River estuaries which form its upper reaches, has suffered severe cultural eutrophication for many years. This cultural eutrophication results in periodic phytoplankton blooms, low DO levels and associated fish kills. Numerous studies have documented hypoxic conditions in the upper bay and Seekonk and Providence Rivers, with the worst conditions found at the upper boundary of the Seekonk River where the Blackstone River discharges. RIDEM, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (2004); Deacutis, et al., "Hypoxia in the Upper Half of Narragansett Bay, RI, During August 2001 and 2002," *Northeastern Naturalist*, 13 (Special Issue 4):173-198 (2006); Bergondo, et al., "Time-series observations during the low sub-surface oxygen events in Narragansett Bay during summer 2001," *Marine Chemistry*, 97, 90-103 (2005). In addition, important habitat has been destroyed: historic estimates of eel grass in Narragansett Bay ranged from 8,000 - 16,000 acres and current estimates of eel grass indicate that less than 100 acres remain. No eel grass remains in the upper two thirds of Narragansett Bay and the Providence River. Severe eutrophication is believed to be a significant contributor to the dramatic decline in eel grass. *See Governor's Narragansett Bay and Watershed Planning Commission, Nutrient and Bacteria Pollution Panel, Initial Report* (2004); RIDEM, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (2004); RIDEM, *Plan for Managing Nutrient Loadings to Rhode Island Waters* (2005).

It is clear that eutrophication in the Seekonk and Providence Rivers and Narragansett Bay has reached levels where it is adversely affecting the composition of fish and wildlife; adversely affecting the physical, chemical, and biological integrity of the habitat; interfering with the propagation of fish and wildlife; adversely altering the activities of fish and wildlife; and causing DO to drop well below allowable levels. The effects of eutrophication, including algae blooms and fish kills, are also interfering with the designated uses of the water. Eutrophication has, therefore, reached a point where it is causing violations of water quality standards.

Excessive loadings of nitrogen have been identified as the cause of the eutrophication. This link has been demonstrated by water quality data and by various studies and reports. The RIDEM

report, titled *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (December 2004), summarizes and references many of the studies and reports. RIDEM's 2004 report analyzes both water quality data and information about major discharges to the Providence and Seekonk Rivers. The report, drawing in part on data developed in earlier studies, divides the rivers into segments and analyzes pollutant loadings and specific water quality impairments in each segment. Much of the data used in the analysis is from a 1995 - 1996 study by RIDEM's Water Resources unit that consisted of measurements of nitrogen loadings from point source discharges and the five major tributaries to the Providence/Seekonk River system. The report also includes an analysis of data produced by a physical model of the Providence/Seekonk River system. That physical model was operated by the Marine Ecosystems Research Laboratory (MERL), and was part of an experiment to evaluate the impact of various levels of nutrient loading on the rivers and Narragansett Bay. EPA's guidance document *Nutrient Criteria Technical Guidance Manual, Estuarine and Coastal Marine Waters* (2001) cites the MERL experiments as compelling evidence that nitrogen criteria are necessary to control enrichment of estuaries.

The predominant sources of nitrogen loading in the Providence and Seekonk Rivers are municipal wastewater treatment facilities in Rhode Island and in Massachusetts. In 2006, the State of Rhode Island reissued several Rhode Island Pollutant Discharge Elimination System (RIPDES) permits for POTWs which discharge to the Providence and Seekonk Rivers and Narragansett Bay. These permits include limitations on the discharge of total nitrogen for a number of facilities, in order to address the cultural eutrophication in these waters and Narragansett Bay, consistent with the targets identified in the 2004 RIDEM Report. RIDEM, *Response to Public Comments Received on Proposed Permit Modification for the Fields Point, Bucklin Point, Woonsocket and East Providence WWTFs* (2006) In addition smaller Rhode Island facilities, not identified in the 2004 RIDEM Report, have had nitrogen optimization and other requirements placed in their permits as they have been (re)issued. *See* RIPDES Permit No. RI0100455, Burrillville WTP (2006).

The 2004 RIDEM Report also concluded that substantial reductions in loadings from the three largest Massachusetts POTWs on the Blackstone and Ten Mile Rivers would be necessary to achieve water quality standards in the Seekonk River and Upper Narragansett Bay. After reviewing the RIDEM studies and other relevant material and performing its own analysis, EPA agreed that nitrogen discharges from the Upper Blackstone Water Pollution Abatement District (UBWPAD) facility (on the Blackstone River) and the Attleboro and North Attleboro WWTFs (on the Ten Mile River) are contributing to impairments in Rhode Island. EPA therefore imposed effluent limits on those facilities that are designed to ensure attainment of water quality standards and are consistent with the 2004 RIDEM Report and Rhode Island's regulation of its in-state facilities. RIDEM updated this analysis to include other Massachusetts POTWs on these rivers, including the Uxbridge WWTF, in 2005 (see section 3(b)(ii)(a)(1) below); limits for these facilities are being analyzed as their permits are reissued. Requirements on these facilities will be implemented in order to achieve equitable regulation of WWTF discharges across the region, to reduce nutrient impacts and achieve acceptable levels of dissolved oxygen.

Monitoring reports submitted by the Uxbridge WWTF confirm that the facility discharges nitrogen to the Blackstone River, which flows into the Seekonk River where the greatest

impairments in the Narragansett Bay Basin have been measured. Therefore EPA must determine whether the Uxbridge discharge "will cause, have reasonable potential to cause, or contribute to" a violation of water quality standards. 40 CFR §122.44(d)(1)(i). In doing so, EPA considers "existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, . . . and where appropriate, the dilution of the effluent in the receiving water." 40 CFR §122.44(d)(1)(ii).

Under the current permit the Uxbridge WWTF reports its discharges of ammonia and of "NO2 + NO3". Together these represent the dissolved inorganic nitrogen ("DIN") component of the facilities nitrogen discharges. While effluent limits are generally set in terms of total nitrogen, DIN was in fact the parameter used for analysis of the impact of nitrogen loadings in the RIDEM studies, and can be used to assess the facility's contribution to effects in the Seekonk River. The average DIN concentration in the Uxbridge discharge from 2005 through 2010, based on the DMRs, was 11.1 mg/l, giving a total load at design flow of 105 kg/day (231 lbs/day).

The Uxbridge discharge is located approximately 21 miles upstream of the impaired reaches in the Seekonk River, so EPA considered whether its nitrogen loading is significantly reduced by in-stream attenuation. There is conflicting evidence concerning the extent of attenuation, if any, within the Blackstone River, with estimates ranging from zero to 23%. *See* Nixon, et al., "Investigation of the Possible Attenuation of Dissolved Inorganic Nitrogen and Phosphorus in the Lower Blackstone River," *Anthropogenic Nutrient Inputs to Narragansett Bay – A Twenty-Five Year Perspective*, Appendix B (2005)); RIDEM, *Nutrient Permit Modifications – Response to Comments* (2005). For this analysis, EPA is applying the 13% attenuation rate used for UBWPAD discharges in the RIDEM 2004 Report based on 1995-96 monitoring data, adjusted proportional to the relative distance along the Blackstone River. This results in an attenuation rate of 6% for the Uxbridge discharge. Based on the studies and analyses previously referenced, EPA believes that this rate is a reasonable estimate. At this attenuation rate, the effective loading from the Uxbridge discharge to the Seekonk River is 99 kg/day (218 lbs/day).

To determine the impact of this loading on the Seekonk River, EPA considers the areally distributed load (load divided by area) in order to allow comparison to the results of the MERL experiment applied in the RIDEM 2004 Report. The MERL enrichment gradient experiment included a study of the impact of different loadings of nutrients on dissolved oxygen and chlorophyll a. *See* Oviatt, et al., "Patterns of Productivity During Eutrophication: A Mesocosm Experiment", *Marine Ecology* (1986); 2004 RIDEM Load Reduction Evaluation. The MERL enrichment gradient experiments consisted of 9 tanks (mesocosms). Three tanks were used as controls, and were designed to have regimes of temperature, mixing, turnover, and light similar to a relatively clean Northeast estuary with no major sewage inputs. The remaining six mesocosms had the same regimes, but were fed reagent grade inorganic nutrients (nitrogen, phosphorus and silica) in ratios found in POTW effluent discharged to the Providence River. The six mesocosms were fed nutrients in multiples of the estimated average sewage inorganic effluent nutrient loading to Narragansett Bay. For example the 1X mesocosm nitrogen loading was 40.3 $mg/m^2/day$, representing the average nutrient loading in the Narragansett Bay as a whole. The 2X was twice that (80.6 $mg/m^2/day$) and so on (4X, 8X, 16X) up to a maximum load of 32X. During the study, dissolved oxygen, chlorophyll, and dissolved inorganic nutrients were measured in the water column and benthic respiration was also measured. Id. From the collected

data the investigators produced times series for oxygen, pH, temperature, nutrients, chlorophyll and system metabolism. Id. The study documented precipitous drops in dissolved oxygen levels with loadings above the 4X gradient, along with increasing and highly variable chlorophyll levels indicative of eutrophic conditions.

The areally distributed loading to the Seekonk River from the Uxbridge discharge alone is 35.2 $mg/m^2/day$. This compares to a "1X" loading in the MERL experiments of 40.3 $mg/m^2/day$, and indicates that even as one of the smaller wastewater plants discharging to this reach, the Uxbridge WWTF alone has the potential to contribute nitrogen levels to the Seekonk nearly matching the background areally distributed load to the bay as a whole. The Seekonk River is already the most enriched portion of the Narragansett Bay under natural conditions, with estimated natural background nitrogen inputs at the 4X level. RIDEM 2004. This makes this area especially vulnerable to overenrichment from wastewater treatment plant sources, and indeed the addition of the Uxbridge to background sources alone would be expected to reduce minimum DO levels from 3.0 mg/l to 2.75 mg/l under MERL experiment conditions. *See* RIDEM 2005 (Figure 4). Of course, the Seekonk River is far from background levels, with loadings as of 2005 estimated at the 24X level, indicating extreme over-enrichment. Effluent limits that have been placed on other wastewater treatments plants in Rhode Island and Massachusetts are expected to achieve an areal load equivalent to the 6.5X condition at current flows, and 10X at 90% design flows. However, this goal will not be reached if the Uxbridge discharge is not controlled.

Based on the available evidence, the Uxbridge discharge "will cause, have reasonable potential to cause, or contribute to" a violation of water quality standards in the Seekonk River and an effluent limit must be set.

ii. Nitrogen Effluent Limit

Having found that the discharge has a reasonable potential to cause an excursion over Rhode Island's narrative standard for the nutrient nitrogen, EPA is required to set an effluent limit for this pollutant. 40 CFR § 122.44(d)(vi). In setting a limit, EPA must ensure that:

> (A) The level of water quality to be achieved by limits on point sources established under this paragraph is derived from, and complies with all applicable water quality standards; and
>
> (B) Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the State and approved by EPA pursuant to 40 CFR 130.7.

40 CFR § 122.44d(vii).

While Rhode Island DEM has not developed a TMDL or other wasteload allocation that has been approved pursuant to 40 CFR 130.7, RIDEM has performed a load allocation analysis that incorporates the Grafton and Uxbridge discharges and has proposed an effluent limit (8 mg/l)

based on that analysis. While EPA is not bound by this analysis, EPA has reviewed the technical basis and allocation method applied in the RIDEM analysis and has determined that it generally represents a sound and technically valid approach. EPA has therefore agreed to process Massachusetts permits in a manner consistent with the RIDEM analysis. *See* EPA and RIDEM, *Performance Partnership Agreement Between the Rhode Island Department of Environmental Management and US Environmental Protection Agency Region 1* (2006), Appendix B. In doing so, however, EPA has an independent obligation both to ensure that the load allocation analysis remains valid, particularly in light of changes in circumstances since the initial analysis was developed five years ago, and to ensure that the level of water quality that will be achieved complies with the applicable water quality standards. We consider these questions in turn below.

a. RIDEM load allocation analysis and EPA Update

(1) RIDEM analysis

RIDEM's approach to allocating nitrogen loads has been to require higher removal rates from larger facilities than from smaller facilities (e.g. 5 mg/l for NBC Bucklin Point and UBWPAD; 8 mg/l for Attleboro and North Attleboro). RIDEM, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (2004) ("2004 RIDEM Report"). This is an accepted approach under EPA guidance for wasteload allocations. *See* EPA, *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001, at 69. In RIDEM's initial analysis of nitrogen loads, facilities as small as Grafton and Uxbridge were not considered in the analysis, with North Attleboro (at 4.6 MGD) the smallest facility included. *See* 2004 RIDEM Report. Subsequently, in 2005, RIDEM updated its analysis to incorporate three additional facilities on the Blackstone River – the Uxbridge, Grafton and Millbury WWTFs – based on a calibrated/validated Qual2e model. This analysis is summarized in the 2005 *Response to Comments Received on Proposed Permit Modifications for the Fields Point, Bucklin Point, Woonsocket and East Providence WWTFs*, Appendix A ("2005 RIDEM RTC"). *See* Michaelis, B., *Dissolved Oxygen Dynamics in a Shallow Stream System,* Dissertation in Civil and Environmental Engineering at the University of Rhode Island (URI 2005). That analysis indicated that under design flows and 2005 permit limits for ammonia and phosphorus, the load at the MA/RI state line from the MA POTWs discharging to the Blackstone was expected to be 4,319 lbs/day. Figure 3. Uxbridge contributes 295 lbs/day (7% of the total) of this load.

The 2005 RIDEM RTC does not specifically set forth the loading target in the Seekonk River to be achieved at the proposed permit limits, but this can be calculated from the proposed effluent limits and design flows as shown in Table 3 below, giving a target load allocation to Massachusetts facilities of 1488 lbs/day DIN at the MA/RI state line. This represents a 65% reduction in loads at design flow from the Massachusetts facilities on the Blackstone River (e.g. 4319 to 1488 lbs/day), consistent with the RIDEM assertion in the 2005 RIDEM RTC that the proposed limits will reduce the total loading to the Seekonk River by 62%.

Figure 3: Table from Rhode Island load analysis

Table 3. Percent delivery and percent contribution of MA WWTF to the MA/RI state line under DWS3 at design flows and currently required permit limits for ammonia and phosphorus.

			At MA/RI state line	
Point Source	Initial Load at end of pipe (lb/day)	Final Load at MA/RI state line (lb/day)	Delivery (%)	Contribution (%)
UBWPAD	3780	3493	92	79
Millbury WWTF	336	312	93	7
Grafton WWTF	239	219	92	5
Uxbridge WWTF	300	295	98	7
Total WWTF	4655	4319	93	98

* Note "DWS3" indicates the model run under flow conditions from August 2005 ("dry weather survey 3").

Table 3. Load Allocation at State Line per RIDEM Analysis

						At MA/RI State Line	
Point Source	Design flow (MGD)	90% of Design Flow (MGD)[1]	Proposed total N permit limit (mg/l)	DIN component of permit limit (mg/l)[2]	DIN load discharged at limit (lb/day)	DIN load at MA/RI state line	Delivery Factor (%)[3]
UBWPAD	56	50.4	5	3	1261	1165	92%
Millbury WWTF	2.7	2.43	8	6	122	113	93%
Grafton WWTF	2.4	2.16	8	6	108	99	92%
Uxbridge WWTF	2.5	2.25	8	6	113	111	98%
Total WWTF					1603	1488	93%

[1] Loads are calculated using 90% of design flow consistent with RIDEM's methodology in the 2004 RIDEM Report

[2] Non-DIN component of total N assumed to be 2 mg/l per the 2004 RIDEM Report.

[3] Delivery factors from the 2005 RIDEM RTC; for discussion of delivery factors see Attachment C.

(2) EPA Update of RI analysis

In applying this load allocation analysis to the reissuance of permits to the Grafton and Uxbridge WWTFs, EPA notes that (1) several other facilities on the Blackstone River and its tributaries were not explicitly considered by RIDEM in its analysis; and (2) the Millbury WWTF is no longer discharging, having tied into UBWPAD. Table 4 shows the current MA dischargers to the Blackstone River system and their seasonal loads based on monitoring data from 2007-09.

Table 4. Current DIN Loadings to Blackstone River from WWTFs

	May-Oct, 2007 to 2009 DMR data		
POTW	Flow (MGD)	DIN (mg/l)	DIN load discharged (lb/day)
UBWPAD	33.5	7.35	1995
Douglas	0.3	5.5	15
Grafton	1.8	10.5	186
Hopedale[1]	0.4	10.7	32
Northbridge	0.9	11.3	75
Upton	0.19	14.9	24
Uxbridge	0.8	10.9	67
		TOTAL:	2,394

[1] The Hopedale facility monitors total N only; DIN calculated by subtracting 2 mg/l from total N per 2004 RIDEM Report.

The omission of Douglas, Hopedale, Northbridge and Upton from RIDEM's analysis was presumably based RIDEM's conclusion that these contributions are *de minimis*, based on the size of the discharger and/or location of the discharger on a tributary to the Blackstone River. While EPA agrees with this determination with respect to Douglas, Hopedale and Upton, we note that it does not appear that the Northbridge WWTF contribution is negligible. Northbridge's current flow, effluent DIN concentration and DIN loads are higher than those of Uxbridge, and while Northbridge discharges to a tributary it is less than 200 yards from the mainstem Blackstone River, unlikely to substantially reduce the delivery of nitrogen to the Blackstone River. For these reasons EPA is including Northbridge in its updated load allocation analysis. The revised load analysis, excluding Millbury WWTF but including Northbridge, is set forth in Table 5.

Table 5. Updated Load Analysis at State Line Using RIDEM Methodology

						At MA/RI State Line	
Point Source	Design flow (MGD)	90% of Design Flow (MGD)[1]	Proposed total N permit limit (mg/l)	DIN component of permit limit (mg/l)[2]	Initial DIN load (lb/day)	Final DIN load at MA/RI state line	Delivery (%)[3]
UBWPAD	56	50.4	5	3	1261	1165	92%
Grafton WWTF	2.4	2.16	8	6	108	99	92%
Uxbridge WWTF	2.5	2.25	8	6	113	111	98%
Alternatives for Northbridge discharge:							
1. Northbridge at current concentration				Current DIN from DMR			
Northbridge	2	1.8	--	11.3	170	155	92%
Total WWTF						1530	
2. Northbridge with permit limit of 8 mg/l			N limit	DIN component			
Northbridge	2	1.8	8	6	90	83	92%
Total WWTF						1458	

[1] Loads are calculated using 90% of design flow consistent with RIDEM's methodology in the *2004 RIDEM Report*

[2] Non-DIN component of total N assumed to be 2 mg/l per the *2004 RIDEM Report*.

[3]Delivery factors from the 2005 RIDEM RTC; for further discussion of delivery factors see Attach. C

As shown in Table 5, the load allocation target is not met if Northbridge discharges at design flow at its current DIN levels, but would be met if Northbridge had an effluent limit similar to that proposed for Grafton and Uxbridge. EPA will consider whether to impose a limit on Northbridge, including conducting further analysis of the appropriate delivery factor, upon reissuance of the Northbridge WWTF permit.

For the purposes of the Grafton and Uxbridge permits, the analysis shows that the RIDEM load allocation can be met and that effluent limits on these discharges consistent with the RIDEM proposal are necessary in order to meet that load allocation. While the Millbury discharge has been tied into UBWPAD and therefore is accounted for in the UBWPAD load allocation, the need to account for the Northbridge discharge eliminates any load reduction that might be achieved eliminating an allocation for Millbury. Therefore it is EPA's intent that the permit limits in the Grafton and Uxbridge reissued permits will be consistent with the load allocation analysis above.

b. Water Quality Analysis

EPA is also obligated to ensure that the proposed effluent limits will achieve a level of water quality that complies with the applicable water quality standards. Since the load allocation analysis discussed above is not from an approved TMDL or waste load allocation, EPA as the permitting authority must independently demonstrate that this standard is met. In doing so, EPA draws from the analysis set forth in connection with the issuance of the UBWPAD permit. *See* EPA, *Fact Sheet, Upper Blackstone Water Pollution Abatement District*, NPDES No. MA0102369 (2006); EPA, *Response to Comments, Upper Blackstone Water Pollution Abatement District*, NPDES No. MA010 (2008); *In re Upper Blackstone Water Pollution Abatement District*, 14 E.A.D. __ (2010).

(1) Loading rate to meet water quality standards

In the UBWPAD permit issuance, EPA concluded that an overall loading rate from all facilities (MA and RI) equivalent to the "6.5X" MERL experiment gradient under current flows, or 1,624 lbs/day[7] was appropriate to ensure that water quality standards in the Seekonk River were met. This conclusion was based on guidance documents, studies of the Seekonk and Providence Rivers and Narragansett Bay, and on an analysis of the application of the MERL experiment results to the Seekonk River. *See* EPA, *Response to Comments, UBWPAD*, at 28-29 and documents cited. It should be noted that the effluent limit established to meet that water quality target was challenged by both the UBWPAD (as too stringent) and by the Conservation Law Foundation (as too lenient) and was upheld on appeal by the Environmental Appeals Board. 14 E.A.D __ (slip op. at 23).

EPA's application of the MERL experiments to determine an acceptable loading for the Seekonk River is based on its conclusion that those experiments provide a suitable analog to the actual river system. As EPA noted in the UBWPAD Response to Comments:

[7] Calculated from the 1X MERL load of 4.032×10^{-5} kg/m^2/day, times the area of the Seekonk River ($2.81 * 10^6$ m^2), times the conversion factor (2.2046 lbs/kg), times 6.5. See 2004 RIDEM Report.

> The basic relationship demonstrated by the MERL tank experiments between the primary causal and response variables relative to eutrophication corresponds to what is actually occurring in the Providence/Seekonk River system. Both the MERL tank experiments and the data from the Providence/Seekonk River system indicate a clear correlation between nitrogen loadings, dissolved oxygen impairment and chlorophyll *a* levels.

Response to Comments, UBWPAD at 29; *see also id*. at 47-49.

EPA has also noted that the MERL experiments do not perfectly replicate the physical system, and accounted for that fact in applying the MERL loading analysis to determine a water quality target. This also was discussed in connection with the UBWPAD permit:

> EPA recognized, however, that the MERL tank experiments cannot completely simulate the response of chlorophyll *a* and dissolved oxygen to nitrogen loadings in a complex, natural setting such as the Providence/Seekonk River system, and thus does not yield a precise level of nitrogen control required to restore uses in the system. For example, dissolved oxygen in Narragansett Bay is influenced by stratification, which was not simulated in the MERL tank experiment, in which waters were routinely mixed. In a stratified system there is little vertical mixing of water, so sediment oxygen deficits are exacerbated, due to the lack of mixing with higher DO waters above. In addition, the flushing rate used in the MERL tanks is not the same as seen in the Bay. Because the physical model does not generate a definitive level of nitrogen control that can be applied to a real world discharge, but instead a range of loading scenarios which are subject to some scientific uncertainty, EPA was required to exercise its technical expertise and scientific judgment based on the available evidence when translating these laboratory results and establishing the permit limit.

Response to Comments, UBWPAD at 49. Thus, while RIDEM has suggested that the MERL experiments might indicate a 4X condition as a goal for the Seekonk River, 2004 RIDEM Report at 25, EPA concluded that the differences between the MERL experiments and the actual physical system, particularly the difference in flushing rates, indicated that the 6.5X target was appropriate.

EPA continues to believe that the water quality target established in the UBWPAD permit development represents an appropriate level of water quality to ensure that standards are met in the Seekonk and Providence River, based on the best available current information. Therefore, EPA applies the 6.5X load target to determine whether the load allocation will comply with water quality standards.

(2) Effluent limits required to meet water quality standards

To determine whether the proposed effluent limits will meet the 6.5X target under current flows, EPA calculates the total load to the Seekonk River assuming that effluent concentrations are at the permit limits and flows are equal to the 2007 to 2009 May to October flows from the facilities' DMR submissions. Current flows are used in this analysis consistent with the analysis of the UBWPAD permit limit that has been upheld on appeal. *See In re Upper Blackstone Water*

Pollution Abatement District, 14 E.A.D. __(2010). A delivery factor is applied to account for attenuation in the Blackstone River (and the Ten Mile River for Attleboro and North Attleboro) before discharge to the Seekonk River; the derivation of these delivery factors is discussed in Attachment C. The contribution of each facility and the total load to the Blackstone River is shown in Table 6. Consistent with Table 5 showing the RIDEM load analysis update, totals are shown both with and without limits on Northbridge since Northbridge was originally omitted from the RIDEM analysis.

Table 6. Effluent limits to meet water quality standard

Source	Current Flow (MGD)	Limit (mg/l)	DIN component (mg/l)	DIN (lbs/day)	Delivery factor[1]	DIN load to Seekonk River (lbs/day)
UBWPAD	33.5	5	3	838	87%	729
Woonsocket	6.3	3	1	53	96%	50
Bucklin	17.9	5	3	448	100%	448
Attleboro	3.8	8	6	190	61%	116
North Attleboro	3.42	8	6	171	61%	104
Grafton WWTF	1.74	8	6	87	90%	78
Uxbridge WWTF	0.8	8	6	40	94%	38
Alternatives for Northbridge Discharge						
1. Northbridge at current concentration			Current DIN from DMR			
Northbridge	0.88	---	11.3	83	91%	75
			Total DIN load at mouth of Blackstone:			**1639**
2. Northbridge with permit limit of 8 mg/l			DIN component of limit			
Northbridge	0.88	8	6	44	91%	40
			Total DIN load at mouth of Blackstone:			**1604**

[1] For Blackstone River delivery factors, see Appendix A; Attleboro and North Attleboro delivery factors from 2004 RIDEM Report

Given the water quality target loading of 1,624 pounds per day, this analysis indicates that effluent limits on Uxbridge, Grafton and Northbridge are necessary to meet the water quality target at current flows.

c. Nitrogen Effluent Limit

As demonstrated above, an effluent limit of 8 mg/l on the Grafton and Uxbridge discharges satisfies both the RIDEM load allocation and the water quality target identified by EPA in the UBWPAD permit proceedings. Therefore, the draft permit includes a limit of 8 mg/l total nitrogen for the period May to October. The draft permit for Grafton WWTF, which is being issued concurrently with this draft permit, also establishes total nitrogen limit of 8 mg/l.

4. Total Residual Chlorine

Chlorine and chlorine compounds produced by the chlorination of wastewater can be extremely toxic to aquatic life. Effluent limits are based on water quality criteria for total residual chlorine (TRC) which are specified in EPA water quality criteria established pursuant to Section 304(a) of the Clean Water Act. The most recent EPA recommended criteria are found in National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047). The fresh water aquatic life criteria for TRC are 11 ug/l for protection from chronic toxicity and 19 ug/l for protection from acute toxicity.

The 1999 Fact Sheet, issued in connection with the existing permit, lists the 7Q10 flow of the Blackstone River at the Uxbridge WWTF as 53.3 MGD, or 82.7 cfs. This figure was based on the Waste Load Allocation model, as shown in the Response to Comments issued in connection with the current permit. See Attachment B. EPA will continue to use a 7Q10 Flow of 53.3 MGD to calculate the dilution factor for this facility. The dilution factor is calculated as follows:

$$\frac{\text{plant design flow + 7Q10 river flow}}{\text{plant design flow}} = \frac{\text{2.5 MGD + 53.3 MGD}}{\text{2.5 MGD}} = 22$$

The 7Q10 dilution multiplied by the chronic and acute criteria provides the appropriate TRC limits. Thus:

11 ug/l(chronic criterion) * 22 (dilution factor) = 242 ug/l or **0.24 mg**/l (avg mnthly limit)
19 ug/l (acute criterion) * 22 (dilution factor) = 418 ug/l or **0.42 mg/l** (max daily limit)

These are the same as the effluent limits contained in the current permit.

EPA and MassDEP recognize that there are limitations in using grab sampling for determining compliance with the chlorine limit. There are complexities and variability associated with the chlorine demand of wastewater as well as the complexities associated with controlling and coordinating the dosing of chlorine and dechlorination chemicals. Therefore, an alarm requirement has been established in this draft permit to assure that a proper range of chlorination is maintained at all times. See footnote 7 on Page 4 of the draft permit.

5. Whole Effluent Toxicity

National studies conducted by EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents and aromatic hydrocarbons among others. The Region's current policy is to include toxicity testing requirements in all municipal permits, while Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts.

Based on the potential for toxicity resulting from domestic and industrial contributions, the low level of dilution at the discharge location, water quality standards, and in accordance with EPA regulation and policy, the draft permit includes acute toxicity limitations and monitoring requirements. (*See, e.g.*, "Policy for the Development of Water Quality-Based Permit

Limitations for Toxic Pollutants", 50 Fed. Reg. 30,784 (July 24, 1985); *see also*, EPA, *Technical Support Document for Water Quality-Based Toxics Control*). EPA Region I has developed a toxicity control policy. The policy requires wastewater treatment facilities to perform toxicity bioassays on their effluents. The MassDEP requires bioassay toxicity testing for state certification.

Pursuant to EPA Region 1 policy, discharges having a dilution ratio of between 20:1 and 100:1 are required to perform acute toxicity testing. The principal advantages of biological techniques are: (1) the effects of complex discharges of many known and unknown constituents can be measured only by biological analyses; (2) bioavailability of pollutants after discharge is best measured by toxicity testing including any synergistic effects of pollutants; and (3) pollutants for which there are inadequate chemical analytical methods or criteria can be addressed. Therefore, toxicity testing is being used in conjunction with pollutant specific control procedures to control the discharge of toxic pollutants.

Semiannual whole effluent toxicity (WET) testing has been conducted during the past five years. Results during the monitoring period have consistently shown an LC50 of 100%. The requirement to test the vertebrate species, *Pimephales promelas* was removed with the permit modification of May 18, 1993. The testing frequency was reduced with this modification from four to two tests per year due to past results which met the permit limits. The draft permit requires that the Town continue to conduct WET testing for Outfall 001 effluent two times per year and that each test include the use of the daphnid, *Ceriodaphnia dubia*, in accordance with EPA Region I protocol found in **Attachment A**.

By letter of October 18, 1990, the EPA granted the Town of Uxbridge the authorization to use an alternate dilution water to the Blackstone River water for its WET testing. The Blackstone River water was found to be unreliable for use as a dilution water for WET testing. In recent WET testing where receiving water controls were carried out, the receiving water has met test acceptability criteria for use as a dilution water. Therefore the draft permit requires the use of the receiving water for dilution. Procedures for substituting an alternate dilution water are available should toxicity issue arise again, as discussed in Footnote 11 on Page 5 of the permit. If alternate dilution water tests are conducted, the permittee must use a minimum of two controls, one of which must be Blackstone River water. Chemical analyses must be provided for the Blackstone River water as well as the effluent.

6. Other Toxic Pollutants

The draft permit includes a new monthly average effluent limit for aluminum.

The segment of the Blackstone River to which the Uxbridge WWTF discharges is listed on the Massachusetts 303(d) list for an impairment caused by “metals.” Examination of effluent analysis conducted in connection with WET testing in the past five years indicates that the Uxbridge WWTP discharges have included detectable levels of the metals aluminum, copper, lead and zinc. EPA therefore analyzed the available data on effluent and receiving water concentrations to determine whether these pollutants “are or may be discharged at a level that causes, has reasonable potential to cause, or contributes to an excursion above” the water quality

standard. 40 CFR 122.44(d)(1)(i). Since there have been no discharges of cadmium above the detection limit, and the single lead result above the detection limit was below the water quality criteria, there is no reasonable potential for the Uxbridge effluent to contribute to excursion above the water quality criteria for cadmium and lead.

Table 5 shows the concentrations of metals in the Uxbridge effluent from April 2005 through April 2011, along with receiving water analyses beginning November 2009. Prior to 2010, Uxbridge's analyses were performed using insufficiently sensitive methods for metals, especially a concern with respect to cadmium and lead. Upon notice from EPA, Uxbridge corrected the issue with their contract laboratory. EPA has concluded that the data provided is sufficient for its analysis of effluent limits for this permit reissuance.

Table 7. Whole Effluent Testing Analytical Data and Water Quality Criteria

	Effluent Analytical Data[1]					Receiving Water Analytical Data[1]				
	Al	Cd	Cu	Pb	Zn	Al	Cd	Cu	Pb	Zn
	ug/l	ug/l *total recoverable*[2]				ug/l	ug/l *total recoverable*[2]			
4/26/2005	240	ND-5	13	ND-10	50					
11/15/2005	120	ND-5	20	ND-10	ND-50					
5/9/2006	198	ND-5	17	ND-10	74					
11/14/2006	210	ND-5	16	ND-10	ND-50					
5/15/2007	ND-100	ND-5	ND-10	ND-10	ND-50					
12/12/2007	120	ND-5	ND-10	ND-10	ND-50					
12/16/2008	270	ND-5	10.2	ND-10	ND-50					
1/23/2009	ND-100	ND-5	ND-10	ND-10	ND-50					
5/5/2009	120	ND-5	10	ND-10	ND-50					
11/3/2009	170	ND-5	12	ND-10	ND-50	120	ND-0.5	ND-10	ND-10	ND-50
5/11/2010	73	ND-0.2	10.9	ND-0.5	37.9	172	0.6	18.4	5.9	2.8
11/16/2010[2]	98	ND-0.5	10.6	ND-0.5	40	124	ND-0.5	8	2.2	19.7
4/26/2011	50	ND-0.2	6.4	ND-0.5	35	114	0.3	1.7	2.5	32
10/25/2011	76	ND-0.5	10.6	0.3	37.8	122	0.3	9.8	2.8	25.7
5/1/2012	32	ND-0.2	5	ND-1.0	37	324	0.6	13	6	24
Median	120	ND	10.6	ND	50	123	0.50	9.9	4.4	24.9
Max	270	ND	20	ND	74					

	Water Quality Criteria				
	ug/l	ug/l *dissolved*[3]			
Chronic Criterion[4]	87	0.2	18.1	1.6	82.4
Acute Criterion[4]	750	1.3	27.2	41.0	83.0

[1] Non-detects noted as " ND - [minimum detection level]"

[2] Samples for effluent and receiving water were switched in initially submitted reports; these are corrected data

[2] Water quality criteria are expressed in terms of the dissolved fraction, while analytical results and permit effluent limits are expressed in terms of total recoverable metal; these are related by a conversion factor as set forth in EPA, National Recommended Water Quality Criteria 2002 ("NRWQC 2002")

[3] Criteria for Cd, Pb and Zn are hardness dependent and calculated using the formulas set forth in the NRWQC 2002 at a hardness of 66 (based on minimum hardness at low flow in Millville, MA from Louis Berger Report).

For aluminum, the effluent and receiving water monitoring data clearly indicate the need for an effluent limit. More than half of the effluent monitoring results indicate aluminum levels above the chronic water quality criterion of 87 ug/l. The receiving water is also above the chronic water quality criterion, as all of the receiving water samples were above 87 ug/l.

The receiving water does not provide dilution for discharges of aluminum, so the draft permit includes monthly average effluent limits set at the chronic criterion of 87 ug/l. The data does not indicate a reasonable potential to exceed the acute criterion for aluminum, so no maximum daily limit is set.

For copper and zinc, a more detailed analysis must be performed to determine the upper bound expected concentration and determine if the discharge has a reasonable potential to cause a violation. EPA bases its determination of "reasonable potential" on a characterization of the upper bound of expected effluent concentrations based on a statistical analysis of the available monitoring data. As noted in the *Technical Support Document for Water Quality Based Toxics Control* (EPA 1991) ("TSD"), "[a]ll monitoring data, including results for concentrations of individual chemicals, have some degree of uncertainty associated with them. The more limited the amount of test data available, the larger the uncertainty." Thus with a limited data set, the maximum concentration that has been found in the samples may not reflect the full range of effluent concentration. On the other hand, individual high data points may be outliers or otherwise not indicative of the normal range of effluent concentrations.

To account for this, EPA has developed a statistical approach to characterizing effluent variability in order to reduce uncertainty in the process. As "experience has shown that daily pollutant discharges are generally lognormally distributed," *TSD* at App. E, EPA uses a lognormal distribution to model the shape of the observed data, unless analysis indicated a different distributional model provides a better fit to the data. The model parameters (mean and variance) are derived from the monitoring data.

The lognormal distribution generally provides a good fit to environmental data because it is bounded on the lower end (i.e. you cannot have pollutant concentrations less than zero) and is positively skewed. It also has the practical benefit that if an original lognormal data set X is logarithmically transformed (i.e. Y = ln[X]) the resulting variable Y will be normally distributed. Then the upper percentile expected values of X can be calculated using the z-score of the standardized normal distribution (i.e. the normal distribution with mean = 0 and variance = 1), a common and relatively simple statistical calculation. The pth percentile of X is estimated by

$$X_p = \exp(\mu_y + z_p \sigma_y),$$

where μ_y = mean of Y
σ_y = standard deviation of Y
Y = ln[X]

For the 95th and 99th percentiles, $z_{95} = 1.645$ and $z_{99} = 2.326$, so that

$$X_{95} = \mu_y + 1.645\ \sigma_y$$
$$X_{99} = \mu_y + 2.326\ \sigma_y$$

These upper percentile values are used to determine whether a discharge has a reasonable potential to cause or contribute to an exceedance of a water quality standard. For reasonable potential to exceed the acute criterion, which is based on acute effects with one hour of exposure to the pollutant, the 99th percentile is used to represent the maximum expected pollutant level. For the chronic criterion, representing a four day exposure, the 95th percentile value is used. The combination of these upper bound effluent concentrations with dilution in the receiving water is calculated to determine whether the water quality criteria will be exceeded. The *TSD* also includes a procedure for determine such percentiles when the dataset includes non-detect results, as is the case for Uxbridge, based on a delta-lognormal distribution.

The statistical analyses for copper and zinc in Uxbridge's discharges are set forth in Attachment D. For copper, the 95th percentile expected concentration is 20.1.8 ug/l, while the 99th percentile is 26.4 ug/l. For zinc, the 95th percentile expected concentration is 59.8 ug/l, while the 99th percentile is 73.6 ug/l.

The receiving water concentration is calculated taking into account dilution at 7Q10 conditions, through a mass balance equation that accounts for concentrations in the Blackstone River upstream of the discharge as reported in the facility's WET test reports:

$$\text{Receiving water concentration } (C_r) = \frac{(C_d * Q_d + C_s * Q_s)}{(Q_d + Q_s)} \quad \text{; where}$$

C_d = upper bound effluent concentration data (99th percentile for acute criteria; 95th percentile for chronic criteria)
Q_d = Design flow of facility
C_s = Median concentration in Blackstone River upstream of discharge
Q_s = 7Q10 streamflow in Blackstone River upstream of discharge

Table 8 shows the result of the mass balance equations. The predicted receiving water concentration ($Cr_{dissolved}$) is less than the relevant criterion for each of these metals. Therefore the Uxbridge discharge does not present a reasonable potential to exceed water quality standards for these pollutants, and no effluent limits are required.

Table 8. Mass Balance calculations

	Qd	Cd	Qs	Cs	Qr = Qd+Qs	Cr_{tr}= (QdCd+QsCs)/Qr	$Cr_{dissolved}$	Criterion
Cu chronic	2.5	20.07	53.3	9.9	55.8	10.4	9.9	18.1
Cu acute		26.41		9.9		10.6	10.2	25.7
Zn chronic		59.82		24.9		26.5	26.1	79.9
Zn acute		73.59		24.9		27.1	26.5	79.2

VII. Sewer System Operation 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[8]). 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. MassDEP has stated that the inclusion in NPDES permits of I/I control conditions is a standard State Certification requirement under Section 401 of the CWA and 40 CFR § 124.55(b).

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.

Several of the requirements in the draft permit are not included in the current permit, including collection system mapping, and preparation of a collection system operation and maintenance plan. EPA has determined that these additional requirements are necessary to ensure the proper operation and maintenance of the collection system and has included schedules for completing these requirements in the draft permit.

VIII. Sewage Sludge Information and Requirements

According to its permit application, the Uxbridge WWTF generates about 262 dry metric tons of sludge per year. The sludge is aerated and then sent through a gravity thickener. This processed sludge is hauled to the Synagro site in Woonsocket, Rhode Island where it is dewatered and

[8] "Infiltration" is groundwater that enters the collection system through physical defects such as cracked pipes, or deteriorated joints. "Inflow" is extraneous flow entering the collection system through point sources such as roof leaders, yard and area drains, sump pumps, manhole covers, tide gates, and cross connections from storm water systems.

incinerated. In February 1993, (EPA promulgated standards for the use and disposal of sewage sludge. The regulations were promulgated under the authority of §405(d) of the (CWA. Section §405(f) of the CWA requires that these regulations be implemented through permits. This permit is intended to implement the requirements set forth in the technical standards for the use and disposal of sewage sludge, commonly referred to as the Part 503 regulations. Section 405(d) of the CWA requires that sludge conditions be included in all municipal permits. The sludge conditions in the draft permit satisfy this requirement and are taken from EPA's Standards for the Disposal of Sewage Sludge at 40 CFR Part 503. These conditions are outlined in the draft permit.

IX. Essential Fish Habitat Determination (EFH)

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 EFH such 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 C.F.R. § 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.

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. A review of the relevant essential fish habitat information provided by NMFS indicates that EFH has been designated for 33 managed species within the NMFS boundaries encompassing Narragansett Bay, which the Blackstone River discharges to, via the Seekonk River and the Providence River. *See* NOAA, Summary of Essential Fish Habitat, Narragansett Bay, RI (http://www.nero.noaa.gov/hcd/ri1.html). It is possible that a number of these species utilize the downstream Rhode Island waters for spawning, while others are present seasonally.

Based on the relevant information examined, EPA finds that the reissuance of this permit will adequately protect EFH for the following reasons:

- The Uxbridge discharge is located more than 20 miles upstream of designated EFH habitat;
- The dilution factor at the point of discharge is 22:1, and effective dilution in the area of EFH designated habitat will be significantly greater;
- The draft permit contains new nitrogen limits to ensure that the discharge does not contribute to nutrient-related water quality violations in the Seekonk and Providence River;
- The permit is designed to ensure that all water quality standards are met in the receiving water, both in Massachusetts and Rhode Island.

EPA believes that the draft permit limits adequately protect all designated EFH, and therefore additional mitigation is not warranted. If adverse impacts to EFH are detected as a result of this

permit action, or if new information is received that changes the basis for our conclusion, NOAA Fisheries will be notified and an EFH consultation will be initiated.

X. Endangered Species Act

Section 7(a) of the Endangered Species Act (ESA) of 1973, 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 U.S. Fish and Wildlife Service (USFWS) typically administers Section 7 consultations for bird, terrestrial, and freshwater aquatic species. NMFS typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the list of federal endangered or threatened species of fish, wildlife, and plants to see if any such listed species might potentially be impacted by the reissuance of this NPDES permit and has not found any such listed species in the vicinity of the discharge. Therefore, EPA does not need to formally consult with NMFS or USFWS in regard to the provisions of the ESA.

XI. Monitoring and Reporting

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 requires that the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR. NetDMR is a national web-based tool for regulated CWA permittees to submit 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.

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. Permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

XII. State Certification Requirements

EPA may not issue a permit unless MassDEP certifies that the effluent limitations included in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State water quality standards, or waives certification. EPA has requested permit

certification by the State pursuant to 40 CFR §124.53 and expects the draft permit will be certified.

XIII. Comment Period, Public Hearing, and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the 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 Susan Murphy, U.S. Environmental Protection Agency, 5 Post Office Square, Suite 100 (OEP06-1), Boston, MA 02109. At the request of the applicant, the Regional Administrator finds significant public interest for the holding of a public hearing on this permit, scheduled for October 25, 2012 at the Uxbridge Senior Center. 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 the public hearing, if held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and to each person who has submitted written comments or requested notice.

XIV. EPA and MassDEP Contacts

Requests for additional information or questions concerning the draft permit may be addressed Monday through Friday, between the hours of 9:00 a.m. and 5:00 p.m., to :

Susan Murphy
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109
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Kathleen Keohane
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627 Main Street, 2nd Floor
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Telephone: (508)-767-2856 Fax: (508) 791-4131
Email: Kathleen.Keohane@state.ma.us

September 2012
Date

Stephen Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

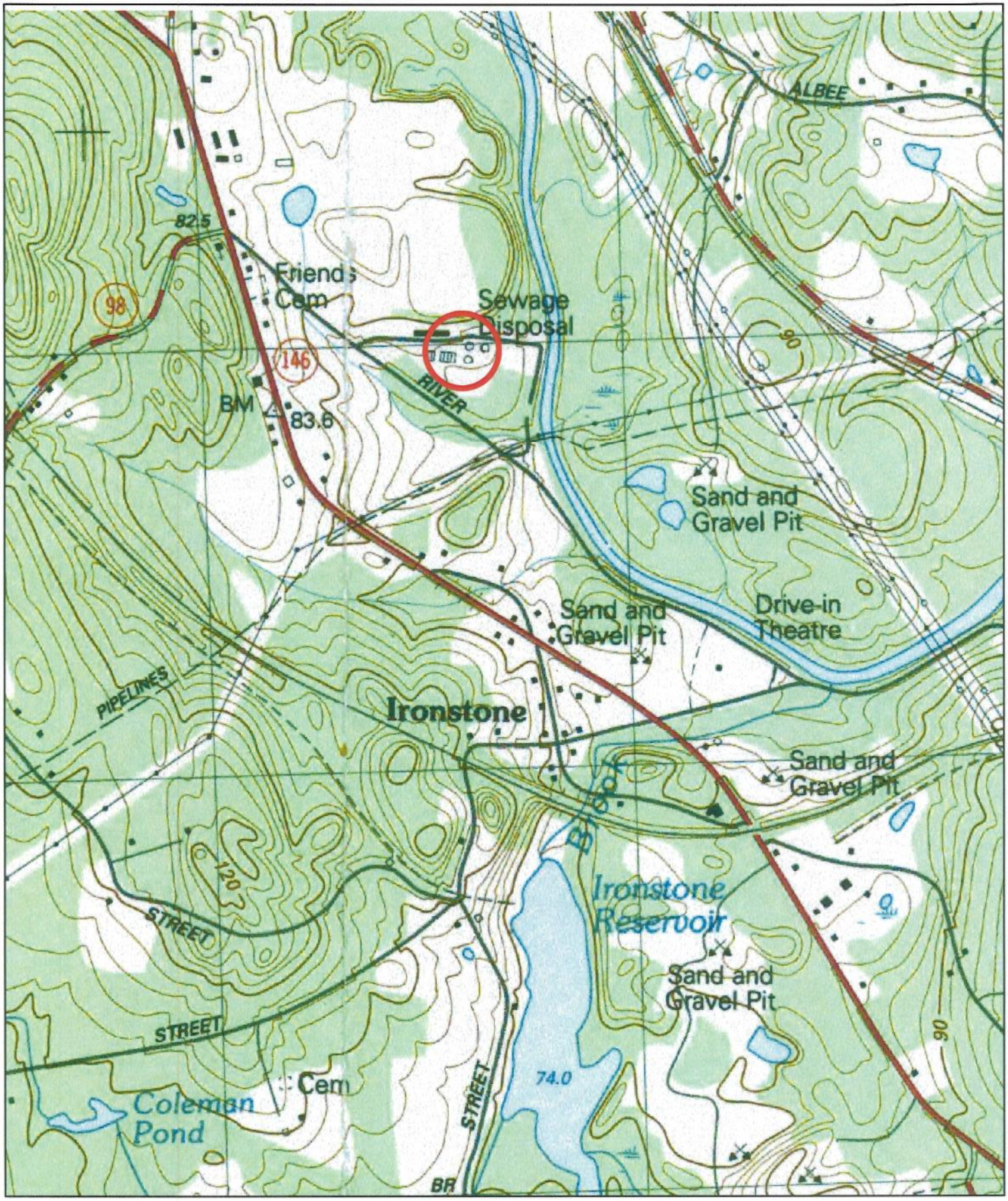


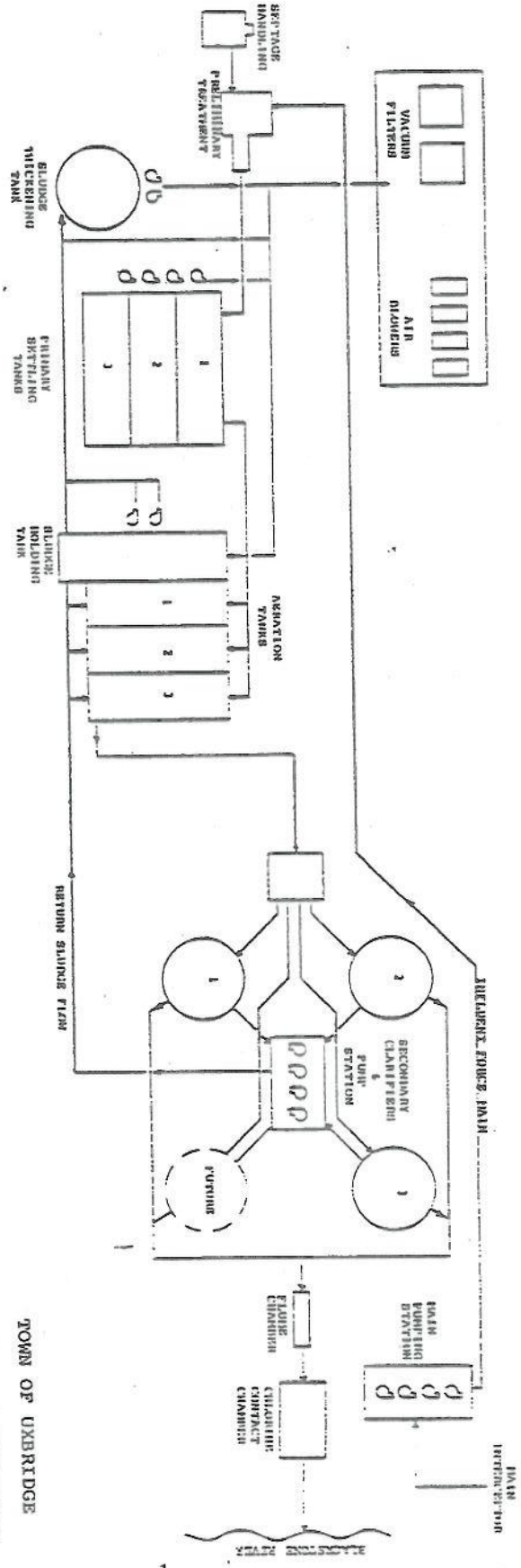
Figure 1. Location Map
Uxbridge WWTF
NPDES No. MA0102440

N
W E
S

1,000 500 0 1,000 Feet

Facility Location

Uxbridge WWTF
Fact Sheet NPDES MA 0102440
Figure 2



1-4

TOWN OF UXBRIDGE
WASTEWATER TREATMENT
FACILITY
SYSTEM SCHEMATIC
FIGURE 1-1

Uxbridge Wastewater Treatment Facility
NPDES Permit No. MA0102440

Table 1 (page 2 of 2)
Two year facility DMR Data

	pH		NH3	NO2 + NO3	DO	Total P	TRC		fecal coliform	
	min (SU)	max (SU)	mo avg (mg/l)	mo avg (mg/l)	min (mg/l)	avg (mg/l)	avg (mg/l)	max (mg/l)	mo avg (cfu/100 ml)	max (cfl/100 ml)
	6	8.3	5/10/15 (seasonal)	Report	5	1.0 (seasonal)	0.24	0.42	200	400
January 2009	7.19	7.47	0.03	10.1	6.2					
February	7.16	7.47	0.04	10.4	5.84					
March	7.1	7.4	0.04	10.1	7					
April	7.15	7.5	0.04	10	7.09	0.53	0.2	0.75	8.6	373.3
May	7.15	7.68	0.04	10.3	6	0.37	0.15	0.23	14.58	160
June	7.3	7.6	0.03	10.7	5.4	0.6	0.16	0.32	25.2	193.3
July	7.3	7.8	0.15	10.3	5.2	0.5	0.18	0.4	12.7	53.3
August	7.37	7.78	0.04	1	4.4	0.5	0.13	0.2	90.4	393.3
September	7.3	7.8	0.04	15.1	4.8	0.7	0.11	0.27	139.5	353.3
October	7.49	7.81	0.04	12.21	5.02	0.53	0.15	0.26	27.9	346.7
November	7.2	7.6	0.03	7.4	5.26					
December	7.1	7.5	0.04	7.6	5.6					
January 2010	7.1	7.6	0.04	6.9	6.1					
February	7.1	7.5	0.05	6.7	6.58					
March	7	7.5	0.64	6.5	6					
April	7.1	7.5	0.1	7.2	6.5	0.54	0.17	0.34	8.6	360
May	7.2	7.7	0.03	10.9	5.2	0.8	0.16	0.27	3.7	20
June	7.18	7.68	0.04	9.92	5.12	0.69	0.11	0.14	5.38	43
July	7.59	7.76	0.07	7.8	4.04	0.54	0.12	0.2	7.12	30
August	7.18	7.8	0.05	8.17	4.37	0.47	0.13	0.28	4.1	26.7
September	7.38	7.74	0.05	9.61	4.47	0.56	0.12	0.29	8.5	305
October	7.46	7.73	0.05	9.21	4.74	0.43	0.15	0.39	51.12	335
November	7.24	7.57	0.34	11.61	5.94					
December	7.05	7.39	0.4	14.5	6.6					
Average:			0.10	9.34		0.55	0.15		29.10	
Maximum:	7.0 (min)	7.81 (max)			4.04 (min)			0.75		393.30

Uxbridge Wastewater Treatment Facility
NPDES Permit No. MA0102440

Table 1 (page 1 of 2)
Two year facility DMR Data

	Flow	BOD			CBOD		TSS		
	12mo avg (MGD)	mo avg (mg/l)	avg wkly (mg/l)	% rem	mo avg (mg/l)	avg wkly (mg/l)	mo avg (mg/l)	avg wkly (mg/l)	% rem
Effluent Limit	2.5	30	45	85	20	30	30	45	85
January 2009	1.06	2	2	99.1			1.1	2.4	99.8
February	1	2.2	2.5	99			2.1	2.9	99.7
March	1.08	2.3	2.9	98.9			2.2	3.2	99.7
April	1.05	3.5	4	98.4			3.3	3.9	99.4
May	0.89	2.4	3	99.2			2.4	3.4	99.6
June	0.78			99.2	2.1	2.3	1.9	2.6	99.7
July	0.86			99	2.2	2.8	2.2	2.9	99.4
August	0.8			99.2	2.1	2.2	2.4	5.1	99.5
September	0.73			99.4	2	2	1.7	2.6	99.6
October	0.78			99.64	1.18	1.63	1.38	1.93	99.99
November	0.86	2	2.8	99.4			1.1	2.2	99.8
December	0.96	1.3	1.6	99.5			1.1	2	99.9
January 2010	0.92	1.2	1.6	99.5			1.1	1.8	99.8
February	0.96	2.2	3.4	99.1			2.1	3.6	99.6
March	1.44	4	7.2	97.6			2.2	4.2	99.3
April	1.53	1.7	2.3	99.1			1.4	1.9	99.6
May	0.96	1.4	2.1	99.4			1	1.6	99.9
June	0.86			99.44	1.24	2.7	1.11	1.77	99.7
July	0.71			99.9	0.47	0.97	0.89	1.44	99.9
August	0.68			99.9	0.56	0.9	0.52	0.93	99.9
September	0.67			99.9	0.4	0.6	0.51	1.1	99.9
October	0.73			99.78	0.98	1.75	1.03	1.55	99.87
November	0.77	3.47	7.25	99.07			2.24	4.63	99.66
December	0.83	1.1	1.7	99.9			0.9	1.6	99.7
Average:	0.91	2.2		99.3	1.3		1.6		99.7
Maximum:			7.25			2.80		5.10	

ATTACHMENT A

CALCULATION OF MAXIMUM ALLOWABLE LOADS FROM CONCENTRATION-BASED LIMITS

Calculations of maximum allowable loads for average monthly and average weekly $CBOD_5$, BOD_5, TSS, ammonia, phosphorus, nitrogen and metals were calculated based on the following equation:

$L = C \times Q_D \times 8.34$ where:

L = Maximum allowable load in lbs/day
C = Maximum allowable effluent concentration for reporting period in mg/l
(Reporting periods are average monthly, average weekly, and daily maximum.)
Q_D = Design flow of facility in MGD = 2.5 MGD
8.34 = Factor to convert effluent concentration in mg/l and design flow in MGD to lbs/day

Therefore:

BOD, TSS (Nov-May):
(Concentration limit) [45] X 8.34 (Constant) X 2.5 (design flow) = 938 lbs/day
(Concentration limit) [30] X 8.34 (Constant) X 2.5 (design flow) = 626 lbs/day
CBOD, TSS (June-Oct):
(Concentration limit) [30] X 8.34 (Constant) X 2.5 (design flow) = 626 lbs/day
(Concentration limit) [20] X 8.34 (Constant) X 2.5 (design flow) = 417 lbs/day
Ammonia:
(Concentration limit) [5] X 8.34 (Constant) X 2.5 (design flow) = 104 lbs/day
(Concentration limit) [10] X 8.34 (Constant) X 2.5 (design flow) = 208.5 lbs/day
(Concentration limit) [15] X 8.34 (Constant) X 2.6 (design flow) = 313 lbs/day
Total phosphorus:
(Concentration limit) [.2] X 8.34 (Constant) X 2.5 (design flow) = 4.2 lbs/day
(Concentration limit) [1] X 8.34 (Constant) X 2.5 (design flow) = 21 lbs/day
Total nitrogen:
(Concentration limit) [8] X 8.34 (Constant) X 2.5 (design flow) = 167 lbs/day

Attachment B: 7Q10 and baseflow calculations

The 7Q10 flow in the Blackstone River was calculated based on the modeling study performed in connection with the Blackstone River Initiative, which was calibrated and validated using data from July and August of 1991 that were at near-7Q10 flows. The model generated a 7Q10 flow at Uxbridge of 117.15 cfs that included all upstream POTWs operating at design flow. The boundary conditions for the 7Q10 conditions of the model-generated flow are as follows:

Sources	Flow (cfs)
Headwaters	6.53
Quinsigamond R	3.03
Mumford R	5.89
West R	3.22
UBWPAD	86.6
Millbury	1.85
Grafton	2.46
Northbridge	2.77

Blackstone River Initiative, Table 5-18.

Calculating dilution factor

The model results were used in the 1999 permit issuance to determine dilution in the Blackstone River at Uxbridge for purposes of determining total residual chlorine limits and appropriate whole effluent toxicity testing requirements. As actual flows are not at design, the design flow from each facility was subtracted from the model-generated total flow to determine the base flow under 7Q10 conditions. Then, dry weather flows from each facility were calculated and added to the baseflow to determine current receiving water flow. The calculation was set forth in the Response to Comments in connection with the current permit as follows:

7Q10 @ Blackstone River near Uxbridge =

Blackstone River upstream flow –

(UBWPAD permitted flow – UBWPAD summer flow) –

(Milbury permitted WTP flow – Milbury summer flow) –

(Grafton permitted WTP flow – Grafton summer flow) –

(Northbridge WPCF permitted flow – Northbridge summer flow)

= 117.15 cfs – 32.35 cfs – 0.76 cfs – 0.13 cfs – 1.22 cfs

= **82.7 cfs (53.3 MGD)**

In table format this calculation can be displayed as below:

	Design Flow (cfs)	Summer Flow (cfs)	(Design Flow-Summer Flow)
7Q10 from WLA model at design flow	117.15	82.69	---
UBWPAD	86.6	54.25	32.35
Millbury	1.85	1.09	0.76
Grafton	2.46	2.33	0.13
Northbridge	2.77	1.55	1.22
Remaining flow at 7Q10	23.47	23.47	---

The resulting 7Q10 flow upstream of Uxbridge, including the existing upstream POTW flows, is 82.7 cfs. This value was used to calculate the dilution factor and the chlorine effluent limit. During the time period since the current permit was issued, the Millbury WWTP discharge was terminated and its flows were tied into UBWPAD. For purposes of determining the dilution factor for this permit it is assumed that these flows are now simply added to the UBWPAD flow and the dilution factor remains the same as in the current permit.

The calculations also indicate that 7Q10 flow in the Blackstone River, when the four major treatment plants are excluded, equals 23.47 cfs. This figure includes flows from two smaller treatment plants, Upton and Douglas, that are also upstream of Uxbridge. For purposes of calculating instream phosphorus concentrations, in which loads from the smaller treatment plants are specifically included based on their permit limits, a 7Q10 baseflow was calculated by subtracting the summer flow from Upton and Douglas. The resulting "Blackstone River baseflow" is 22.75 cfs, or 14.7 MGD.

ATTACHMENT C. Delivery Factors

In order to determine the appropriate delivery factors in the Blackstone River, EPA reviewed the available evidence from the RIDEM studies and other sources. In the 2004 RIDEM Report, RIDEM applied a delivery factor of 87% (i.e. 13% of the nitrogen is removed by uptake or denitrification) to both the UBWPAD and Woonsocket nitrogen loadings in calculating the resulting loads in the Seekonk River. This figure was based on RIDEM sampling in 1995 and 1996 as compared to monthly average WWTF monitoring data. 2004 RIDEM Report at 18.

Subsequent studies have produced conflicting evidence as to the extent of attenuation in the Blackstone River. A URI study based on biweekly sampling in the lower Blackstone River between April and August 2004 found "no direct evidence of DIN attenuation or removal in the lower Blackstone," with about a 20% increase in DIN that was not accounted for by WWTF discharges. The team also concluded that "[n]or can the results of a mass balance analysis unequivocally exclude DIN removal processes in the river itself," as non-WWTF inputs such as atmospheric deposition, individual septic system inputs or other sources could be in excess of the 20% increase and mask in-stream removal processes. Nixon, et al., "Investigation of the Possible Attenuation of Dissolved Inorganic Nitrogen and Phosphorus in the Lower Blackstone River" (April 2005), in *Anthropogenic Nutrient Inputs to Narragansett Bay - A Twenty Five Year Perspective* (2005), Appendix B. In contrast, the 2005 RIDEM RTC reported attenuation rates derived from a Qual2E water quality model, modified as part of a dissertation project at URI, that predicted an attenuation rate of 8% from the UBWPAD discharge to the state line, and an additional 21% from the state line to the mouth of the river, for a combined 27% attenuation. Total attenuation of the Woonsocket discharge was predicted to be 14%. 2005 RIDEM RTC, citing Michaelis, *Dissolve Oxygen Dynamics in a Shallow Stream System*, Dissertation in Civil and Environmental Engineering at the University of Rhode Island (2005).

Additional insight into the issue is provided in a regional study conducted by the U.S. Geological Service, which indicates that there is no significant attenuation of nitrogen in New England rivers with discharges greater than 2.83 m^3/s (100 cfs) or in reservoirs. Moore, et al., *Estimation of Total Nitrogen and Phosphorus in New England Streams Using Spatially Referenced Regression Models*, USGS Scientific Investigations Report 2004-5012. This study applied a water-quality model called SPARROW (Spatially Referenced Regressions on Watershed Attributes), a "spatially detailed, statistical model that uses regression equations to relate total nitrogen and phosphorus (nutrient) stream loads to nutrient sources and watershed characteristics." The regression analysis utilized a wide array of data sources, including nitrogen monitoring data from 65 sites, to derive coefficients in-stream loss as well as for source loading from particular land uses, point and atmospheric sources and for land-to-water delivery. As applied to the Blackstone River, the SPARROW model predicts no attenuation on an annual average basis based on its average annual flow.

The UBWPAD permit analysis was based on an estimated attenuation rate for the UBWPAD discharge of 13%, and EPA continues to believe that this represents the most reasonable and appropriate estimate of attenuation in the Blackstone River. While the 2005 RIDEM RTC suggests a higher rate, that modeling indicated that uptake of nitrogen decreased as phosphorus to the system are reduced. This would indicate that attenuation rates will be lower under the new

UBWPAD permit limit of 0.1 mg/l total P (as well as new limits on other WWTFs), as opposed to the limit of 0.75 mg/l total P that was used in the model. On the other hand, while the Nixon and USGS studies indicate there may be less than 13% attenuation even under current conditions, both studies leave open the possibility that some level of attenuation is occurring. The Nixon Report specifically notes that the results do not exclude the existence of in-stream removal processes, while the USGS study does not specifically address the potential for attenuation during occasional periods when river flow falls below the 100 cfs threshold (in the Blackstone, this occurs approximately 20% of the time at Northbridge and less than 3% of the time at Woonsocket, based on USGS gage data from those locations). The attenuation rate of 13% is thus squarely within the range of the possible values based on currently available information.

For these reasons, EPA has applied delivery factors to each discharge that are consistent with 13% attenuation of the UBWPAD discharge. In the absence of other information, we assume that attenuation is proportional to the distance traveled, as calculated in Table B.1. The resulting delivery factors are applied to determine the load to the Seekonk River.

Table B.1. Delivery Factors

Calculated from: $A_i = A_{UB} * Rm_i/RM_{UB}$

Source	River Mile	Attenuation	Delivery Factor
UBWPAD	44.4	13.0%	87%
Millbury	40.6	11.9%	88%
Grafton	35.4	10.4%	90%
Northbridge	29.2	8.5%	91%
Uxbridge	22.0	6.4%	94%
Woonsocket	12.4	3.6%	96%

Date	Cu* (ug/l)	lnCu (ug/l)	$(y_i - u_y)^2$	# samples per month
4/26/2005	13	2.5649	0.0109962	1
11/15/2005	20	2.9957	0.2869163	1
5/9/2006	17	2.8332	0.1392236	1
11/14/2006	16	2.7726	0.0976576	1
5/15/2007	ND-10			1
12/12/2007	ND-10			1
12/16/2008	10.2	2.3224	0.018961	1
1/23/2009	ND-10			1
5/5/2009	10	2.3026	0.0248067	1
11/3/2009	12	2.4849	0.000616	1
5/11/2010	10.9	2.3888	0.0050871	1
11/16/2010	8	2.0794	0.1448906	1
4/26/2011	6.4	1.8563	0.3645606	1

Daily Maximum Concentration - 99th percentile (some measurements < detection limit)

Detection Limit** =		10.000
u_y = Avg of Nat. Log of daily Discharge (mg/L) =		2.46009
$\Sigma (y_i - u)^2$ =		1.09372
k = number of daily samples =		13
r = number of non-detects =		3
σ_y^2 = estimated variance = $(\Sigma[(y_i - u_y)^2]) / (k-r-1)$ =		0.12152
σ_y = standard deviation = square root σ_y^2 =		0.34860
δ = number of nondetect values/number of samples =		0.23077
z=z-score[$(0.99-\delta)/(1-\delta)$] =	z-score of	0.98700
	=	2.226211769

RP analysis/Limit calculation:

99th percentile daily max limit = exp (u_y + z-score*σ_y)

Daily Max Limit* = 25.44 ug/l

TSD-Table E-1, 99th percentile with ND

Average Monthly Concentration - 95th percentile (some measurements < detection limit)

Number of samples per month, n =		1
E(x) = Daily Avg = $\delta D + (1-\delta) \exp(u_y + 0.5\,\sigma_y^2)$ =		11.87627
V(x) = Daily Variance = $(1-\delta)\exp(2u_y + \sigma_y^2)[\exp(\sigma_y^2)-(1-\delta)] + \delta(1-\delta)D[D-2\exp(u_y + 0.5\sigma_y^2)]$ =		16.43609
A = $V(x)/[n(E(x)-\delta^n D)^2]$ =		0.179516334
B = $-[\delta^n D^2(1-\delta^n)]/(E(x)-\delta^n D)^2$ =		-0.193883136
C = $(2\delta^n D)/(E(x)-\delta^n D)$		0.482348176
σ_n^2 = Monthly Average variance = $\ln\{(1-\delta^n)[1+A+B+C]\}$		0.12152
σ_n = Monthly Average standard deviation = σ_n^2^(0.5) =		0.34860
u_n = n-day monthly average = $\ln[(E(x)-\delta^n D)/(1-\delta^n)] - 0.5\sigma_n^2$ =		2.46009
z=z-score[$(0.95-\delta)/(1-\delta)$] =	z-score of	0.93500
	=	1.514101888

RP analysis/Limit calculation:

95th percentile monthly average limit = exp (u_n + z-score*σ_n)

Monthly Avg Limit* = 19.84 ug/l

TSD-Table E-2, 95th percentile with ND

Date	Zn* (ug/l)	lnZn (ug/l)	$(y_i - u_y)^2$	# samples per month
4/26/2005	50	3.9120	0.0550474	1
11/15/2005	ND-50			1
5/9/2006	74	4.3041	0.3927077	1
11/14/2006	ND-50			1
5/15/2007	ND-50			1
12/12/2007	ND-50			1
12/16/2008	ND-50			1
1/23/2009	ND-50			1
5/5/2009	ND-50			1
11/3/2009	ND-50			1
5/11/2010	37.9	3.6350	0.001802	1
11/16/2010	19.7	2.9806	0.4855059	1
4/26/2011	35	3.5553	0.014897	1

Daily Maximum Concentration - 99th percentile (some measurements < detection limit)

Detection Limit** =		10.000
u_y = Avg of Nat. Log of daily Discharge (mg/L) =		3.67740
$\Sigma (y_i - u)^2$ =		0.94996
k = number of daily samples =		13
r = number of non-detects =		8
σ_y^2 = estimated variance = $(\Sigma[(y_i - u_y)^2]) / (k-r-1)$ =		0.23749
σ_y = standard deviation = square root σ_y^2 =		0.48733
δ = number of nondetect values/number of samples =		0.61538
z=z-score[(0.99-δ)/(1-δ)] =	z-score of	0.97400
	=	1.943133751

RP analysis/Limit calculation:

99th percentile daily max limit = exp (u_y + z-score*σ_y)

Daily Max Limit* = **101.94 ug/l**

TSD-Table E-1, 99th percentile with ND

Average Monthly Concentration - 95th percentile (some measurements < detection limit)

Number of samples per month, n =		1
E(x) = Daily Avg = δD + (1-δ) exp(u_y + 0.5 σ_y^2) =		23.28048
V(x) = Daily Variance = (1-δ)exp(2u_y + σ_y^2)[exp(σ_y^2)-(1-δ)] + δ(1-δ)D[D-2exp(u_y + 0.5σ_y^2)] =		486.62777
A = V(x)/[n(E(x)-δ^nD)^2] =		1.659024921
B = -[δ^nD^2(1-δ^n)]/(E(x)-δ^nD)^2 =		-0.080691783
C = (2δ^nD)/(E(x)-δ^nD)		0.71862884
σ_n^2 = Monthly Average variance = ln{(1-δ^n)[1+A+B+C]}		0.23749
σ_n = Monthly Average standard deviation = σ_n^2^(0.5) =		0.48733
u_n = n-day monthly average = ln[(E(x)-δ^nD)/(1-δ^n)] - 0.5σ_n^2 =		3.67740
z=z-score[(0.95-δ)/(1-δ)] =	z-score of	0.87000
	=	1.126391129

RP analysis/Limit calculation:

95th percentile monthly average limit = exp (u_n + z-score*σ_n)

Monthly Avg Limit* = **68.47 ug/l**

TSD-Table E-2, 95th percentile with ND

***Take dilution and ambient conc into consideration to determine potential conc after mix, if conc after mix > criteria, then RP exists**

**detection limit =0.003

***TSD Table 3-1

****TSD Table 3-2

Uxbridge Wastewater Treatment Facility - Response To Comments

On September 21, 2012, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) public noticed a Draft Permit (MA0102440) for the Uxbridge Wastewater Treatment Facility.

EPA received written comments from the Town of Uxbridge, the Blackstone River Coalition and the Rhode Island Department of Environmental Management (RIDEM). At the request of the applicant, EPA determined to hold a public hearing on the draft permit based on substantial public interest in the permit. The hearing took place on October 25, 2012, at the Uxbridge Senior Center. At the public hearing, the following individuals made oral comments:

State Senator Richard T. Moore
Peter Baghdasarian, Town of Uxbridge Selectman and Water/Sewer Commission
Mark Andrews
Joseph Curran
Peter Coffin, Blackstone River Coalition
Donna Williams, Blackstone River Valley National Heritage Corridor Inc.
Michael Potaski, Town of Uxbridge Conservation Commission member

The following are responses to all significant comments received and descriptions of any changes made to the public-noticed permit as a result of those comments. Additional changes to clarify permit language have also been made and are summarized at the end of this document.

A. The following comments were received from the Town of Uxbridge in a letter dated November 16, 2012:

Comment A1. At the time of the issuance of the draft permit, the Town was in the middle of conducting a wastewater facilities planning project. As the agency responsible for the implementation of the regulations, the DPW respectfully submits the following comments on this draft permit:

1. There are several new parameters in the permit that the existing wastewater treatment facility either cannot meet at current flows, cannot meet at the design flow, was not designed to meet and/or has no long term data to show it can meet. These are as follows:

a. The existing facility was not designed to treat to the bacteria levels contained in the new permit (E. coli and Enterococci) nor is there any data to demonstrate the facility is capable of achieving these new limits.

b. The existing facility was not designed to treat to the total phosphorus levels contained in the new permit nor is there any data to demonstrate the facility is capable of achieving these new limits.

c. The existing facility was not designed to treat to the total nitrogen levels contained in the new permit nor is there any data to demonstrate the facility is capable of achieving these new limits.

d. At the very least, the Town will need time to complete the planning process, design, bid and construct necessary improvements to meet these new limits.

> **Response to Comment A1.** EPA recognizes that the existing facility was not designed to meet the referenced permit limits. With respect to the bacteria limit, EPA expects that the existing facility will be able to meet the new limits based on the experience of other facilities in Massachusetts. EPA does not expect that the existing facility can meet the new limits for total phosphorus or total nitrogen. EPA has provided for tiering of the permit limits based on the facility's flow that should provide some relief from the need for immediate upgrades while the planning process proceeds, see Response to Comment A9. However, to the extent that new permit limits cannot be met by the existing facility EPA understands that the Town will need time to complete the planning process, design, bid and construct necessary improvements to meet the new limits, and expects that a reasonable compliance schedule will be developed and incorporated into an EPA enforcement order after issuance of the permit. This schedule would address any permit limit that cannot be met by the existing facility (including bacteria if necessary). Such a compliance schedule is not included within the permit because the permit is designed in part to meet Rhode Island's water quality standards, which do not provide for permit compliance schedules.
>
> *Changes to permit: See Response to Comment A9 with respect to tiered limits.*

Comment A2. With regard to pH, the former permit contained a clause after the permit range as follows "unless these values are exceeded due to natural causes." Can this be added into the new permit?

> **Response to Comment A2.** EPA is no longer including a blanket statement permitting pH exceedances that are "due to natural causes" in POTW permits. That language is vague and on its face would allow excursions from the technology-based secondary treatment pH range of 6.0 to 9.0 s.u. that are not permissible under 40 C.F.R. § 133.102. Rather, individual treatment plants are being considered on a case-by-case basis to determine whether "natural causes" are present that would support a relaxation of the permit range, and if so to determine a specific alternative pH limit for the facility. In doing so, EPA must ensure that the pH limit complies with both the technology-based standard for secondary treatment of 6.0 to 9.0 s.u.,[1] and water quality requirements based on the Massachusetts SWQS for pH requiring that the receiving water: "[s]hall be in the range of 6.5 through 8.3 standard units and not more than 0.5 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class." 314 CMR

[1] The secondary treatment standard does not apply if the POTW "demonstrates that (1) Inorganic chemicals are not added to the waste stream as part of the treatment process; and (2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0." The Uxbridge WWTF adds inorganic chemicals as part of its treatment process so this exception is inapplicable here.

4.05(b)(3). In most cases, MassDEP requires a permit range of 6.5 to 8.3 s.u. as a condition of state certification.

In the case of the Uxbridge WWTF, the facility has had no excursions from the limit in the past seven years. This indicates an ability to comply with the limit over a large range of natural conditions and no basis for expanding the permit limit range. Therefore no change will be made to the draft permit language.

Changes to permit: none.

Comment A3. With regard to residual chlorine, the former permit contained different sampling requirements. Can the permit be worded as follows: "two samples per day Monday to Friday, one sample per day Saturday and Sunday and holidays"?

Response to Comment A3. The draft permit footnote 15 to the total residual chlorine sampling requirement states "two samples per day Monday to Friday, one sample per day Saturday and Sunday." EPA agrees that the addition of holidays is consistent with the intent of this language and has revised the requirement as requested.

Changes to permit: Footnote 15 has been revised to state: "Two samples per day Monday to Friday, one sample per day Saturday, Sunday and holidays."

Comment A4. With regard to aluminum, this limit is unreasonable given the phosphorus limit and the prevalence of aluminum in phosphorus removal chemicals. It is unclear from the information provided in the Fact Sheet if a determination has been made as to what levels of aluminum may be naturally occurring in the receiving waters. It should be noted that bioassays conducted by the Town are always successful indicating the aluminum that is being discharged is non-toxic. Thus, the Town requests to have aluminum limit reduced to "reporting" status only. Further, the Town supports the Commonwealth in its establishment of a statewide site specific aluminum criterion.

Response to Comment A4. EPA's regulations require that NPDES permits contain limitations on any pollutant which it "determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard," and to make that assessment based on the approved state water quality criteria. 40 C.F.R. § 122.44(d)(1). EPA conducted an analysis of the "reasonable potential" of Uxbridge's discharge (Fact Sheet at 28-30) and determined that there was reasonable potential for the discharge to cause an excursion over the Massachusetts chronic water quality criterion for aluminum of 87 ug/l. Therefore a limit on aluminum is required.

EPA recognizes the challenges presented by aluminum limits given the widespread use of aluminum compounds for phosphorus removal. However, the need to remove phosphorus is not a justification for exceeding water quality criteria based on the toxic effects of aluminum on aquatic life, just as the need for disinfection does not obviate the

requirement for permit limits on toxic chlorine discharges. The problem is inherent in the selection of a toxic pollutant as a treatment compound. A permit limit on such a toxic pollutant is both reasonable and necessary.

EPA agrees that there has not been a determination as to what level of aluminum may be "naturally occurring" in the Blackstone River. However, high aluminum concentrations upstream of Uxbridge do not appear to be "natural." There are numerous potential sources of aluminum to the Blackstone River upstream of the discharge, including POTWs and urban and industrial stormwater discharges. Furthermore, aluminum impairments in receiving waters that are not influenced by point sources have been linked to acid rain, which is due to human activity and therefore does not constitute a naturally occurring condition. See, e.g., ENSR, *Evaluation of potential causes of aluminum-impairment in 21 New Hampshire Ponds* (2007) (Appendix E to *Determination of Total Maximum Daily Load (TMDL) for 158 Acid Impaired and 21 Aluminum Impaired New Hampshire Ponds*).

The MA SWQS do permit MassDEP to make a "determination" that a higher concentration than the adopted criterion is "naturally occurring" in a particular receiving water, and identify an alternate naturally occurring concentration. Any such determination would be part of a Water Quality Standards process, not an individual permit issuance. No such determination has been made by MassDEP for the Blackstone River, and no evidence has been provided that would indicate that the aluminum concentrations currently found in the Blackstone River at Uxbridge are naturally occurring. The available information therefore does not support application of a higher "naturally occurring" criterion, and the 87 ug/l criterion must be used. EPA is aware that MassDEP has indicated its intent to develop site specific criteria for aluminum, and a change in the water quality standards during the permit term would be grounds to request a permit modification pursuant to 40 CFR § 122.62(a)(3)(i)(B).

With respect to the bioassays cited in the comment, these permit limits are independent and whole effluent toxicity testing is not an allowable substitute for limits on specific pollutants that contribute to exceedances of a numeric criterion. It should also be noted that the permit limit is designed to meet the **chronic** aluminum criterion of 87 ug/l, while the facility performs only **acute** Whole Effluent Toxicity testing. EPA's analysis did not indicate a reasonable potential to exceed the acute criterion for aluminum. Therefore the lack of toxicity in the facility's bioassays is not inconsistent with the permit limit analysis.

Changes to permit: none.

Comment A5. Regarding Footnote No. 7, with the Town in the middle of a planning process, it is requested that any modifications should be incorporated into the overall plan for the plant and implemented as determined by the schedule in this plan.

Response to Comment A5. Footnote 7 concerns implementation of a chlorination system alarm, required within 6 months of permit effective date. EPA is not opposed to a

reasonable extension of time, but is not willing to defer it indefinitely while the Town completes its planning process. Further, as the Final Permit provides for a tiered flow structure, a major upgrade may be deferred for a number of years, a delay that is not appropriate for this requirement. The Final Permit provides a one year period for completion of this requirement.

Changes to permit: The timeframe in footnote 7 is modified from "six (6) months" to "one (1) year."

Comment A6. With regard to the dates for the toxicity tests, the new dates may cause an issue with the limited number of laboratories who perform this type of testing. The Town requests that the language from the 1999 permit be maintained in the new permit.

Response to Comment A6. The reissued permit identifies specific months for toxicity testing (April and October), as opposed to the 1999 permit which allowed the test to take place any time in the quarters ending June 30 and December 31. EPA and MassDEP's current policy is to provide for a consistent time frame for all toxicity testing in a particular watershed, to allow for better comparability among test results from multiple facilities. EPA and MassDEP are aware of the need to distribute workload for the laboratories and for that reason has identified different months for different watersheds. The requirement to conduct toxicity testing in April and October is consistent with the other POTW permits in the Blackstone River watershed and remains in the Final Permit.

Changes to permit: none.

Comment A7. Article C.5.a requires a submittal within 6 months of the effective date of the permit. This information is currently being collected as part of the planning process the Town has initiated. It is requested that the submission be tied to the completion of the planning document and not the effective date of the permit.

Response to Comment A7. The requirement for submittal within 6 months is limited to (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. While EPA recognizes that the Town is conducting a planning process, this information does not require the completion of an entire planning document and is not contingent upon any planning decisions. EPA believes these items are appropriately considered at the outset of the planning process and that 6 months is a reasonable time frame for this submittal.

Changes to permit: none.

Comment A8. With regard to articles C.5.b and c, it is requested that the Town be granted more time to complete since they are in a planning process. The Town requests that these time

frames be tied to the completion of the planning process and not to the effective date of the permit or that the submissions are a requirement of the final year of the permit.

> **Response to Comment A8.** Part C.5.b of the permit concerns submittal and implementation of the full Collection System O & M Plan, to be completed within 24 months of the permit effective date. There is no permit part C.5.c. This plan also does not require the completion of an entire planning document and is not contingent upon final plan decisions. The Town already has substantially completed mapping of the collection system, providing the basic information necessary for proceeding with this document. It is not clear what further relevant information would be provided by the planning process and in what time frame that information would be developed; the fact of a planning process alone is not a sufficient basis for deferring this requirement. The timeframe remains the same in the Final Permit.
>
> *Changes to permit: none.*

Comment A9. This permit, if issued, will lead to significant costs to upgrade the existing facility. Some of these costs may be controlled by recognizing that the ultimate design flow of the plant (2.5 mgd) would not be achieved for up to twenty years while the flows for the plant for at least the next two permit cycles are expected to fall far short of the design flow. In an attempt to mitigate these upgrade costs and not overdesign an upgrade to the facility, can EPA issue a permit that has two tiers for flows with the understanding that once the plant flow approaches the first flow tier, additional plant accommodations would be needed for the second and ultimate plant design flow? The Town is in the middle of a planning process which may demonstrate a lower design flow would be adequate for the short-term.

> **Response to Comment A9.** EPA recognizes that the permit limits for nutrients are based in large part on the design flow of the facility of 2.5 mgd, and that the facility is currently discharging less than 1.0 mgd. While in terms of design flow Uxbridge is the largest of the three remaining POTWs on the Blackstone River to receive nitrogen limits (Uxbridge, Grafton, and Northbridge), at its current level of operation it has the lowest actual flows, lowest effluent DIN concentration, and lowest nitrogen loads of the three. This is in large part a credit to the operators of the facility, who have achieved DIN reductions of approximately 65 percent (26.4 mg/l to approximately 9 mg/l) since 2004 on an entirely voluntary basis. At its current flows, the Uxbridge WWTF is comparable in size to the Burrillville, RI plant, a 1.5 mgd design flow (< 1.0 mgd current flows) for which RIDEM has required nitrogen reduction "to the maximum extent practicable" rather than including a numeric effluent limit. EPA also recognizes that the Town is engaged in a planning process and that it may determine that a 2.5 mgd design flow is unnecessary (the current design flow was based on several large industrial dischargers that have long since ceased operation). A tiered flow structure would also provide incentives for planning decisions, water conservation and other approaches that would reduce or defer effluent flow increases, an outcome EPA encourages given the large total volume of effluent that is permitted for discharge to the Blackstone River.

While the Town has suggested two tiers for flows, it has not suggested a figure for the lower flow. However, MassDEP has suggested that a lower tier of flow be established at 1.5 MGD, and that while the facility remains below that flow the permit contain only load limits for nutrients (set equal to those in the draft permit). While EPA does not accept this proposal in full, EPA agrees that it is reasonable to implement a tiered approach for a facility that is so substantially below its design flow, where (1) the facility's treatment in terms of allocating load among facilities is premised on its design flow, (2) water quality requirements can be met with modified limits at its existing flows, and (3) while the Town is actively engaged in a planning process that includes consideration of whether the current design flow is necessary to maintain in the planned facility upgrade.

The load allocation performed by RIDEM is based on design flow. The Fact Sheet also uses Uxbridge's design flow in discussing the potential downstream impacts, see Fact Sheet at 22-26, including comparison of Uxbridge's potential delivered DIN load to the Seekonk River at design flow (218 lb/day) with the MERL tank 1X loading rate, Fact Sheet at 20. Uxbridge's actual DIN loads to the Seekonk River over the past three summers (May through October 2010-12) have been much less than 218 lb/day, averaging approximately 60 lb/day. As noted above, this is less than the load for Grafton or Northbridge (which have lower design flows). It is sufficiently low that the target load at the mouth of the Blackstone, shown in Table 6 of the Fact Sheet, can essentially be met with Uxbridge at its current loading[2]; this is not the case for any of the other facilities included in the analysis. Similarly, the actual TP load from the Uxbridge facility over the past three summers has averaged 4.8 lb/day, within 15% of the permit load limit of 4.2 lb/day and far less than the 20.9 lb/d that the facility would discharge at design flow and its current permit limit of 1 mg/l.

In evaluating a proposed tiered flow structure, EPA must consider the appropriate reduced flow and the potential water quality-based limits applicable to that reduced flow. MassDEP has suggested setting a tier of limits based on a flow of 1.5 mgd, equivalent to the design flow of the Burrillville, RI facility. However, that value would allow the Uxbridge WWTF to increase its flows over 50% over current levels before more stringent permit limits would be triggered. EPA believes this is too great a scope for increase for the follow reasons:

(1) While the Burrillville, RI facility has a 1.5 mgd design flow, it is a more modern facility that is currently achieving close to 8 mg/l TN concentrations;
(2) The Uxbridge's facility's success in achieving substantial nitrogen reductions is in part due to the large amount of excess capacity at the treatment plant, which allows for creation of anoxic zones for dentrification -- it is not clear at what flow capacity will no longer be sufficient for effective denitrification; and
(3) This tiered structure is specifically designed to allow the Town to move forward with its planning process – it is not EPA's intent to provide unlimited scope for a 50%

[2] With a delivered load of 60 lb/day from Uxbridge, the total delivered load is 1,626 lb/day, compared to the water quality target of 1,624 lb/day – approximately one-tenth of one percent difference.

expansion of the existing system under reduced flow permit limits, in the absence of completed planning to identify short and medium-term, as well as long-term, needs.

Therefore, EPA has implemented a tiered approach based on a 1.25 mgd flow, or 50% of the facility design flow. EPA also notes that the Final Permit requires completion of the planning process during the permit term; this has been included as a change to Part 1.A.2.g in the Final Permit.

At flows up to 1.25 mgd, reduced flow effluent limits will be in place. The reduced flow limits have been calculated as follows:

Effluent limits carried over from previous permit: With respect to permit limits carried over from the previous permit, including BOD5, TSS, Ammonia, pH, DO and Total Residual Chlorine, concentration limits remain the same as in the prior permit in order to meet anti-backsliding requirements. Load limits, where applicable, are recalculated based on the reduced flow of 1.25 mgd. Whole effluent toxicity testing requirements and limits remain the same.

Aluminum and bacteria limits: These are not based on flow or dilution and are unchanged under the lower flow.

Nutrient limits: The new nutrient limits in the reissued permit are modified as follows:

(1) Nitrogen: Uxbridge's current nitrogen reduction practices are consistent with the water quality target for the Blackstone River at current flows. Therefore for the reduced flow of 1.25 mgd the nitrogen limit of 8 mg/l is replaced with a requirement that "the permittee shall operate the treatment facility to reduce the discharge of total nitrogen to the maximum extent possible using all available treatment equipment in place at the facility," equivalent to the requirement in the Burrilville, RI discharge permit. The Final Permit also requires annual reports that summarize activities related to optimizing nitrogen removal efficiencies, document the annual nitrogen discharge load from the facility, and track trends relative to the previous year.

(2) Phosphorus: The water quality-based calculation of the impact of Uxbridge's phosphorus load is set forth in the Fact Sheet at pages 12-13 for the design flow condition. The same calculation is set forth below based on a load limit of 4.2 lb/day (the same as that in the Draft Permit), but subtracting Uxbridge's design flow from the total flow in the river in order to ensure that the load limit alone is sufficiently protective at lower flows.

Instream concentration is determined using a mass balance equation as follows:

$$Q_r C_r = \Sigma\ Q_d C_d + Pload_{\text{Douglas}} + Q_s C_s$$

Where

Q_r = receiving water flow downstream of the discharge (Σ Qd + Q_{Douglas} + Qs)
C_r = total phosphorus concentration in the receiving water downstream of the discharge
Q_d = design flow from each facility (excluding Douglas)
C_d = total phosphorus concentration in each discharge (assumed to be permit limit)
Q_{Douglas} = design flow from Douglas
$Pload_{\text{Douglas}}$ = mass load from Douglas (assumed to be permit load limit)
Q_s = Blackstone River base flow at 7Q10 = 22.75 cfs = 14.7 MGD[1]
C_s = phosphorus concentration in baseflow, from sampling upstream of all POTWs = 0.04 mg/l

Solving for C_r yields:

$$C_r = \frac{\Sigma\ Q_d C_d + Pload_{\text{Douglas}} + Q_s C_s}{Qr}$$

$$C_r = \frac{56*\ 0.1 + 2.4*0.2 + 2.0*0.2 + 0.4*0.2 + \mathbf{4.2/8.34} + 1.2/8.34 + 14.7*0.04}{(78.4-2.5)}$$

$$C_r = 0.10 \text{ mg/l}$$

This indicates that a load-only permit limit, equivalent to that based on a design flow of 2.5 mgd and concentration of 0.2 mg/l, is sufficiently protective at the reduced flow of 1.25 mgd. The 1.0 mg/l winter limit remains in the final permit; at the lower tier flow a load limit of 10 lb/day applies.

The Final Permit also establishes a procedure for triggering the design flow-based permit limits. The Final Permit requires the permittee to evaluate their flow trends if and when the permittee becomes aware that increased flows or planned connections/extensions of the sewer system may result in an exceedance of the 1.25 MGD average annual flow limit, and estimate a projected date that the exceedance is expected to occur. The permittee must notify EPA – Office of Ecosystem Protection in writing a minimum of 60 days before that projected date, and the design flow-based permit limits will go into effect on the date identified by the permittee. If annual average flows exceed 1.25 MGD in any DMR, the design flow limits will go into effect 60 days thereafter. The permittee must notify notify EPA – Office of Ecosystem Protection in writing upon such occurrence. EPA encourages the permittee to closely track flow trends to avoid violations of the flow limit that will occur if the facility exceeds 1.25 MGD without prior notice to EPA.

Changes to permit: The permit limits at Part I.A.1. of the Draft Permit have been moved to a new Part I.A.1.b. and a new Part I.A.1.a. has been added with permit limits for flows up to 1.25 mgd as described above.

Footnote 2 to Part I.A.1. has been revised to add the following:

The permittee shall notify EPA by letter to the OEP Director, U.S. Environmental Protection Agency, 5 Post Office Square – Suite 100 (OEP06-5), Boston, MA 02109-3912, with a copy to be submitted with its monthly DMR, (i) no later than sixty days before a projected exceedance of 1.25 MGD annual average flow, if and when the permittee's evaluation of flow trends indicates that flows are expected to exceed 1.25 MGD; or (ii) at the time of filing of the first DMR in which the reported annual average flow exceeds 1.25 MGD.

Paragraph I.A.2.g. has been revised as follows:

The permittee shall conduct a planning process leading to the completion of a Comprehensive Wastewater Management Plan (CWMP) that shall include consideration of whether a design flow smaller than 2.5 mgd may be appropriate within the planning horizon of the plan. The resulting CWMP shall be completed no later than four (4) years from the effective date of the permit and shall be submitted with the reapplication for the next permit reissuance.

Comment A10. The draft permit contains load limits and concentration limits for nutrients (total nitrogen and total phosphorus). Why can't the permit contain just load limits? If the load is acceptable at 2.5 mgd, why is the same load not acceptable at a lower effluent flow rate?

Response to Comment A10. In general, both load limits and concentration limits serve important and complementary purposes in NPDES permits. As load limits are based on an annual average design flow and that flow may be exceeded in some seasons, load limits serve to ensure that the permit is protective under high flow conditions. In converse, the concentration limits serve to protect water quality under low flow conditions and to ensure that the treatment facility is being operated to its capabilities. In this case EPA has incorporated a load-only permit limit for total phosphorus under reduced flows up to 1.25 MGD. As discussed in Response to Comment A9, the load limit is sufficiently protective under the reduced flow.

Changes to permit: See Response to Comment A9 with respect to tiered limits.

Comment A11. With respect to the phosphorus limit, the incremental cost to remove an additional 0.8 mg/L (a decrease in the limit from 1 to 0.2 mg/L) is astounding. In fact, the facility is currently able to achieve an average effluent phosphorus level of less than 0.6 mg/L now, but will need to add a treatment process to reliably reduce phosphorus levels by 0.4 mg/L to 0.2 mg/L. For a facility of this size, the cost to remove a pound of phosphorus at such low limits is

extremely high when compared to larger facilities with much higher discharges of phosphorus. If 4.2 lb/d is an acceptable discharge at 2.5 mgd, why can the Town not be allowed to manage the cost of their upgrade by being allowed to meet a load limit – why is that same load not acceptable at any flow rate?

> **Response to Comment A11.** EPA recognizes the increased cost involved in meeting the permit limits, but cost is not a consideration in setting water quality-based effluent limits in NPDES permits. *Upper Blackstone Water Pollution Abatement District v. U.S. EPA*, __ F.3d __ (August 3, 2012); *United States Steel Corp. v. Train*, 556 F. 2d 822, 838 (7th Cir. 1977); *see also In re City of Moscow*, 10 E.A.D. 135, 168 (EAB 2001). As stated in the Response to Comment A10, both load and concentration limits serve important and complementary purposes in NPDES permits. In addition, the permit limit of 0.2 mg/l has been established as representing "highest and best practical treatment" under the MA SWQS and is defined as a concentration limit. As noted in Response to Comment A9, EPA recognizes that the facility is operating substantially below its design flow and has provided tiered limits to allow the facility time to plan for an upgrade, including consideration of appropriate design flow. Under the reduced flow a load limit of 4.2 lb/day is in effect, as requested by the permittee. The permittee should assume that any upgraded facility must be capable of achieving a 0.2 mg/l monthly average total phosphorus limit.
>
> *Changes to permit: see Response to Comment A9.*

Comment A12. The recent draft permit issued for Burrillville, RI contains no nitrogen limits and that facility is located further downstream and closer to Narragansett Bay. Uxbridge, like Burrillville, represents one of the smallest nitrogen loads from a wastewater treatment facility on the Blackstone River. Uxbridge has reduced its nitrogen levels to 11 mg/L as noted in the Fact Sheet. It should be noted that this reduction was done voluntarily. If required to further reduce nitrogen levels, small wastewater treatment facilities like Uxbridge will pay much more per pound removed than larger facilities which are able to remove nitrogen far more cost effectively. It would seem that this was recognized when the Burrillville permit was issued. But then, why would Burrillville have no limit while our facility has a limit? Since the Town has demonstrated a capability to voluntarily maximize nitrogen removal at the facility, the Town requests terminology in their permit that is similar to that which is in the Burrillville permit: "The permittee shall operate the treatment facility to reduce the discharge of Total Nitrogen to the maximum extent possible using all available treatment equipment in place at the facility."

> **Response to Comment A12.** According to RIDEM, the basis for the permit conditions on the Burrillville POTW is its lower design flow of 1.5 mgd (operating at 0.85 mgd at last reissuance). RIDEM's position is that at that small flow, a reduction in nitrogen would not be that significant in pounds per day. (*Personal communication, Joseph Haberak, RIDEM, March 4, 2013*). Based on the Burrillville DMR data this appears to be the case. Burrillville's average total nitrogen concentration in the summers of 2010 to 2012 was 9 mg/l. (The DIN concentration, which is what Uxbridge has reported, averaged 6.9 mg/l). An equivalent permit limit of 8 mg/l TN would achieve a 1 mg/l reduction, or 12.5 lb/day at Burrillville's design flow. In comparison, Uxbridge is

achieving a DIN concentration of approximately 9 mg/l (TN 11 mg/l). At design flow the load reduction from an 8 mg/l permit limit would be 62.5 lb/day. This is five times the potential reduction from the Burrillville facility.

EPA recognizes that Uxbridge has achieved substantial reductions in nitrogen discharges using its current facility and that it is operating well under design flow, and therefore has included tiered limits to allow the Town time for its planning process, including consideration of the necessary design flow. See Response to Comment A9. The permittee should, however, expect to implement an 8 mg/l TN limit in its upgraded facility for any projected design flow greater than 1.5 mgd.

Changes to permit: See Response to Comment A9.

Comment A13. The Town has very limited property for additional facilities and if required to meet these new permit conditions will need to wisely chose how best to use remaining property. And, given the limited funds available to address this permit, it is imperative that any work that is put into the existing facility would not be undone by a short-term change in the permit. What permit limits are expected to be in the next two permit cycles? Can EPA make a commitment with regard to how long these proposed limits will be in effect?

Response to Comment A13. EPA recognizes the space constraints at the facility and the objective to ensure that upgrades implemented to meet this permit are not undone by changes in future permit reissuances. While the permit limits are based on the best available current information, EPA notes that permit limits would be subject to change in connection with a duly issued and approved TMDL containing different load allocations. There is also the potential for long-term monitoring, subsequent to the implementation of facility improvements at all the facilities in the watershed, to indicate the need for additional reductions. Therefore, while EPA can commit that these limits are unlikely to become less stringent (due to anti-backsliding requirements), EPA cannot make a firm commitment that the permit limits will not become more stringent in future permit cycles, particularly if those permit cycles extend longer than five years, as was the case with this reissuance. As with all permits containing nutrient limits, particularly those where the watershed-scale and long range impacts of nutrients may create uncertainty as to the response of the system to loading reductions, EPA encourages facility designers to attempt to maximize the flexibility of their designs to allow for accommodating future process changes.

Changes to permit: None.

B. The following comments were received from the Blackstone River Coalition in a letter dated November 16, 2012:

Comment B1. The Blackstone River Coalition strongly supports the recently proposed draft permit limits for the Uxbridge Sewage Treatment Plant. The new nutrient limits will provide significant water quality improvements for the Blackstone River, its downstream impoundments and ultimately the Narragansett Bay.

Uxbridge is not alone in facing new limits for nitrogen and phosphorous. Every treatment plant along the river in both Massachusetts and Rhode Island is, or soon will be, forced to upgrade the quality of their discharges. Detailed scientific studies and years of citizen monitoring all report excessive nutrient levels that continue to plague the Blackstone. It is not EPA that tells us there are too many nutrients in the River; it is our noses. It is not arcane scientific models, but our eyes that can see excessive vegetation smothering downstream impoundments, and have witnessed fish kills in the Narragansett Bay.

Unfortunately, much like global warming, scientists can argue interminably as to what sources contribute how much, or how long it will take to achieve critical levels, or even what those levels are; but no one can disagree that there are simply way too many nutrients in the Blackstone River. Yes, regulators need to consider the effects of stormwater runoff and the existence of historic sediments; but at times of critical low flows in the summer, sewage treatment plants are the dominating factor affecting water quality.

Treatment at the end of the pipe is critical and necessary, but in all likelihood even the proposed limits will not be sufficient to achieve a "Fishable/Swimmable Blackstone". The Blackstone River Coalition is committed to work with homeowners and businesses, cities and towns, federal and state agencies to restore a river we can be proud to call our home.

> **Response to Comment B1.** EPA notes the support of the Blackstone River Coalition for the nutrient limits. EPA appreciates the commitment of the Blackstone River Coalition to work with stakeholders for the restoration of the Blackstone River. As discussed above, the tiered limits provided in the Final Permit will ensure that the facility maintains the nutrient reductions it has achieved, provides an incentive to avoid increasing flows, and allows the facility to meet water quality standards at its current flow, while the Town engages in planning for an upgrade and further treatment for such time as flows increase.
>
> *Changes to permit: See Response to Comment A9 with respect to tiered limits .*

C. The following comments were received from the RIDEM in a letter dated November 13, 2012:

Comment C1. The draft permit includes summer e-coli limits, to meet the Massachusetts water quality standards, and year round enterococci limits, to meet the Rhode Island water quality standards. The enterococci limits account for die-off when assigning permits limits that will meet the Rhode Island standards at the state line. These permit also include a condition that, after a minimum of 1 year, the permittee may request a reduction to only require enterococci monitoring in the winter if it is determined that "e.coli control is adequate to ensure control of enterococcus". Although RIDEM is willing to accept the reduction to the enterococci monitoring, this reduction should only be made if it is demonstrated that compliance with the e.coli limit will also ensure compliance with the enterococci limit. Therefore, RIDEM is requesting that the following change be made to footnote 8 of the permit:

8. *The E. coli limits are State certification requirements. The enterococci limits are a requirement of the EPA permit and are not a requirement of the Massachusetts Department of Environmental Protection (MassDEP) permit.*

   The enterococci sample shall be collected concurrently with one of the E.coli samples during the April to October period. After a minimum of one year, the permitee may request reduction of enterococci monitoring to winter only, if the monitoring data demonstrates that compliance with the E.coli limit is adequate to ensure compliance with the enterococcus limit. The request shall be made in writing to EPA and shall include all concurrent monitoring data collected by the permittee. The permittee shall continue sampling for both E.coli and enterococci between April and October until receiving written approval of its request from EPA.

Response to Comment C1. EPA agrees that the revised language is consistent with the intent of the original language in the Draft Permit and more clearly states the showing that is required for EPA approval of a reduction in monitoring. The Final Permit has been modified accordingly.

Changes to permit: Footnote 8 has been modified as set forth in the comment above.

D. The following comments were made orally at the Public Hearing on October 25, 2012:

Comment D1 from Senator Richard T. Moore: Thank you, Mr. Chairman. For the record, Richard T. Moore. I am a Senator in the General Court, and a resident of the Town of Uxbridge.

I have several comments. I will provide to the agencies more detailed written comments before the November 19th deadline.

But, the observations that I have first is that, I know this effort has been going on for some time, and particularly, the last year or so beginning in Worcester and then in the upper Blackstone and other communities.

And I'm somewhat concerned about the timing of it. And I know that might come in to -- at the end, once the permit is granted and the effort is -- with the Town is scoped out as far as the compliance requirement. But, given the state of the economy, and given the current condition of the Federal Treasury, I'm concerned that neither the Federal government nor the communities along the river have the resources necessary to do all that might be required by the permit, certainly within a short period of time.

And even though I don't know anyone who is probably opposed to clean water, or cleaner water, that the economics of it and the impact -- not just here, this is -- I know this is a national activity and a lot of places are subject to this. Some probably worse off than -- than we may be economically.

But, nevertheless, it is a -- it does constitute adding an additional significant economic burden to the users of the system, whether they be individual homeowners or commercial entities or industrial entities. And I would imagine, some of the entities that might have to do pre-treatment, potentially as well, in order to comply with the permit.

So, it is an additional burden to the -- the larger users potentially of the system.

The -- there is, I think it is important for the agencies to respond to the degree that the science on which -- on what it is based on, on what the numbers that have been selected, and even if they are numbers that have been in place for some period of time and yet, not achieved in many places, what is the science behind that, and will, whatever the permit calls for, will it actually make a difference in the body of water of both the Blackstone River and the Narragansett Bay.

And so, will we, if we spend $20,000,000 or $30,000,000 upgrading the plant, what is the assurance that it will, in fact, make a difference in the quality of the river. I'm not sure that -- at least in the discussions I've had with EPA on another issue, the storm water runoff issue in Bellingham and Norfolk and Franklin, they -- I still haven't heard a good answer for that.

And so, I would be hopeful that, in this case, where it is utilizing a treatment plant that perhaps, there is better science behind it. I would hope that there is. I don't know that that's the case but -- on which these regulations are based.

The other activity is relative to the financing and the cost of the actual compliance that we are complying with a Federal statute, a State statute, I guess, and State regulations on which they are based.

The benefit of compliance is a benefit that all citizens, residents of the United States will realize and why the users pay the sole cost of that compliance is a concern. It seems to me that the Federal Treasury, and perhaps that means borrowing more from China. But, the Federal Treasury ought to be more involved in this than it is. A low interest or even if it is a zero interest loan, but a low interest loan isn't the same as at least some more significant participation by those who will be the ultimate, both immediate and long term beneficiaries of cleaner rivers ought to share in that burden, not only the users, who I could conceive of the users, because they have the immediate benefit, potentially -- or at least, are -- might be considered to be the immediate contributors to the -- to the pollution have a heavy burden, the responsibility. But, so does the population as a whole, as represented through the government of the United States.

So, I think, how -- how quickly the permit gets developed, on what it is based is important, how it is funded and how it's -- how the funding that's used to comply with the permit, I think are all matters that need to be discussed by the agencies involved in the -- in the enforcement and certainly will be by the communities involved.

I would hope that there is some assistance from the EPA, perhaps the DEP, but certainly the EPA, with assisting the community to do some of the things that I mentioned during the informal part of the discussion and that is, are there things that the community can do, or the users of the system can do that would reduce the impact on the plant itself and the operations of the plant as far as what they put into it. And -- and so that the cost is spread out much more and perhaps is reduced at the plant level because of the -- those contributing to it have to take whatever action might be appropriate.

And so, some technical assistance to the community, I think, would be beneficial in that regard, assuming there is -- there are steps that could be taken.

So, those are my -- my initial comments to you. And I will provide more details to that in writing.

Response to Comment D1. EPA recognizes the concern about the timing of new permit limits in an economically weak time. EPA does not expect compliance immediately but expects to develop a reasonable compliance schedule based on affordability that takes

into account current economic conditions, and moreover has provided for tiered limits that allow the Town of Uxbridge additional time if its flows remain at a low level.

EPA also recognizes that where pollutant sources are dispersed and the impacts are felt downstream, such as with nitrogen impacts on Narragansett Bay, it is often impossible to quantify the incremental benefit associated with reductions from an individual source. This is not an indication that the science is inadequate but is simply inherent in the nature of a watershed-scale, dynamic system. The science is compelling that large reductions in discharges from POTWs are essential to achieving water quality goals, and that while the biggest treatment plants are most important (and have been treated as such), controls on smaller facilities are necessary as well.

The construction cost of the current Uxbridge WWTF was widely distributed, as it was funded with federal taxpayer money through the construction grants program. Federal grant funding is no longer available, but construction of upgrades is still eligible for low interest loans from the SRF program. EPA recognizes that funding mechanisms have shifted to greater user funding. This is not in EPA's control but it is not inherently inequitable. With respect to technical assistance, EPA has published technical assistance documents with respect to nutrient control technologies and both EPA and MassDEP are prepared to work with the Town of Uxbridge on its technical challenges.[3]

Changes to permit: See Response to Comment A9 with respect to tiered limits.

Comment D2 from Peter Baghdasarian: Thank you. As you can see, I'm a member of the Board of Selectmen and a member of the Board of Health.

And by virtue of being a Selectmen, Selectmen are also Water Sewer Commissioners in the Town of Uxbridge.

I heard the word feasibility used a little earlier in the -- in the commentary. There are two kinds of feasibilities. Scientific feasibility and financial feasibility.

And my concern is, when I look at regulations from the EEP -- the EPA, and the DEP, I see a diversion between substance and form. And we don't mind spending money for environmental protection, if a dollar spent produces a dollar's worth of actual protection of the environment.

But, where $10 is required to be spent to get a $1 or $2 benefit for the environment, that degrades the environment. Because, it takes -- consumes money, resources, otherwise available to put into areas that will produce a better return. Just a simple economic reality.

The term used was, you want to eliminate pollutants in the downstream. Well, of course, that's not possible. But yet, we see that word all the time. Eliminate.

So, there seems to be a greater emphasis on form over substance. And I would like to see a much greater emphasis on the substance.

To the extent that the DPW in Uxbridge is required to expend a certain amount of money, that money is not available to buy newer equipment. And newer equipment provides a better environmental benefit than the equipment we have today.

[3] EPA notes that it did not receive written comments from Senator Moore.

So, it's not a question of spending money to help the environment or not. When we spend resources, that are not completely justified by good science, it also degrades the environment.

And I think that part of it needs to be understood more. When I go on the DEP website -- I've been on the EPA website, but not as much, you see -- I find more attorneys than I find scientists. And I think, somewhere along the line, we have to shift the balance of responsibility.

In the case right here, we have two agencies basically doing the same thing which doesn't seem to be economically the best way to spend the governmental resources.

I know there is always a tendency for every agency to hone in on its own mission. And I understand that. But, there needs to be, and that has to come from the legislature, both the State and Federal, that everything should have a strong scientific basis and be economically feasible.

We have to look at the economic cost, because everything we do to generate economic funds has an environmental impact.

So, efficiency in regulation is an absolute must.

Thank you very much.

Response to Comment D2. Water quality-based limits in NPDES program are required to be sufficiently stringent to attain water quality standards. Under the applicable law and regulations there is no allowance for cost-benefit analysis in this process. See Response to Comment A11. This is not an issue of form over substance; the substance of water quality-based permit limit development is simply limited to water quality concerns, not cost. To the extent that cost can be considered, adjustments to water quality standards can be made, pursuant to 40 CFR 131.10 (g)(6) if necessary controls would result in substantial and widespread economic and social impact. Such an adjustment has not been proposed or approved for this receiving water

EPA does not concede that water quality benefits are such a small fraction of costs, although such an analysis is not a permissible basis for NPDES permit and no cost benefit analysis of the permit limit has been performed. EPA also disagrees with the suggestion that the permit limits are not supported by "good science." Further, upgrades to meet the permit limits are generally a portion of a larger project to upgrade outdated facilities: Uxbridge's existing plant is over 30 years old.

Neither EPA nor MassDEP employ more lawyers than scientists and engineers, and coordination between state and federal agencies is both necessary and more efficient than each agency writing independent permits to satisfy state and federal statutory requirements. EPA agrees that permit limits should have a sound scientific basis; water quality based permit limits are not based on cost. See Response to Comment A11.

Changes to permit: none.

Comment D3 from Mark Andrews: Hello. Thank you for coming tonight. My name is Mark Andrews.

I'm not -- I don't have town sewer. So, theoretically, I'm not affected by this. However, I do pay attention to the town finances and stuff like this. And I know that this will affect the school budgets, the municipal budgets because they all use town sewer.

So, I have a couple of questions. First of all, the jump of 5X sensitivity in the phosphorus, is it your history that you say, okay, that's a very tremendous jump.

So, you would ease it in over time? Is that what you expect to do? Is that what you have been doing with the permits to date?

It's very hard scientifically to make that huge jump without actually going through a process.

Now, we've been told that this -- potential changes could result. And the studies haven't been done to determine the plant and that type of thing. But, it could be up to a $30,000,000 charge.

And you have a specification that says this wouldn't -- this wouldn't respond back to any person or person over the -- less than 3 percent of the annual income of the average person in Uxbridge.

And I think you might have a tough time with that because only -- I think it was mentioned only 52 percent of the people are on town sewer. Okay. So, that's something that you need to take a look at. Will we able to meet that criteria over time?

The other thing is that you have to understand to us, is we always have a very tight school budget and municipal budget. They will be charged these fees.

That's why I asked the question is, do you guys have a funding source? Because, if it's a very, very important thing to do, I think, the Federal government should act in collaboration with the local Towns and help that process happen.

Because it's not only Uxbridge. It's Grafton before us. Worcester before us. Okay. We may do a great job, but if they don't do a great job, then -- then, we're sort of like losing the whole system of why we're trying to accomplish this.

So, my thought process, back to you guys is, can we think this out? I know we have to come up with a permit pretty quickly.

The other thing that concerned me was, when I asked a question about how long would the existing regulations last, and the response back was, well, for this permit, we think it will last longer but, maybe it won't.

And I think, we need to think about this more long-term. Because, if you -- if we make changes today that are useless for the next version that may come out, you've just wasted our money. And that will reflect back negatively on the entire process.

Thank you.

Response to Comment D3. The comment appears to reflect some uncertainty as to the basis for the phosphorus limits. The analysis underlying the permit is set forth in detail in the Fact Sheet. With respect to "eas[ing] it in over time," EPA expects that a compliance schedule will be developed providing time to come into compliance with the permit limits. See Response to Comment A1. In addition, based on the current flow level significantly below design flow, the Final Permit contains alternative limits reflecting the lower flow. See Response to Comment A9.

Regarding the comment on the economic impact being borne by sewered residents (versus the entire Town population), EPA's affordability guidance states that, "In order to evaluate substantial impacts . . . the analysis must establish which households will actually pay for pollution control as well as what proportion of the costs will be borne by households.. ." *Interim Economic Guidance for Water Quality Standards,* EPA-823-B-

95-002 (March 1995). EPA does not have information regarding the MHI for sewered versus non-sewered households nor do we have detailed information regarding how wastewater costs are apportioned by the Town, but EPA will consider such information in determining the projected financial impacts if it is presented by the Town.

EPA also notes that the reference to a "3 percent of the annual income of the average person" does not accurately reflect the financial capability analysis. Under EPA's current guidance, two percent of MHI (not three percent) is considered a threshold at which "the project may place an unreasonable financial burden on many of the households within the community," but the analysis is not limited to MHI. (EPA, 1995). As recently noted by EPA Headquarters as part of its ongoing dialogue with local governments on this issue:

> The MHI indicator presents only one of many considerations that should be evaluated in determining the most appropriate schedule. EPA expects that the full range of financial indicators as well as municipal-specific information will be considered when developing schedules. A common misconception is that the EPA requires communities to spend to a level of 2% of MHI to meet CWA obligations. Rather, the percent MHI calculation is guidance, and is considered along with a suite of other financial indicators to assess the overall burden on a community.

Stoner, N., *Memorandum, Assessing Financial Capability for Municipal Clean Water Act Requirements*, EPA (January 13, 2013).

EPA funding is through the SRF program and consists of low income loans. EPA recognizes concerns about long term uncertainty but is constrained by statutory requirements that permits be issued for five year terms. See Response to Comment A13.

Changes to permit: none.

Comment D4 from Joseph Curran: I'm Joseph Curran, resident of Uxbridge.

I would say that I really focus on the total cost. We are a town of about 14,000. And initially, I looked upon that as representing a cost of about $2000 for every man, woman and child.

If we're talking about 52 percent of the town on the sewerage, well, now, that changes those numbers. And we're talking probably in the vicinity of $4000 to $5000 for the people who are on the town sewerage system. And I think it's going -- that's going to be found to be very objectionable.

There is really nothing for us as a town. It would be one thing if the effluent was discharged into a recreational lake or a source of drinking water. I could see some real stringent things put in place.

Also true, we checked the effluent at the point of discharge. Maybe we should be looking at the discharge 100 feet or so, or whatever the distance might be, from its point of entry to see how it is diluted by the flow of water in a particular river, lake or what have you.

Some of these things were given in terms of milligrams per liter. I prefer to change them into parts per million.

So, the objections of the phosphorus comes down to .2 particles per million and the nitrogen 8 parts per million.

Our own drinking water consists of a nitrate concentration of 1.5 parts per million, copper .4 parts per million.

So, we start with our own drinking water which is coming from a well. Therefore, you will have naturally occurring materials in there that could possibly contribute to what is being processed through the sewerage treatment plant.

Our effluent is within range right now. And I can't -- I don't see the real benefit of changing some of this drastically, particularly so is the fact that too many communities are really a part of the final outcome of how this is going to be. And we're coming back to a price tag on this that is extremely high and the possible results from this are questionable at best.

Thank you.

Response to Comment D5. Costs will be taken into account in determining compliance schedules, see Response to Comment D3. Dilution is taken into account in the analysis of water quality-based limits. Human wastes are a clear and significant source of nutrients well above naturally occurring materials.

EPA also recognizes that where pollutant sources are dispersed and the impacts are felt downstream, such as with nitrogen impacts on Narragansett Bay, it is often impossible to quantify the incremental benefit associated with reductions from an individual source. This is not an indication that the science is inadequate but is simply inherent in the nature of a watershed-scale, dynamic system. The science is compelling that large reductions in discharges from POTWs are essential to achieving water quality goals, and that while the biggest treatment plants are most important (and have been treated as such), controls on smaller facilities are necessary as well.

Changes to permit: none.

Comment D5 from Peter Coffin: Peter Coffin with the Blackstone River Coalition. I reside in Mendon, Massachusetts. I'm on the Con Comm there.

Our board has not taken a vote on our stance on this permit. But, I feel comfortable that they will most likely take the same stance that they took on the Worcester permit, which is to support the EPA's stringent limits recognizing that there are physical impacts on the communities.

But, as a previous speaker noted, it all works together. And if we want this river to be fishable and swimable, like I'm sure we all do, and it is used for recreation a great deal, the plan is to work on all the permits and the treatment plants together.

Worcester is at .1 and they've been screaming. Grafton is at .2 and Uxbridge -- all of them consistent. If you look down stream, Woonsocket, an environmental justice community with even less financial resources, is stepping up and designing their plant to meet their new permit limits with nitrate of down to .3 I think, or 3 parts. They went even beyond, because they're developing a new system.

And each -- each plant is different and has different needs.

But, it is one river and it reacts to the phosphorus all together.

So, some would argue, why -- why do small treatments get .2, and the big ones have to do .1. Where -- where's the fairness in that?

I -- I don't understand all the complicated nature. And I understand, okay, bigger systems can achieve greater efficiencies. So, it makes sense, bang for the buck, to focus our -- the efforts there.

Just along those lines though, when the -- when the Worcester permit came out, I think, the Draft Permit was in 2008, 2009, there was public hearings. And at that time, the State of Massachusetts said, well, you know, we know the phosphorus is good. Let's do a TMDL. Let's do a scientific study and get a real justification of how much we're going to have to do. And get it done by 2013.

My board -- and we felt back in 2009, no, 2013 was too far away, that we had to start working on now on nutrients. So, maybe I regret that position because, 2013 is looking pretty close. And if we had a TMDL in place, we'd be in a lot better position in getting these permits out.

And that brings up the larger issue that yes, these permits are tough. And they're going to get us a lot closer to where we want to go.

But, it's not going to get us where we need to go, because we all have to work on other sources of phosphorus, non-point source. And we have to work together. And there are many ways that Towns can work together on new development and retrofitting old development and homeowners, what they can do.

And thanks to the legislature getting the phosphorus out of the fertilizer. There was a lot of education. And we all need to do a better job on that.

So, I look forward to working with the Town and all the Towns. The Blackstone River Coalition is committed to helping out the Towns do the education and the outreach to the general populace and the people understanding that there is too many nutrients and we all have to work together on it.

So, we will follow up with formal comments later. But, thank you.

Response to Comment D5. EPA acknowledges the support for the nutrient limits in the permit. EPA notes that the different wastewater treatment plants mentioned in the comment receive different permit limits and conditions based on both their size and the location of their discharge (which effects both the dilution and the potential attenuation of the discharge). The Worcester facility referred to (the Upper Blackstone Water Pollution Abatement District) is both the largest facility in the watershed (56 mgd) and receives the least dilution, as it is located in the upper portion of the watershed where very little dilution is available. It has therefore received the most stringent limit (0.1 mg/l) for phosphorus, which has direct water quality impacts at the point of the discharge, and relatively stringent (5 mg/l) total nitrogen limits to prevent downstream impacts in the Providence/Seekonk Rivers. Woonsocket has the second largest facility (16 mgd) and discharges just upstream of the nitrogen-impaired area, and therefore has received the most stringent limit for both phosphorus (0.1 mg/l) and nitrogen (3 mg/l). Uxbridge, as well as Grafton and Northbridge, receive some dilution from baseflow in the Blackstone River and therefore receive somewhat higher phosphorus limits (0.2 mg/l at design flow), as well as somewhat higher nitrogen limits reflecting the size of the facility (8 mg/l at

design flow), with Uxbridge receiving an additional tier of limits at its reduced flow. This approach is consistent with EPA guidance on load allocation approaches in TMDLs and other contexts.

With respect to the 2013 schedule for TMDLs, unfortunately there is no realistic prospect of a TMDL for the Blackstone River being completed in 2013. Despite the projected date stated in the 2012 303(d) list, MassDEP has informed EPA that the TMDL will not be completed in 2013. Nor has MassDEP provided a projected timeframe for completion, stating that the TMDL is not actively being worked on. However where a TMDL has not been completed for an impaired water and a permit to the affected receiving water has expired, EPA must proceed with permit issuance nonetheless. EPA's regulations are quite clear: where a discharge plant "will cause, have reasonable potential to cause, or contribute to' a water quality violation, EPA must include effluent limits designed to ensure that the discharge does not cause or contribute to water quality violations. When developing and issuing an NPDES permit, EPA cannot postpone reasonable potential determination and limit setting for a pollutant on the basis that there may be a TMDL for that pollutant sometime in the future.

Changes to permit: none.

Comment D6 from Donna Williams: Thank you for the opportunity to comment.

I'm Donna Williams. I'm a Grafton resident up river. We're going through the same thing. We have a permit with the same -- a Draft Permit with the same limits as Uxbridge.

Our plant is just about the same size as Uxbridge's and the same age. I believe, they were both built around 1979.

They are old plants. They are really aging. I know they have been maintained. But, they -- they do need upgrades.

I would like to speak on behalf of the Blackstone River Valley National Heritage Corridor Incorporated. This is the new management entity, the new nonprofit that is taking the place of the Federal commission for the Blackstone Heritage Corridor. Senator Moore is a fellow director with me on -- on this board.

And this board, this Blackstone River Heritage Corridor Incorporated strongly supports EPA's limits on nutrients.

The Blackstone River is a river of national significance. And that is proven by the fact that we have the Blackstone River Valley National Heritage Corridor. 24 communities have been named part of a National Heritage Corridor.

And the river is the lifeblood that runs through this entire corridor and obviously through our watershed. It is the basis of our watershed.

And perhaps you know that there is a proposal for a new national historical park within the Blackstone Heritage Corridor. So, we have the opportunity to help make this river -- to help restore it and make it much more appropriate for that kind of national status.

We know it is an old industrial river. And we all live in towns that have been industrial towns and villages and have contributed to the degradation of the river over time.

The river is much better than it has been for decades, for centuries. But, it's not anywhere near where it needs to be in order to meet class B standards of fishable, swimable.

So, by reducing these nutrients, then, we will help get to that goal.

The Blackstone River Coalition has a very admirable volunteer water quality monitoring program. Tammy Gilpatrick is here. She is the coordinator of the program and an Uxbridge resident.

So, we have 80 monitors monitoring it at 79 sites. I always get those confused -- 79 sites throughout the watershed from Worcester to Pawtucket. And they monitor on the second Saturday of every month from April through November.

That's a lot of data. It's much more data than the sparse resources of the State can use to provide that kind of data. This data is reliable. It has a quality assurance project plan that has been approved by EPA, MassDEP and Rhode Island DEM. The data is reliable.

What the data shows is that the main stem of the river is overwhelmed with nutrients, with phosphorus and nitrogen. And most of that -- much of that is coming from the wastewater treatment plants. Principally Worcester.

It's a huge plant at the head of a river that is small at the beginning of the river. It's much smaller up there certainly than it is down here or in Pawtucket.

So, Worcester is going appeal, after appeal, after appeal, after appeal, to no avail. So far, they have spent hundreds of thousands of dollars on lawyers and consultants. I would hate to see Uxbridge get into that cycle and spend very scarce dollars on an appeal to only enrich the lawyers and the consultants, because eventually, all of these Towns are going to have to meet these standards.

So, why waste that money on an appeal.

I know that under the Clean Water Act, cost cannot be a consideration for setting the limits -- for setting the limits, the standards. However, cost is -- can be and is a consideration in the implementation and the schedule for achieving those limits.

So, EPA does take affordability into account.

So, I know it sounds daunting. We don't know for sure if these estimates are accurate. Often they're way overblown. There are new technologies that can be used for these aging plants.

So, I would -- I would hesitate to say absolutely that this is going to cost $30,000,000. It might not.

So, I would just urge you to keep an open mind and really think about the river as a resource that is so important to all of us. It might not be a drinking water. It might not be our swimming hole.

But, it certainly is a major -- as I say, it's a river of national significance and it really deserves to be as clean as we can possibly make it. Thank you.

Response to Comment D6. EPA acknowledges the support for the nutrient limits in the permit. With respect to affordability see Response to Comment D3.

Comment D7 from Michael Potaski: Thank you. Michael Potaski of Uxbridge, a member of the Conservation Commission here in town.

I wasn't going to speak tonight, but, I sort of object to the idea of a previous speaker telling us we should just suck it up and not appeal or try to find some common sense in this process.

There are problems in what you've presented to us. They were brought forward by a previous speaker. I think they need to be emphasized in terms of the cost of this.

2 percent of median household income, 2 percent of the median household income of the community at large or of the 52 percent that are using the sewer facility.

I think you will find, if you examine the town, the majority of the sewer service is in the old part of town where the median income is much lower than that of the town at large.

So, to say the town at large has a median income, which should be the basis of your calculation, is a flawed approach to it. Be reasonable. Take the median income of those people who are on the sewer system and who will pay for these upgrades.

I'm also concerned about the reasonable schedule for implementation. Who defines what is reasonable? Is it a collaborative effort on the part of DEP and EPA working with the Town authorities to determine what is reasonable?

Or does the DEP and EPA say, this is what we consider reasonable, you will comply? What's it going to be?

That's not here in your presentation. Define reasonable for us, and we might be a little bit more comfortable with what's going on here.

Yes. I see the problem in Worcester. Worcester tried to be reasonable, thinking that EPA and DEP was staffed with reasonable people. And because they missed some arbitrary deadline to respond, the Courts are now telling them, well, too bad, suck it up, pay it.

I don't think that's being reasonable on the part of EPA and DEP. If a community misses a deadline, work with the community, don't shove it down people's throats.

Thank you.

Response to Comment D7. Median household income is appropriately based on the households that will bear the cost of upgrades. See Response to Comment D3. EPA expects a reasonable schedule to be developed, and that it will be consistent with national guidance regarding affordability. See Response to Comment A1. EPA disagrees with the characterization of the proceedings in Worcester.

Changes to permit: none.

APPEALING NPDES PERMITS

If you wish to contest any of the provisions of this permit, you must petition the Environmental Appeals Board (EAB), within thirty (30) days. The EAB of the U.S. Environmental Protection Agency is the final Agency decisionmaker on administrative appeals of NPDES permits. If you received notice of this permit via certified mail, the 30-day period begins on the day after the date of receipt. If you were served by regular mail, the 30-day period begins on the day after the date of receipt, and an additional three days are added to the period within which to appeal in order to compensate for mail delay.

In order to be eligible to file a petition for review, you must have filed comments on the draft permit or participated in any public hearing that may have been held pertaining to this permit. In addition, the issues raised in the appeal must have been raised during the public comment period so long as they were reasonably ascertainable. Any person who failed to file comments or failed to participate in any public hearing on the draft permit may file a petition for review of permit conditions, but only to the extent that such permit conditions reflect changes from the draft permit.

Procedures for appealing permits can be found at 40 C.F.R. § 124.19. Related provisions can be found at 40 C.F.R. § 124.16 (stays of permit conditions), 40 C.F.R. § 124.20 (computation of time), and 40 C.F.R. § 124.60 (issuance and effective date and stays of NPDES permits).

Please note: Section 124.19 has been revised, and the changes take effect on March 26, 2013. (See 17 Fed. Reg. 5281, 5285-5288 (Jan. 25, 2013)). All permit appeals filed on or after that date must conform to the revised regulation. Set forth on the following pages is the revised version of § 124.19. More information on the appeals process and the EAB can be found on the Internet at http://www.epa.gov/eab.

ENVIRONMENTAL APPEALS BOARD (EAB) CONTACT INFORMATION

The EAB's telephone number is (202) 233-0122. The EAB's fax number is (202) 233-0121. The EAB's website is at http://www.epa.gov/eab

The EAB's mailing address is:

Clerk of the Board
U.S. Environmental Protection Agency
Environmental Appeals Board
1200 Pennsylvania Avenue, N.W.
(Mail Code 1103M)
Washington, D.C. 20460-0001

40 CFR Part 124, Section 124.19(a) - (p) is revised, effective March 26, 2013, as set forth on the following pages:

issues a subsequent "final permit decision" under section 124.19 *after* administrative review proceedings are exhausted. This revised text now appears in section 124.19(l)(2).

B. What is the Agency's authority for taking this action?

EPA is issuing this document under its general rulemaking authority, Reorganization Plan No. 3 of 1970 (5 U.S.C. app.).

Section 553 of the Administrative Procedure Act (APA), 5 U.S.C. § 553(b)(3)(A), provides that "rules of agency organization, procedure, or practice" are exempt from notice and comment requirements. The action the Agency is taking today involves revisions to the Environmental Appeals Board's procedural rules to clarify existing practices and procedures that are applicable in permit appeals filed with the Environmental Appeals Board. These revisions fall under the exemption provided in APA § 553(b)(3)(A). Accordingly, EPA is not taking comment on this action.

III. Statutory and Executive Order Reviews

This action involves revisions to the Environmental Appeals Board's procedural rules to clarify existing practices and procedures that are applicable in permit appeals filed with the Environmental Appeals Board. This type of action is exempt from review under Executive Orders 12866 (58 FR 51735, October 4, 1993) and 13563 (76 FR 3821, January 21, 2011). Because this action is not subject to notice and comment requirements under the Administrative Procedures Act or any other statute, it is not subject to the Regulatory Flexibility Act (5 U.S.C. 601 *et. seq.*) or sections 202 and 205 of the Unfunded Mandates Reform Act of 1999 (UMRA) (Pub. L. 104–4). In addition, this action does not significantly or uniquely affect small governments. This action does not create new binding legal requirements that substantially and directly affect Tribes under Executive Order 13175 (63 FR 67249, November 9, 2000). This action does not have significant Federalism implications under Executive Order 13132 (64 FR 43255, August 10, 1999). This rule also is not subject to Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," (62 FR 19885, April 23, 1997), because it is not economically significant. This action is not subject to Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355, May 22, 2001), because it is not a significant regulatory action under Executive Order 12866. This action does not involve technical standards; thus the requirements of § 12(d) of the National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) do not apply. This action does not impose an information collection burden under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). The Congressional Review Act, 5 U.S.C 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. Section 804 exempts from section 801 the following types of rules (1) rules of particular applicability; (2) rules relating to agency management or personnel; and (3) rules of agency organization, procedure, or practice that do not substantially affect the rights or obligations of non-agency parties. 5 U.S.C. 804(3). EPA is not required to submit a rule report regarding today's action under section 801 because this is a rule of agency organization, procedure, or practice that does not substantially affect the rights or obligations of non-agency parties.

List of Subjects

40 CFR Part 124

Administrative Practice and Procedures.

40 CFR Part 270

Environmental Protection, Hazardous Waste.

Dated: January 14, 2013.

Lisa P. Jackson,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency amends title 40 parts 124 and 270 of the Code of Federal Regulations as follows:

PART 124—PROCEDURES FOR DECISIONMAKING

■ 1. The authority citation for part 124 continues to read as follows:

Authority: Resource Conservation and Recovery Act, 42 U.S.C. 6901 *et seq.;* Safe Drinking Water Act, 42 U.S.C. 300f *et seq.;* Clean Water Act, 33 U.S.C. 1251 *et seq.;* Clean Air Act, 42 U.S.C. 7401 *et seq.*

■ 2. Section 124.10 is amended by removing paragraph (a)(1)(iv) and redesignating paragraphs (a)(1)(v) through (a)(1)(vi) as paragraphs (a)(1)(iv) through paragraphs (a)(1)(v), respectively.

■ 3. Paragraph (b)(1) of § 124.16 is revised to read as follows:

§ 124.16 Stays of contested permit conditions.

* * * * *

(b) *Stays based on cross effects.* (1) A stay may be granted based on the grounds that an appeal to the Administrator under § 124.19 of one permit may result in changes to another EPA-issued permit only when each of the permits involved has been appealed to the Administrator.

* * * * *

■ 4. Section 124.19 is revised to read as follows:

§ 124.19 Appeal of RCRA, UIC, NPDES and PSD Permits.

(a) *Petitioning for review of a permit decision.* (1) *Initiating an appeal.* Appeal from a RCRA, UIC, NPDES, or PSD final permit decision issued under § 124.15 of this part, or a decision to deny a permit for the active life of a RCRA hazardous waste management facility or unit under § 270.29 of this chapter, is commenced by filing a petition for review with the Clerk of the Environmental Appeals Board within the time prescribed in paragraph (a)(3) of this section.

(2) *Who may file?* Any person who filed comments on the draft permit or participated in a public hearing on the draft permit may file a petition for review as provided in this section. Additionally, any person who failed to file comments or failed to participate in the public hearing on the draft permit may petition for administrative review of any permit conditions set forth in the final permit decision, but only to the extent that those final permit conditions reflect changes from the proposed draft permit.

(3) *Filing deadline.* A petition for review must be filed with the Clerk of the Environmental Appeals Board within 30 days after the Regional Administrator serves notice of the issuance of a RCRA, UIC, NPDES, or PSD final permit decision under § 124.15 or a decision to deny a permit for the active life of a RCRA hazardous waste management facility or unit under § 270.29 of this chapter. A petition is filed when it is received by the Clerk of the Environmental Appeals Board at the address specified for the appropriate method of delivery as provided in paragraph (i)(2) of this section.

(4) *Petition contents.* (i) In addition to meeting the requirements in paragraph (d), a petition for review must identify the contested permit condition or other

specific challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions for why the permit decision should be reviewed. The petition must demonstrate that each challenge to the permit decision is based on:

(A) A finding of fact or conclusion of law that is clearly erroneous, or

(B) An exercise of discretion or an important policy consideration that the Environmental Appeals Board should, in its discretion, review.

(ii) Petitioners must demonstrate, by providing specific citation to the administrative record, including the document name and page number, that each issue being raised in the petition was raised during the public comment period (including any public hearing) to the extent required by § 124.13. For each issue raised that was not raised previously, the petition must explain why such issues were not required to be raised during the public comment period as provided in § 124.13. Additionally, if the petition raises an issue that the Regional Administrator addressed in the response to comments document issued pursuant to § 124.17, then petitioner must provide a citation to the relevant comment and response and explain why the Regional Administrator's response to the comment was clearly erroneous or otherwise warrants review.

(b) *Response(s) to a petition for review.* (1) In a PSD or other new source permit appeal, the Regional Administrator must file a response to the petition for review, a certified index of the administrative record, and the relevant portions of the administrative record within 21 days after the filing of the petition.

(2) In all other permit appeals under this section, the Regional Administrator must file a response to the petition, a certified index of the administrative record, and the relevant portions of the administrative record within 30 days after the filing of a petition.

(3) A permit applicant who did not file a petition but who wishes to participate in the appeal process must file a notice of appearance and a response to the petition. Such documents must be filed by the deadlines provided in paragraph (b)(1) or (2) of this section, as appropriate.

(4) The State or Tribal authority where the permitted facility or site is or is proposed to be located (if that authority is not the permit issuer) must also file a notice of appearance and a response if it wishes to participate in the appeal. Such response must be filed by the deadlines provided in paragraph (b)(1) or (2) of this section, as appropriate.

(c) *Replies.* (1) In PSD and other new source permit appeals, the Environmental Appeals Board will apply a presumption against the filing of a reply brief. By motion, petitioner may seek leave of the Environmental Appeals Board to file a reply to the response, which the Environmental Appeals Board, in its discretion, may grant. The motion must be filed simultaneously with the proposed reply within 10 days after service of the response. In its motion, petitioner must specify those arguments in the response to which petitioner seeks to reply and the reasons petitioner believes it is necessary to file a reply to those arguments. Petitioner may not raise new issues or arguments in the motion or in the reply.

(2) In all other permit appeals under this section, petitioner may file a reply within 15 days after service of the response. Petitioner may not raise new issues or arguments in the reply.

(d) *Content and form of briefs.* (1) *Content requirements.* All briefs filed under this section must contain, under appropriate headings:

(i) A table of contents, with page references;

(ii) A table of authorities with references to the pages of the brief where they are cited;

(iii) A table of attachments, if required under paragraph (d)(2) of this section; and

(iv) A statement of compliance with the word limitation.

(2) *Attachments.* Parts of the record to which the parties wish to direct the Environmental Appeals Board's attention may be appended to the brief submitted. If the brief includes attachments, a table must be included that provides the title of each appended document and assigns a label identifying where it may be found (e.g., Excerpts from the Response to Comments Document * * * Attachment 1).

(3) *Length.* Unless otherwise ordered by the Environmental Appeals Board, petitions and response briefs may not exceed 14,000 words, and all other briefs may not exceed 7,000 words. Filers may rely on the word-processing system used to determine the word count. In lieu of a word limitation, filers may comply with a 30-page limit for petitions and response briefs, or a 15-page limit for replies. Headings, footnotes, and quotations count toward the word limitation. The table of contents, table of authorities, table of attachments (if any), statement requesting oral argument (if any), statement of compliance with the word limitation, and any attachments do not count toward the word limitation. The Environmental Appeals Board may exclude any petition, response, or other brief that does not meet word limitations. Where a party can demonstrate a compelling and documented need to exceed such limitations, such party must seek advance leave of the Environmental Appeals Board to file a longer brief. Such requests are discouraged and will be granted only in unusual circumstances.

(e) *Participation by amicus curiae.* Any interested person may file an amicus brief in any appeal pending before the Environmental Appeals Board under this section. The deadline for filing such brief is 15 days after the filing of the response brief, except that amicus briefs in PSD or other new source permit appeals must be filed within 21 days after the filing of the petition. Amicus briefs must comply with all procedural requirements of this section.

(f) *Motions.* (1) *In general.* A request for an order or other relief must be made by written motion unless these rules prescribe another form.

(2) *Contents of a motion.* A motion must state with particularity the grounds for the motion, the relief sought, and the legal argument necessary to support the motion. In advance of filing a motion, parties must attempt to ascertain whether the other party(ies) concur(s) or object(s) to the motion and must indicate in the motion the attempt made and the response obtained.

(3) *Response to motion.* Any party may file a response to a motion. Responses must state with particularity the grounds for opposition and the legal argument necessary to support the motion. The response must be filed within 15 days after service of the motion unless the Environmental Appeals Board shortens or extends the time for response.

(4) *Reply.* Any reply to a response filed under paragraph (f)(3) of this section must be filed within 10 days after service of the response. A reply must not introduce any new issues or arguments and may respond only to matters presented in the response.

(5) *Disposition of a motion for a procedural order.* The Environmental Appeals Board may act on a motion for a procedural order at any time without awaiting a response.

(g) Timing of motions for extension of time. Parties must file motions for extensions of time sufficiently in advance of the due date to allow other

parties to have a reasonable opportunity to respond to the request for more time and to provide the Environmental Appeals Board with a reasonable opportunity to issue an order.

(h) *Oral argument.* The Environmental Appeals Board may hold oral argument on its own initiative or at its discretion in response to a request by one or more of the parties. To request oral argument, a party must include in its substantive brief a statement explaining why oral argument should be permitted. The Environmental Appeals Board will apply a presumption against oral argument in PSD or other new source permit appeals. The Environmental Appeals Board may, by order, establish additional procedures governing any oral argument before the Environmental Appeals Board.

(i) *Filing and service requirements.* Documents filed under this section, including the petition for review, must be filed with the Clerk of the Environmental Appeals Board. A document is filed when it is received by the Clerk of the Environmental Appeals Board at the address specified for the appropriate method of delivery as provided in paragraph (i)(2) of this section.

(1) *Caption and other filing requirements.* Every document filed with the Environmental Appeals Board must specifically identify in the caption the permit applicant, the permitted facility, and the permit number. All documents that are filed must be signed by the person filing the documents or the representative of the person filing the documents. Each filing must also indicate the signer's name, address, and telephone number, as well as an email address, and facsimile number, if any.

(2) *Method of filing.* Unless otherwise permitted under these rules, documents must be filed either electronically, by mail, or by hand delivery. In addition, a motion or a response to a motion may be submitted by facsimile if the submission contains no attachments. Upon filing a motion or response to a motion by facsimile, the sender must, within one business day, submit the original copy to the Clerk of the Environmental Appeals Board either electronically, by mail, or by hand-delivery.

(i) *Electronic filing.* Documents that are filed electronically must be submitted using the Environmental Appeals Board's electronic filing system, subject to any appropriate conditions and limitations imposed by order of the Environmental Appeals Board. All documents filed electronically must include the full name of the person filing below the signature line. Compliance with Environmental Appeals Board electronic filing requirements constitutes compliance with applicable signature requirements.

(ii) *Filing by U.S. Mail.* Documents that are sent by U.S. Postal Service (except by U.S. Express Mail) must be sent to the official mailing address of the Clerk of the Environmental Appeals Board at: U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue NW., Mail Code 1103M, Washington, DC 20460–0001. The original and two copies of each document must be filed. The person filing the documents must include a cover letter to the Clerk of the Environmental Appeals Board clearly identifying the documents that are being submitted, the name of the party on whose behalf the documents are being submitted, as well as the name of the person filing the documents, his or her address, telephone number and, if available, fax number and email address.

(iii) *Filing by hand delivery.* Documents delivered by hand or courier (including deliveries by U.S. Express Mail) must be delivered to the Clerk of the Environmental Appeals Board at: U.S. Environmental Protection Agency, Environmental Appeals Board, EPA East Building, 1201 Constitution Avenue NW., Room 3334, Washington, DC 20004. The original and two copies of each document must be filed. The person filing the documents must include a cover letter to the Clerk of the Environmental Appeals Board clearly identifying the documents being submitted, the name of the party on whose behalf the documents are being submitted, as well as the name of the person filing the documents, his or her address, telephone number and, if available, fax number and email address.

(3) *Service requirements.* Petitioner must serve the petition for review on the Regional Administrator and the permit applicant (if the applicant is not the petitioner). Once an appeal is docketed, every document filed with the Environmental Appeals Board must be served on all other parties. Service must be by first class mail, or by any reliable commercial delivery service. Upon agreement by the parties, service may be made by facsimile or electronic means.

(4) *Proof of service.* A certificate of service must be appended to each document filed stating the names of persons served, the date and manner of service, as well as the electronic, mailing, or hand delivery address, or facsimile number, as appropriate.

(j) *Withdrawal of permit or portions of permit by Regional Administrator.* The Regional Administrator, at any time prior to 30 days after the Regional Administrator files its response to the petition for review under paragraph (b) of this section, may, upon notification to the Environmental Appeals Board and any interested parties, withdraw the permit and prepare a new draft permit under § 124.6 addressing the portions so withdrawn. The new draft permit must proceed through the same process of public comment and opportunity for a public hearing as would apply to any other draft permit subject to this part. Any portions of the permit that are not withdrawn and that are not stayed under § 124.16(a) continue to apply. If the Environmental Appeals Board has held oral argument, the Regional Administrator may not unilaterally withdraw the permit, but instead must request that the Environmental Appeals Board grant a voluntary remand of the permit or any portion thereof.

(k) *Petitioner request for dismissal of petition.* Petitioner, by motion, may request to have the Environmental Appeals Board dismiss its appeal. The motion must briefly state the reason for its request.

(l) *Final disposition and judicial review.* (1) A petition to the Environmental Appeals Board under paragraph (a) of this section is, under 5 U.S.C. 704, a prerequisite to seeking judicial review of the final agency action.

(2) For purposes of judicial review under the appropriate Act, final agency action on a RCRA, UIC, NPDES, or PSD permit occurs when agency review procedures under this section are exhausted and the Regional Administrator subsequently issues a final permit decision under this paragraph. A final permit decision must be issued by the Regional Administrator:

(i) When the Environmental Appeals Board issues notice to the parties that the petition for review has been denied;

(ii) When the Environmental Appeals Board issues a decision on the merits of the appeal and the decision does not include a remand of the proceedings; or

(iii) Upon the completion of remand proceedings if the proceedings are remanded, unless the Environmental Appeals Board's remand order specifically provides that appeal of the remand decision will be required to exhaust administrative remedies.

(3) The Regional Administrator must promptly publish notice of any final agency action regarding a PSD permit in the **Federal Register**.

(m) *Motions for reconsideration or clarification.* Motions to reconsider or clarify any final disposition of the Environmental Appeals Board must be filed within 10 days after service of that order. Motions for reconsideration must set forth the matters claimed to have been erroneously decided and the nature of the alleged errors. Motions for clarification must set forth with specificity the portion of the decision for which clarification is being sought and the reason clarification is necessary. Motions for reconsideration or clarification under this provision must be directed to, and decided by, the Environmental Appeals Board. Motions for reconsideration or clarification directed to the Administrator, rather than the Environmental Appeals Board, will not be considered, unless such motion relates to a matter that the Environmental Appeals Board has referred to the Administrator pursuant to § 124.2 and for which the Administrator has issued the final order. A motion for reconsideration or clarification does not stay the effective date of the final order unless the Environmental Appeals Board specifically so orders.

(n) *Board authority.* In exercising its duties and responsibilities under this part, the Environmental Appeals Board may do all acts and take all measures necessary for the efficient, fair, and impartial adjudication of issues arising in an appeal under this part including, but not limited to, imposing procedural sanctions against a party who, without adequate justification, fails or refuses to comply with this part or an order of the Environmental Appeals Board. Such sanctions may include drawing adverse inferences against a party, striking a party's pleadings or other submissions from the record, and denying any or all relief sought by the party in the proceeding. Additionally, for good cause, the Board may relax or suspend the filing requirements prescribed by these rules or Board order.

(o) *General NPDES permits.* (1) Persons affected by an NPDES general permit may not file a petition under this section or otherwise challenge the conditions of a general permit in further Agency proceedings. Instead, they may do either of the following:

(i) Challenge the general permit by filing an action in court; or

(ii) Apply for an individual NPDES permit under § 122.21 as authorized in § 122.28 of this chapter and may then petition the Environmental Appeals Board to review the individual permit as provided by this section.

(2) As provided in § 122.28(b)(3) of this chapter, any interested person may also petition the Director to require an individual NPDES permit for any discharger eligible for authorization to discharge under an NPDES general permit.

(p) The Environmental Appeals Board also may decide on its own initiative to review any condition of any RCRA, UIC, NPDES, or PSD permit decision issued under this part for which review is available under paragraph (a) of this section. The Environmental Appeals Board must act under this paragraph within 30 days of the service date of notice of the Regional Administrator's action.

■ 5. Paragraph (b)(1) of § 124.60 is amended by removing the reference to "§ 124.19(f)" in the first sentence and adding in its place "§ 124.19(k)(2)".

PART 270—EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

■ 6. The authority citation for part 270 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912, 6924, 6925, 6927, 6939, and 6974.

■ 7. Paragraph (f)(3) of § 270.42 is revised to read as follows:

§ 270.42 Permit modification at the request of permittee.

* * * * *

(f) * * *

(3) An automatic authorization that goes into effect under paragraph (b)(6)(iii) or (v) of this section may be appealed under the permit appeal procedures of 40 CFR 124.19; however, the permittee may continue to conduct the activities pursuant to the automatic authorization unless and until a final determination is made by the Environmental Appeals Board to grant review and remand the permit decision.

* * * * *

■ 8. Paragraph (a) of 270.155 is revised to read as follows:

§ 270.155 May the decision to approve or deny my RAP application be administratively appealed?

(a) Any commenter on the draft RAP or notice of intent to deny, or any participant in any public hearing(s) on the draft RAP, may appeal the Director's decision to approve or deny your RAP application to EPA's Environmental Appeals Board under § 124.19 of this chapter. Any person who did not file comments, or did not participate in any public hearing(s) on the draft RAP, may petition for administrative review only to the extent of the changes from the draft to the final RAP decision. Appeals of RAPs may be made to the same extent as for final permit decisions under § 124.15 of this chapter (or a decision under § 270.29 to deny a permit for the active life of a RCRA hazardous waste management facility or unit).

* * * * *

[FR Doc. 2013–01318 Filed 1–24–13; 8:45 am]

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 239 and 258

[EPA–R01–RCRA–2012–0944; FRL–9771–7]

Adequacy of Massachusetts Municipal Solid Waste Landfill Permit Program

AGENCY: Environmental Protection Agency (EPA).

ACTION: Direct final rule.

SUMMARY: This action approves a modification to Massachusetts's approved municipal solid waste landfill (MSWLF) program. The approved modification allows the State to issue Research, Development, and Demonstration (RD&D) Permits to owners and operators of MSWLF in accordance with its State law. On March 22, 2004, EPA issued final regulations allowing research, development, and demonstration (RD&D) permits to be issued to certain municipal solid waste landfills by approved states. On December 7, 2012 Massachusetts submitted an application to EPA Region 1 seeking Federal approval of its RD&D requirements. After thorough review EPA Region 1 is determining that Massachusetts's RD&D permit requirements are adequate through this direct final action.

DATES: This determination of RD&D program adequacy for Massachusetts will become effective April 25, 2013 without further notice unless EPA receives adverse comments on or before March 26, 2013. If adverse comments are received, EPA will review the comments and publish another **Federal Register** document responding to the comments and either affirming or revising the initial decision.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–R01–RCRA–2012–0944, by one of the following methods:

- *www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *Email: hsieh.juiyu@epa.gov.*
- *Fax:* (617) 918–0646, to the attention of Juiyu Hsieh.
- *Mail:* Juiyu Hsieh, RCRA Waste Management and UST Section, Office of

DRAFT

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